ENCYCLOPEDIA
AMERICANA

ELLESMERE I.
Arctic
Baffin Bay
GREENLAND
WRANGEL I.
VICTORIA I.
BAFFIN I.
USSR
SIBERIA
ALASKA
Nome
Godthaab
Hudson Bay
Bering Sea
Juneau
North
KAMCHATKA PENIN.
CANADA
ALEUTIAN IS.
Vancouver
Montreal
Ottawa
Toronto
Quebec
St. John's
North Pacific
Chicago
Atlantic
UNITED STATES
New York
AZORES
San Francisco
Denver
Washington
Ocean
Los Angeles
New Orleans
Houston
BERMUDA
Ocean
MIDWAY IS.
Gulf of Mexico
BAHAMAS
MEXICO
Havana
Honolulu
HAWAII
CUBA
HAITI
Mexico City
WAKE I.
BR.HON.
VIRGIN IS.
DOM.REP.
PUERTO RICO
GUATEMALA
HON.
Caribbean Sea
NIC.
Caracas
EL SALVADOR
MARSHALL IS.
CLIPPERTON
COSTA RICA
VENEZUELA
PANAMA
COLOMBIA
Bogotá
GUIANAS
GILBERT IS.
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GALÁPAGOS IS.
Quito
ECUADOR
SOLOMON IS.
ELLICE IS.
MARQUESAS IS.
PERU
BRAZIL
SAMOA
Lima
La Paz
NEW HEBRIDES
TUAMOTU ARCH.
BOLIVIA
FIJI IS.
Sucre
Rio de Janeiro
PARAGUAY
SOCIETY IS.
NEW CALEDONIA
Asunción
São Paulo
PITCAIRN I.
CHILE
South Pacific
Santiago
URUGUAY
Tasman Sea
Buenos Aires
Montevideo
NEW ZEALAND
Wellington
ARGENTINA
Ocean
FALKLAND IS.
N
TIERRA del FUEGO
S. GEORGIA
S. ORKNEY IS.
S. SHETLAND IS.
PALMER PENINSULA
Weddell Sea
ANTARCTICA
MARIE BYRD LAND

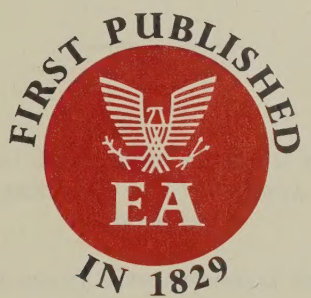
THE WORLD

ENCYCLOPEDIA AMERICANA MAP

BY HAROLD K. FAYE

THE ENCYCLOPEDIA AMERICANA

THE INTERNATIONAL REFERENCE WORK



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VOLUME XIX

MEYER–NAVAL RANK

MEYER, mī'ẽr, **Adolf,** American psychiatrist: b. Niederweningen, Switzerland, Sept. 13, 1866; d. Baltimore, Maryland, March 17, 1950. He was educated at the universities of Zürich, Paris, London, Edinburgh, and Berlin, and came to the United States in 1892.

He was honorary fellow and docent at the University of Chicago (1892–1895), and pathologist to the Eastern Hospital for the Insane at Kankakee, Illinois (1893–1895). He was pathologist and later director of the clinical and laboratory work at the Worcester, Mass., Insane Hospital, and docent in psychiatry at Clark University (1895–1902). He was director of the Pathological Institute at the New York State hospitals from 1902 to 1910, and professor of psychiatry at the Cornell University Medical College from 1904 to 1909. From 1910 to 1941 he was professor of psychiatry at Johns Hopkins University, and director of the Henry Phipps Psychiatric Clinic at Johns Hopkins Hospital. He was emeritus professor at Johns Hopkins University from 1941. He was the first person to use the term "mental hygiene," and he wrote many scientific papers on the subject.

MEYER, Adolf Bernhard, German zoologist and anthropologist: b. Hamburg, Germany, Oct. 11, 1840; d. Dresden, Germany, Feb. 5, 1911. He was educated at the universities of Göttingen, Vienna, Zürich, and Berlin. Later he made explorations in the Malays and in the Philippines. He was director of the Royal Museum of Natural History at Dresden from 1874 until his retirement in 1905

He was author of *Die Hirschgeweihsammlung zu Moritzburg* (1883–1887); *Album von Philippinentypen* (1885–1904); *Album von Papuatypen* (1894–1900); and *Amerikanische Bibliotheken und ihre Bestrebungen* (1906)

MEYER, Annie Nathan, American dramatist, author, and educator: b. New York, New York, Feb. 19, 1867; d. there, Sept. 23, 1951. Educated at home, she took examinations at Columbia University (women not then being admitted), and was one of the founders of Barnard College (women's department of Columbia University) She was active as a lecturer and publicist, and was a member of the Authors League of America, and the Dramatists Guild.

Her publications include *Woman's Work in America* (1891); *Helen Brent, M.D.* (1893); *The Dominant Sex,* a play (1911); *The District Attorney,* a play (1920), *The Advertising of Kate,* a play (1921); *Black Souls,* a play (1932); *Barnard Beginnings* (1935); and *It's Been Fun* (published posthumously, 1951).

MEYER, Balthasar Henry, American economist: b. Mequon, Wisconsin, May 28, 1866. He was graduated at the University of Wisconsin in 1894, and later studied at Berlin. He was connected with the staff of the University of Wisconsin from 1895, and was professor of political economy there from 1900 to 1910. In 1905 he was appointed a member of the Railroad Commission of Wisconsin, and from 1907 until 1911 served as its chairman. President Taft appointed him to the United States Railroad Securities Commission in 1910, and to the Interstate Commerce Commission in 1911.

He was author of *Railway Legislation in the United States* (1903); and *History of Transportation in the United States before 1860* (1917); *Some Accounting Problems under the Transportation Act* (1921).

MEYER, Conrad Ferdinand (called himself MEYER-ZIEGLER), Swiss novelist and poet: b. Zürich, Switzerland, Oct. 11, 1825; d. Kilchberg, Switzerland, Nov 28, 1898. He devoted himself in his earlier years chiefly to studies in history and art. The two historians who influenced Meyer partciularly were Louis Vulliemin at Lausanne and Jakob Burckhardt at Bâle whose book, *Die Kultur der Renaissance in Italien* (1860), stimulated his imagination and interest. From his travels in France and Italy (1857) Meyer derived likewise much inspiration for the settings and characters of his historical novels. His mind matured slowly and it was not until the Franco-Prussian War in 1870 that he found himself and his genius. In Meyer's novels a great crisis will often release latent energies and precipitate a catastrophe. In the same manner his own life, which so far had been one of dreaming and experimenting, was stirred to the very depths by the events of 1870. Meyer identified himself with the German cause and as a manifesto of his sympathies published the little epic, *Huttens Letzte Tage,* in 1871. The following two decades from 1870 to 1890 were the years of harvesting and brought to light a number of historical novels and tales.

Meyer's works include six long and five shorter historical tales, two short epic poems, and a volume of lyrics, among them some ballads of exceptional merit. The periods of the Renaissance and Counter-Reformation furnished the subjects for most of his novels in which the aesthetic charm of a picturesque setting is combined with keen psychological analysis.

Jurg Jenatsch (1876) describes the political plots and intrigues in which the Swiss canton, Graubünden, became involved during the Thirty Years' War through the conflict between Spain and Austria, and France. *Der Heilige* (1880)

tells the story of Thomas à Becket of Canterbury. *Die Richterin* (1885) introduces Charlemagne and his palace school.

Among Meyer's shorter stories may be singled out *Gustav Adolf's Page* (1882), and *Plautus in Nonnenkloster* (1882) as two gems of his inimitable art. As a psychologist and interpreter of enigmatic characters Meyer has few equals in the field of the historical novel.

EWALD A. BOUCKE,
Former Professor of German, University of Michigan.

Bibliography.—Langmesser, A., *C. F. Meyer* (Berlin 1905); Frey, A., *Meyer: sein Leben und seine Werke* (Stuttgart 1909); Korrodi, E., *C. F. Meyer: Studien* (Leipzig 1912); Burkhard, A., *Conrad Ferdinand Meyer, the style and the man* (Cambridge, Mass., 1932); Bang, C. K., *Maske und gesicht in den werken Conrad Ferdinand Meyer* (Baltimore, Md., 1940).

MEYER, Eduard, German historian: b. Hamburg, Germany, Jan. 25, 1855, d. Berlin, Germany, Aug. 31, 1930. He was educated at Bonn and Leipzig, and after completing his studies spent one year in Constantinople (Istanbul). In 1879 he went to the University of Leipzig as privatdocent; in 1885 he became professor of ancient history at Breslau; in 1889 at Halle; and in 1902 at Berlin. His original methods of teaching ancient history were highly acclaimed, and he received honorary degrees from Oxford, St. Andrews, and Freiburg universities.

Among his works are *Geschichte des Altertums,* 5 vols. (1884–1902), *Geschichte des Alten Aegyptens* (1887); *Forschungen zur alten Geschichte* (1892–1899); *Die Wirtschaftliche Entwickelung des Altertums* (1895); *Die Entstehung des Judentums* (1896); *Zur Theorie und Methodik der Geschichte* (1902); *England* (1915); *Ursprung und Anfänge des Christentums,* 3 vols. (1920–1922); and *Die Entwicklung des Judentums und Jesus von Nazareth* (1921).

MEYER, George von Lengerke, American cabinet officer and diplomat: b. Boston, Massachusetts, June 24, 1858; d. March 9, 1918. He was graduated at Harvard in 1879, and engaged in business as merchant and trustee in 1879–1899. He was a director of various trust companies, banks, manufacturing companies, and public utilities concerns, and was a member of the Boston Common Council, 1889–1890. He served in the Massachusetts House of Representatives in 1892–1896, acting as speaker in 1893–1896, and was a member of the Republican National Committee in 1898–1904. He was ambassador extraordinary and plenipotentiary to Italy in 1900–1905, and to Russia in 1905–1906. He served as postmaster general under President Roosevelt in 1907–1909, and in the Taft administration he was secretary of the navy (1909–1913).

MEYER, Hans, German explorer and publisher: b. Hildburghausen, Germany, March 22, 1858; d. Leipzig, Germany, July 5, 1929. He was educated at Leipzig, Berlin, and Strasbourg, afterward travelling in India, North America and South Africa, and subsequently visiting East Africa and South America. He entered the publishing house of his father, the Bibliographischen Instituts at Leipzig in 1884, and in the following year became one of the directors of the firm; but at intervals he continued his exploring expeditions. Among his explorations were the ascent and survey of the summit of Kilbo Peak in East Africa in 1889 and 1898; and the Ecuadorian Cordilleras in 1903.

He was author of *Zum Schneedom des Kilimandscharo* (1888); *Der Kilimandscharo* (1900); *Die Eisenbahnen im tropischen Afrika* (1902); *In den Hochanden von Ecuador* (1907); *Die Barundi* (1916); and *Das portugiesische Kolonialreich* (1918); *Morphologie der Visunga-Vulkane* (1927).

MEYER, Heinrich August Wilhelm, German Biblical commentator and theologian: b. Gotha, Germany, Jan. 10, 1800; d. Hannover, Germany, June 21, 1873. He studied at Jena, was pastor at Harste, Hoye and Neustadt, and upon his retirement in 1848, settled in Hannover. He is remembered for his *Commentaries on the New Testament,* in 16 volumes, begun in 1832 and completed in 1859.

MEYER, Henry Herman, American Methodist Episcopal clergyman, editor, and educator: b. Champaign, Illinois, Nov. 21, 1874; d. Brooklyn, New York, Oct. 6, 1951. He was educated at Baldwin Wallace College, Berea, Ohio; Drew Theological Seminary; Teachers' College, Columbia University; and at Yale University. He was ordained in the ministry in 1900, and filled pastorates in Wilmington, Calif., and Mount Vernon, N. Y. He was professor of St. Paul's College, Minnesota, 1900–1901; in 1903 he became assistant editor of the Methodist Episcopal Sunday School publications, and in 1914 he was appointed editor of those publications. In 1929 he became dean of Boston University's School of Religious and Social Work, retaining that position until 1942 when he became dean emeritus. After his retirement he was visiting lecturer at Nanking Theological Seminary, Yenching University, and West China Union University, China.

He was a member of the executive council of the Religious Education Association, the executive committee of the World's Sunday School Association, and a member of the American Association for Adult Education, the International Council of Religious Education, and the National Conference of Social Work.

He was author of *The Lesson Handbook* (annual 1904–1927); *The Graded Sunday School in Principle and Practice* (1910); *Cooperation in Christian Education* (1917); and *Child Nature and Nurture according to Count Nicholas Ludwig von Zinzendorf* (1928). He also contributed articles to various religious educational periodicals.

MEYER, Hugo Richard, American author and economist: b. Cincinnati, Ohio, April 1, 1866. He was graduated at Harvard in 1892, and attended the Harvard Graduate School from 1892 to 1896. He was instructor in political economy at Harvard from 1897 to 1903, and was assistant professor in political economy at the University of Chicago from 1904 to 1905. In 1907 he was engaged at Melbourne in preparation of a history of state ownership in Victoria, Australia.

He has written *Government Regulation of Railroad Rates* (1905); *Municipal Ownership in Great Britain* (1906), and related works including *The British State Telegraphs* (1907);

'Public Ownership and the Telephone in Great Britain' (1907).

MEYER, Johann Georg, commonly known as "Meyer von Bremen," German painter: b. Bremen, 28 Oct. 1813; d. Berlin, 4 Dec. 1886. In his 21st year he went to Düsseldorf and began his studies under Sohn and Schadow; in 1841 he opened a studio of his own but removed to Berlin as his fame increased (1853). While scenes from the Bible were first the subjects of his brush, he later turned his attention to incidents of popular life, especially among the Hessian peasantry, and finally to the portrayal of family life in its pathetic aspect. Such pictures as 'The Jubilee of a Hessian Pastor' (1843); 'Christmas Eve'; 'Blindman's Buff'; 'The Soldier's Return'; 'The Inundation' (1846); 'The Repentant Daughter' (1852, in the gallery at Bremen), are full of intense sympathy with the "simple annals of the poor." After taking up his residence at Berlin, he chose especially scenes from child life, which he rendered with spirited humor. Among his pictures of this kind are 'The Fairy Tale'; 'Children Playing Blindman's Buff'; 'Grandfather and Grandchild,' etc. A third group of his pictures includes those of young women, as single figures or in groups. Such are 'The Tryst'; 'The Love Letter.' An excellent example of his work, 'The Letter' (1873), is in the Metropolitan Museum, New York. All his works are distinguished by true human feeling, truthfulness and thoroughness of execution.

MEYER, Joseph, German publisher: b. Gotha, 9 May 1796; d. 27 June 1856. He organized various industrial undertakings, founded a publishing business at Gotha, which soon attained large proportions, was removed by him to Hildburghausen (1828), and in 1874 was transferred to Leipzig. The best known of his publications is the 'Meyers Konversationslexikon,' the rival of Brockhaus in the encyclopædia field, which has been brought down to date by constant revisions and supplements. He published also a series of the German Classics, a 'Historical Library,' and a 'Library of Natural Philosophy.'

MEYER, Kuno, German Celtic scholar: b. Hamburg, 20 Dec. 1858. He was educated at the Gelehrtenschule of the Johanneum, Hamburg, and at the University of Leipzig. In 1884–95 he was lecturer, and in 1895–1915, professor of Teutonic languages at University College, Liverpool; and from 1911 he was professor of Celtic at the University of Berlin. He founded the *Zeitschrift für Celtische Philologie* in 1895, and with Whitley Stokes founded the *Archiv für Celtische Lexikographie* in 1898. He founded the School of Irish Learning at Dublin in 1903. He was a member of the Royal Prussian Academy. His pro-German sympathies brought him into disfavor in England and Ireland after the outbreak of the European War. Author of 'Eine irische Version der Alexandersage' (1883); 'The Irish Odyssey' (1885); 'The Vision of Mac-Conglinne' (1892); 'Early Relations of the Brython and Gael' (1896); 'Liadain and Curithir' (1902); 'Ancient Irish Poetry' (1911), etc. He died in 1919.

MEYER, Lothar Julius, German chemist: b. Varel, Oldenburg, 19 Aug. 1830; d. Tübingen, 11 April 1895. He studied medicine at Zürich and Würzburg and later specialized in physiological chemistry at Heidelberg, and in mathematical physics at Königsberg. He became privatdocent in physics and chemistry at Breslau in 1859, taught in the School of Forestry at Neustadt-Eberswalde in 1866–68, and at the Karlsruhe Polytechnic in 1868–76; and from 1876 he was professor of chemistry at Tübingen. He is known for his theory of the action of carbon monoxide on the blood; and for his work in the periodic classification of the elements. Author of 'Die modernen Theorien der Chemie' (1896); 'Die Stomgewichte der Elemente aus den Originalzahlen neu berechnet' (1883); 'Grundzüge der theoretischen Chemie' (1902).

MEYER, [Marie] Paul Hyacinthe, French philologist: b. Paris, 17 Jan. 1840; d. 19 March 1917. He was educated at the Lycée Louis le Grand and at the École des Chartes, specializing in the Romance languages. He was attached to the manuscript department of the Bibliothèque Nationale in 1863–65, and in 1865 founded the *Revue Critique.* He was keeper of the national archives in 1866–72 and in 1872 founded *Romania,* to which he was the leading contributor. He was appointed professor of the languages and literatures of southern Europe at the College of France in 1876, and from 1882 he was a director of the École Nationale des Chartes. He became honorary professor at the College of France in 1906. His work in connection with romance literature is of exceptional value and he is considered the leading modern authority on the French language. He was a member of the Institute of France, a commander in the Legion of Honor and an associate of the British Academy. He edited a large number of old French texts, many of which were for the Société de l'histoire de France and the Société des anciens textes français. Among them are 'Aye d'Avignon' (1861); 'Flamença' (1865); 'Histoire Guillaume le Maréchal, comte de Striguil et de Pembroke' (3 vols., 1891–1901); 'Fragments d'une vie de Saint Thomas de Cantorbéry' (1885), etc. Author of 'Rapports sur les documents manuscrits de l'ancienne littérature de la France conservés dans les bibliothèques de la Grande Bretagne' (1871); 'Recueil d'anciens textes bas-Latins, provencaux et français' (2 parts, 1874–76); 'Alexandre le Grand dans la littérature française du moyen âge' (2 vols., 1886); 'Histoire des relations de la France avec Venise' (1896); 'Documents linguistiques du midi de la France' (1909), etc.

MEYER, Victor, German chemist: b. Berlin, 8 Sept. 1848; d. Heidelberg, 8 Aug. 1897. He studied at the University of Berlin and under Bunsen at Heidelberg. In 1868 he entered the laboratory of Baeyer at Berlin, and in 1871 he became professor at the Stuttgart Polytechnic. He was professor of chemistry and director of the laboratory at Zürich in 1872–85, professor at Göttingen in 1885–89, and from 1889 until his death he occupied the chair of his former master, Bunsen, at Heidelberg. He is famous for his experiments establishing a method of determining vapor densities and for the discovery of thiophen. He was awarded the Davy medal of the Royal Society in 1891. Author of 'Die Thiophengruppe' (1888); 'Chemische Probleme der Gegenwart' (1890);

'Lehrbuch der organischen Chemie' (2 vols., 1891–92); 'Märztage im Kanarischen Archipel' (1893), etc.

MEYER-HELMUND, Erik, Russian-German composer: b. Petrograd, 25 April 1861. He studied in Berlin and became known as a composer of appealing songs, for many of which he wrote both words and music. Author of the operas 'Margitta' (1889); 'Der Liebeskampf' (1892); 'Heines' Traumbilder' (1912); the burlesques 'Trischka' (1894); 'Lucullus' (1905), and the light opera 'Taglioni' (1912).

MEYER-LUBKE, Wilhelm, German-Swiss philologist: b. Dübendorf, Switzerland, 30 Jan. 1861. He was educated at the universities of Zürich and Berlin, and in 1887 became professor at Jena. He was appointed professor of Romance philology at Vienna in 1890, serving as rector in 1906–07. Author of 'Grammatik der romanischen Sprachen' (4 vols., 1890–1905); 'Italienische Grammatik' (1891); 'Einfuhrung in das Studium der romanischen Sprachwissenschaft' (1901); 'Historische Grammatik der französischen Sprache' (1908); 'Katalonische Deutsch' (1925).

MEYERBEER, mī'ĕ-bār, **Giacomo** (Italianized form of Jakob Meyer Beer), German composer: b. Berlin, 5 Sept. 1791; d. Paris, 2 May 1864. His father, Jakob Beer, was a rich banker of Jewish descent, and of high reputation in the commercial world. The son gave early proof of his devotion to the art of music, and at nine was regarded as a masterly pianist in a city famous for its excellent musicians. After studying composition under Bernhard Anselm Weber, he entered in 1810 the school of the Abbé Vogler at Darmstadt, where for three years he had the companionship of Karl Maria von Weber (q.v.). An intimate friendship sprang up between them, which was only interrupted by the death of the latter. While at Darmstadt Meyerbeer composed a cantata, 'Gott und die Natur,' which brought him the appointment of court musician to the grand-duke. In 1811 his opera 'Jephthas Gelübde' was produced at Munich, but failed to please the audience, though highly praised by Weber, Vogler and other musical authorities. Discouraged by its public reception, Meyerbeer went to Vienna, where he made his début as a pianist with such success that he seemed destined to eclipse the fame of all contemporary artists. Commissioned by the court of Vienna he produced 'Alimelek, oder die beiden Kalifen,' which was no more successful than his former effort. He was induced to visit Italy, and became a convert to the new musical school of that country. He rapidly composed in this style a series of operas, which were generally well received: 'Romilda e Costanza' (1818); 'Semiramide riconosciuta' (1819); 'Emma di Resburgo' (1819); 'Margherita d'Anjo' (1820); 'L'Esule di Granata' (1822); and 'Il crociato in Egitto' (1824). The success of the last-mentioned opera traveled beyond the Alps, and the composer was invited to Paris to superintend the preparations for the production of the 'Crociato' at the Grand Opéra, where it met with an enthusiastic reception. In 1831 his 'Robert le Diable' was produced for the first time, and the excitement it caused was perhaps unparalleled on the Parisian stage. Meyerbeer had ceased to be a pupil of Rossini, and 'Robert' combined in a singular degree oriental gorgeousness, German massiveness, French vivacity and Italian brilliancy, which the preceding works of the composer had not prepared the world to expect. He reached the climax of his fame by his next opera, 'Les Huguenots' (1836). He was appointed Royal music director at Berlin in 1842, and returned to Paris in 1849. 'Les Huguenots' was followed at long intervals by 'Le Prophete' (1849); 'Pierre le Grand' ('L'Etoile du Nord' 1854); 'Le Pardon de Ploërmel' ('Dinorah' 1858); and 'L'Africaine' (1865). The composer did not live to see the production of his last work. Besides his operas he wrote many songs, an oratorio, cantatas, a Te Deum, music for the tragedy of 'Struensee' by his brother, and other works. Consult De Curzon, H., 'Meyerbeer; biographie critique' (1910); De Bury, 'Meyerbeer, sa vie, ses œuvres et son temps' (1865); Hervey, A., 'Meyerbeer' (1913); Mendel, 'Giacomo Meyerbeer, eine biographié' (1868); Pougin, 'Meyerbeer' (1864).

MEYERHEIM, Friedrich Eduard, frēd'-rĭh ed'oo-ard mī ĕ-hīm, German artist: b. Dantzic, 7 Jan. 1808; d. Berlin, 18 Jan. 1879. He studied landscape painting in his native town, and in his 22d year went to Berlin, where he attended the Academy and fell under the influence of Schadow. He became a member of the Berlin Academy in 1838, and a professor there in 1850. Ten lithographic views of Dantzic, published by him in 1832, were included in his 'Architektonische Denkmäler der Altmark Brandenburg,' which appeared the following year. Between 1833 and 1841 he produced a number of genres with a romantic motif as illustrative of peasant and bourgeoise life. Of such a character is 'The Champion Shot' (1836) in the Berlin National Gallery. In his search for character, costume, scenery and incident he traveled, studied and sketched over a wide area of territory, which included Westphalia, Altenburg, Thuringia, Hesse and the Harz district. His admirable genres are distinguished by a clear enamel-like coloring. Amongst the most notable are 'Leaving Church in Altenburg'; 'In an Altenburg Cornfield'; 'The Little Kid' (1842); 'Bedfellows' (1844); his masterpiece, 'Waiting' (1845); and 'Good Morning, Dear Father' 1858). Consult his 'Autobiography' (1880).

MEYERHEIM, Paul, German painter: b. Berlin, 13 July 1842; d. 1915. He was a son of Friedrich Eduard Meyerheim and was taught by his father, and afterward studied at the Berlin Academy. Travel through Belgium and Holland enlarged his artistic experience and knowledge, and he afterward spent a year at Paris. He then returned to Berlin, where he applied himself to animal painting, but also did some portrait, genre of common life, humorous scenes, still life, interior decoration of buildings, etc. He executed works both in oil and watercolors, and his versatility was only equaled by his delicate sense of color and brilliant technique. Considering all these qualities his fertility must be called extraordinary. Some of his best works are 'History of the Locomotive in Seven Pictures on Copper' (Villa Borsig, Berlin); 'An Antiquary of Amsterdam' (1869); 'Four Seasons in the Life of a Bird';

In the Menagerie; Portrait of His Father and Daniel Chodowiecki; The Theatre of Monkeys; The Hare and the Frog.

In 1863 he undertook a journey into Egypt from which he brought back many landscape and figure studies. He was a Royal professor and was awarded grand gold medals at Berlin and Munich.

MEYERHOF, mī'ĕr-hōf, **Otto,** German physiologist: b. Hannover, Germany, April 14, 1884. He was professor at Kiel (1918–1924); he joined the Kaiser Wilhelm Institute for Biology in Berlin-Dahlem in 1924, and five years later became the director of the Department of Physiology of the Kaiser Wilhelm Institute for Medical Research at Heidelberg. He investigated carbohydrate metabolism, enzyme chemistry, thermodynamics, and biological assay, and was awarded the Nobel Prize (with Archibald V. Hill) in 1922 for his study of cellular oxidation and for the discovery of the transformation of lactic acid in the muscles. In 1938–1940 he worked at the Institute of Biology in Paris, and subsequently continued his research activities at the School of Medicine of the University of Pennsylvania.

MEYERHOLD, mī'ĕr-hôlt, **Vsevolod Emilievich,** Russian theatrical director and producer: b. Penza, Russia, Jan. 28, 1874. Although he attained success and recognition during the czarist regime, after the revolution he became a member of the Communist Party. He began his career as an actor of the Moscow Theater of Art under the guidance of such famous masters of the true-to-life staging as K. S. Stanislavsky and V. I. Nemirovsky-Danchenko. After a trip to Italy in 1902 he founded the Theater of New Drama; in 1906 he became the director of a theater in St. Petersburg (now Leningrad); subsequently he took over the direction of a theater in Moscow bearing his name.

Meyerhold's earlier stagings were strongly naturalistic, but later he made such radical changes in presenting plays as the discarding of the curtain, the keeping the stage bare or provided only with purely formal, symbolistic scenery—a style imitated by modern theaters all over the world. He is author of *The Theater* (St. Petersburg 1913) and *Reconstruction of the Theater* (Moscow 1930).

MEYERSDALE, mī'ĕrz-dāl, borough, Pennsylvania, in Somerset County, 18 miles northwest of Cumberland, Md., and 113 miles southeast of Pittsburgh; altitude 2,054 feet. It is served by the Baltimore and Ohio, and Western Maryland railroads. Industries include the manufacture of cement, fertilizer, feed, and clothing. Diversified farming and coal mining are carried on nearby. It was incorporated as Dale City in 1870, the name being changed in 1874. Pop. (1950) 3,137.

MEYNELL, mĕn'l, **Alice Thompson,** English poet: b. Barnes, Surrey, Eng., Sept. 22, 1847; d. London, Nov. 27, 1922. She spent much of her childhood in Italy, and in about 1872 became a Catholic. She married in 1877 Wilfrid Meynell by whom she had eight children, and with whom she founded and edited the Catholic papers *Weekly Register* (1883–1895) and *Merry England* (1881–1898). Their home was a center of literary life of the Catholic intelligentsia. In 1901–1902 she lectured in the United States on Charles Dickens, the Brontë sisters and on poets of the 17th century.

Mrs. Meynell's early volume of poems *Preludes* (1875) was illustrated by her sister Elizabeth, Lady Butler, well-known as a painter. It reveals the same delicate sentiments, the same mystic searching for the unseen world of the soul, that characterize the poems of her idols, Elizabeth Barrett Browning and Christina Rossetti. She published essays in *The Rhythm of Life* (1893), *The Colour of Life* (1896), *The Children* (1897) and *John Ruskin* (1900); then the whole harvest of a life rich in beauty and faith was presented in *Collected Poems* (1913) and *Essays* (1914). Consult also *Alice Meynell, a Memoir* (London 1929) written by her daughter Viola Meynell Dallyn.

MEYRINK, mī'rĭngk, **Gustav,** German writer: b. Vienna, Austria, June 19, 1868; d. Starnberg, Bavaria, Germany, Dec. 7, 1932. He was a banker in Prague, Bohemia, but abandoned his profession to dedicate himself to writing. Joining the staff of *Simplicissimus,* Munich's celebrated satirical periodical, he acquired his first reputation as author of sketches and parodies. Later he wrote novels, mostly about gruesome and mystic topics, among which *The Golem* (1915), based upon an ancient Jewish legend of Prague, attained great success.

MEZEN, mā'z'n, Russian myā'zyĭn-y', river, Soviet Russia, Europe, about 550 miles long. It rises on the west slope of the Timan Mountains and flows south and then north-northwest, past the cities of Koslan and Mezen, to Mezen Bay, an arm of the White Sea. The upper course is strewn with rapids. It is navigable from May to November.

MEZEREUM, mē-zē'rē-ŭm, or **MEZEREON,** mē-zē'rē-ŏn, an Old World low shrub of the family Thymelaeaceae. The genus *Daphne* contains about 40 species of which the best-known is *Daphne mezereum.* See also DAPHNE.

MEZES, mā'zĕz, **Sidney Edward,** American educator: b. Belmont, California, Sept. 23, 1863; d. Pasadena, California, Sept. 15, 1931. He was graduated from the University of California in 1884 and received his doctor's degree from Harvard University in 1893. From 1894 to 1914 he was engaged in teaching, principally at the University of Texas, where he was professor of philosophy and dean of the college. In 1908 he was elected president of that university, and in 1914 he succeeded John H. Finley as president of City College of The City of New York, a position he held until 1927.

His published works include: *The Conception of God* (1897); *Ethics, Descriptive and Explanatory* (1901); *What Really Happened in Paris* (part author, 1921); and *The Intimate Papers of Colonel House,* 4 vols. (1926–1928).

MEZIERES, mā-zyâr', **Alfred Jean François,** French critic and politician: b. Rehon, France, Nov. 19, 1826; d. there, Oct. 10, 1915. He studied at the École Normale and in Athens; was professor of literature at Nancy (1854–1861) and at the Sorbonne (1863); became a member of the French Academy in 1874; in poli-

tics was a member of the moderate Opportunists, and was deputy from 1881 to 1900, when he was elected senator for Meurthe-et-Moselle. Besides contributions to the *Revue des Deux Mondes* and *Temps,* he wrote *Shakespeare* (1861); *Shakespeare's Predecessors and Contemporaries* (1863); *Shakespeare's Contemporaries and Successors* (1864); *Dante* (1865); *Petrarch* (1867); *Goethe* (1872–1873); *In France* (1883); *Outside of France* (1883); *Mirabeau* (1891); *Petrarch* (1895); *Dead and Living* (1898); *The Passing Time* (1906); *Portraits of Soldiers* (1907); *Ulbina Verba* (1914).

MEZIERES or **MAISIERES,** mā-zyâr', **Philippe de,** soldier, crusader, and author: b. Château of Mézières, Picardy, about 1327; d. Paris, May 29, 1405. He served with the French Army in Smyrna in 1346, was knighted and afterward went to Jerusalem where he endeavored to found an order of knighthood to be maintained in Rome for its protection against the Mohammedans. He visited Cyprus in 1347 and made a convert of Peter of Lusignan, the son of King Hugo IV; and after the accession of Peter to the throne, in 1358, he returned to the island and became his chancellor, probably in 1360. He was associated here with the legate Peter Thomas, who became patriarch of Constantinople in 1364. Mézières traveled with King Peter to the courts of western Europe, seeking support for a new crusade, and was with him at the capture of Alexandria in 1365. One-third of the booty was awarded Mézières for the creation of his order, the plan of which was laid forth in his *Nova religio passionis* (1367–1368), and which he extended in 1386 and 1396. Finding the Crusaders unwilling to aid him in realizing his dream Mézières was commissioned to visit Venice, Avignon, and western Europe to enlist their aid for the kingdom of Cyprus against the sultan. Failing in his efforts he again sought converts for his order, but in 1368 returned to Cyprus, where he remained until the assassination of King Peter in 1369. In 1372 he was attached to the court of Pope Gregory XI, and in 1373 he became a counsellor of Charles V, at Paris. He enjoyed the king's full confidence and was tutor to his son, who became Charles VI. After the accession of Charles VI, however, Mézières retired to the Convent of the Celestines. He never lost touch with public affairs, but devoted himself chiefly to literature and the endeavor to establish his order at Jerusalem. His life of his friend and confrere, Peter Thomas, *Vita S. Petri Thomasii* (Antwerp 1659), contains a highly valuable account of the Alexandrian expedition. Most of his writings concerned his project for the founding of his Order of the Passion.

MEZIERES, capital city, France, of the Department of Ardennes, on the neck of a peninsula formed by the Meuse, 55 miles northeast of Reims, on the Eastern Railway. It is connected by a bridge with Charleville on the opposite bank of the Meuse, which, together with Arches, Pierre, and Mohon, forms practically one city with Mézières. It was formerly a fortified town but its forts were dismantled in 1886. It was successfully defended by Bayard against Emperor Charles in 1521, but was besieged and taken by the Germans in 1815 and in 1871. It fell into German hands early in World War I and remained in the enemy's hands until after the signing of the armistice, Nov. 11, 1918. Its parish church is a fine Gothic edifice dating from the 16th century. Together with Charleville it forms an important manufacturing center in the metallurgical industries.

During World War II many of the historic buildings of the city were damaged. Pop. (1946) 7,898.

MEZOTUR, mĕ'zû-tōōr, city, Hungary, in the County Jász-Nagykun-Szolnok, on the Berettyo, an affluent of the Tisza, 88 miles east of Budapest. It is situated in a rich agricultural district for which it furnishes a trade center, and there are extensive communal pastoral lands upon which large herds of cattle are grazed. There are several large fairs held annually and the town has important potteries. Pop. (1941) 28,192.

MEZZANINE, *in architecture,* a low window occurring in attics and entresols. Sometimes applied to an entresol. A mezzanine story is a small story halfway between the stories above and below. In theaters it is usually a floor between the stage and the bottom of the deep cellars of large theaters, from which floor the short scenes and traps are worked, the large scenes going down through openings into the cellar; hence the name, from being midway between the stage and cellar floor.

MEZZOFANTI, mĕd-dzô-fän'tē, **Giuseppe,** Italian linguist: b. Bologna, Sept. 17, 1774; d. Rome, March 15, 1849. He studied at the seminary of Bologna, and took priest's orders in 1797. He was appointed librarian and professor of Oriental languages at the university; in 1831 went to Rome, there succeeded Angelo Mai as keeper of the Vatican Library (1833), and in 1838 was made cardinal. It is said that he was familiar with over fifty languages, and even with the provincialisms of these various tongues. Byron called him "a monster of languages, the Briareus of parts of speech." His library and his papers came into the possession of the University of Bologna.

MEZZOTINT, mĕd'zō-tĭnt, a process of engraving on copper which dates from the 17th century. The smooth plate of the metal is abraded with a file-like tool, and tiny points are raised over the surface. These points catch and hold the ink, and an impression taken from a plate in this condition would give a soft velvety mass of black without variety of light and shade. A burnisher is next used to get rid of the raised points where half tones and lights are wanted. Sometimes where very brilliant high lights are required, they are cut away so as to ensure a smooth surface of copper. By means of this burnishing process, all gradations of light and shade are obtained from the white of the smooth copper to the black of the roughened plate. See also ENGRAVINGS; ETCHING.

MHOU, mou, town, India, in Madhya Bharat state, 12 miles south-southwest of Indore. It has an airport and is an important military station. Dairy farming is the most important industry. Mhou was one of the centers of the Sepoy Mutiny in 1857. Pop. (1941) 34,823.

MIAGO, myä-gä'ô, municipality, Philippines,

in the Province of Iloilo, Panay on the southern coast of the island, on Iloilo Strait, 22 miles west of the city of Iloilo. It is an agricultural center raising rice, sugar cane, and hemp. Pop. (1948) 30,143.

MIAMI, mī-ăm'ĭ, town, Arizona, in Gila County, at an altitude of 3,400 feet, 68 miles east of Phoenix, and served by the Southern Pacific Railroad and state highways. It is located in a copper mining district and its prosperity depends largely upon the price of this metal. It was settled in 1910 and incorporated in 1918. It is governed by a mayor and council. Pop. (1950) 4,329.

MIAMI, city, Florida, seat of Dade County, a world-famous year-round resort and sports center situated 70 miles southwest of Palm Beach. Located at the mouth of the short Miami River, it extends for 12 miles along the shore of Biscayne Bay, and 8 miles inland, at an altitude of 15 feet. Miami has excellent highway, air, and rail connections, being served by the Florida East Coast and the Seaboard Air Line railroads, state and federal highways, and several airfields with scheduled air service. Miami's international airport is a regular stopping point for planes to South America, New York, Chicago, Cuba, and the West Indies, being served by over 15 scheduled airlines and 46 nonscheduled. The airports do an especially large air freight business, handling mainly citrus fruits and fresh vegetables. The city is connected to all points by steamship lines carrying both freight and passengers, while 14 lines do a brisk freight business between the city and South and Central America and the Caribbean area.

Greater Miami includes the independent municipalities of Miami Beach, Coral Gables, Hialeah, Miami Springs, Opalocka, Miami Shores, Bal Harbor, North Miami Beach, North Miami, Biscayne Park, Surfside, El Portal, West Miami, North Bay Village, Golden Beach, Indian Creek Village, Medley, South Miami, Homestead, and Florida City. Seven bridges facilitate travel over the Miami River, and three splendid causeways connect Miami with Miami Beach across Biscayne Bay, while a fourth connects it with Virginia and Biscayne keys, the latter the site of Crandon Park, largest off-shore park in the United States.

The city has few historically interesting buildings but prides itself in its luxurious hotels and private residences on the ocean, in its climate, and in its many facilities for sportsmen, among them the Orange Bowl Stadium (site of the annual Orange Bowl football game), Miami Stadium (for baseball), and numerous municipally owned playgrounds. The city has excellent, modern grammar and high schools, and is the seat of Barry College, situated in Miami Shores, established in 1946 for women.

Tourists are Miami's most important industry. Winter visitors are principally from the northern cities, while summer visitors come from South and Central America, Cuba, and the Caribbean, visiting Miami to escape the heat.

Other industries include the manufacture of garments, concrete, metal, and meat products, and novelties, and there is extensive commercial fishing. Another source of income is the retired middle-income worker, who finds in Miami the inexpensive and easygoing living to fit his pension.

History.—Miami was incorporated in 1896, soon after Henry M. Flagler extended the Florida East Coast Railroad from West Palm Beach to what is now Miami. A short time before its incorporation as a city, what is now Miami was a tiny agricultural and Indian trading settlement, consisting of but two dwellings, a storehouse, and Fort Dallas, a stone structure, still standing, used as an outpost during the Seminole Indian wars. In the 16th century the city's site was occupied by a large settlement of Tequesta Indians.

During the 1920's Miami was the scene of one of the greatest land booms in the country. However, a hurricane in 1926 coincided with a money panic and the land boom left many brokers with acres of swampland and brush, and no buyers. However, the city continued to grow even during the depression of the 1930's, and soon became the mecca of the sunbathers. During World War II, most of the fashionable hotels were taken over by the armed forces for quarters and training schools. Pop. (1940) 172,272; (1950) 249,276.

MIAMI, city, Oklahoma, seat of Ottawa County, situated 66 miles east of Bartlesville, and served by the Northeast Oklahoma and the Kansas, Oklahoma, and Gulf railroads, and federal and state highways. It is located in a rich grain growing, cattle raising, dairying, and mining district, and there are meat packing plants and manufactures of tires, glass, metal goods, wood products, clothing, and bedding in the city. Lead and zinc are mined in the neighborhood.

It is the seat of Northeastern Oklahoma Agricultural and Mechanical College. It was settled in 1891 and incorporated in the same year, and has a commission form of government. Pop. (1950) 11,801.

MIAMI (formerly GREAT MIAMI), river, Ohio, rising in Hardin County, and flowing south and southwest to enter the Ohio River at the southwest corner of the state. It is about 160 miles long and furnishes extensive power for manufacturing. It is still sometimes called Great Miami to distinguish it from the Little Miami. The Miami Canal, which paralleled the river for some 80 miles, was closed in 1895.

MIAMI, University of, coeducational, nonsectarian institution of higher learning, located in Coral Gables, Fla. It was chartered by the State of Florida, April 8, 1925, and opened its doors for registration Oct. 15, 1926. Among the signers of the charter were the late William Jennings Bryan, and his daughter, Mrs. Ruth Bryan (Owen) Rhode, who subsequently served in Congress from Florida, and later became United States ambassador to Denmark.

The university embraces the following schools: College of Arts and Sciences, and schools of music, law, engineering, education, business administration. There is also a Graduate School and an evening division

The university maintains three campuses—north campus, on which are the original buildings of the university; main campus, 245 acres located one mile south of Coral Gables business center; and south campus, about 2,300 acres, located 13 miles south of the main campus. Here is located the university's experimental farm, also various laboratories. The average yearly enrollment of regular students is between 8,000 and 9,000: the evening enrollment is approximately 2,000.

MIAMI BEACH, resort city, Florida, located on an island across Biscayne Bay from the city of Miami, and connected with that city by three causeways. A large portion of the land within the city limits is filled land, formed by pumping rock and sand from the bottom of Biscayne Bay. The city has no industry save that of catering to the tourists which flock to its lavish hotels and pleasure resorts. All told, there are facilities for over 120,000 people on the island, and during the year the city plays host to over 1,500,000 tourists. There are 15 city parks, four golf courses, numerous playgrounds, beaches, recreation centers, and swimming pools.

The city was largely planned and developed by two men, John S. Collins and Carl G. Fisher, who filled in the jumble of mangrove roots and sand to eventually create the tourist paradise of today. It was incorporated in 1915 and during World War II most of its hotels were militarized. Pop. (1940) 28,012; (1950) 46,282.

MIAMI INDIANS, an Algonquian tribe whose earliest range was in Wisconsin, northern Illinois and Indiana. In the early 19th century the majority moved west into Kansas and later to Oklahoma, where they are now located on Miami and Peoria reservations in the Quapaw area. A small number remained in Indiana around Peru. The Miami are now much mixed with the Peoria and other tribes. There were 439 Peoria and 323 Miami Indians on this reservation in 1950. The two tribes are confederated under a treaty of Feb. 23, 1867 with the confederated Peoria, Kaskaskia, Wea, and Piankeshaw Indians granting permission for the confederation.

MIAMI SHORES, village, Florida, in Dade County, nine miles north of Miami. Bounded on the east by Biscayne Bay, Miami Shores is classified as a residential community. It is served by the Florida East Coast and the Seaboard Air Line railroads and U.S. Highway 1, and is the site of Barry College for women. It was separated from Miami in 1932 and has a council-manager form of government. Pop. (1950) 5,086.

MIAMI SPRINGS, town, Florida, in Dade County, adjoining the city of Miami. A residential community, it was incorporated in 1927, the first white settlement dating from 1924. It has manufactures of prefabricated houses.

The Miami Springs Golf Course here is the scene of many nationally known golf tournaments, and the Miami Battle Creek Sanitarium is an offshoot of the famous Battle Creek Sanitarium in Wisconsin. Government is by mayor and council. Pop. (1950) 5,108.

MIAMI UNIVERSITY, a coeducational institution of the higher learning located in Oxford, Butler County, Ohio. In 1788, J. C. Symmes purchased from the United States 1,000,000 acres of land, bounded south by the Ohio River, east by the Little Miami, and west by the Great Miami. One condition of the purchase was that a full township, six square miles, should be set apart "for the endowment of an academy and other seminaries of learning." This condition was not complied with; but as the prospect of the establishment of a university within the bounds of the Symmes purchase had induced many to settle there, in 1803 Congress ceded to the State of Ohio the township of Oxford, to be held in trust for educational purposes. The university was incorporated in 1809. The lands are leased for 99 years (renewable forever, without revaluation), subject to an annual quitrent of six per cent on the purchase money. The government is vested in a board of 27 trustees appointed by the governor of the state, nine of whom retire every third year. A grammar school was established in 1818, and in November 1824 the college department proper was opened. The school has teachers' and college departments, the courses leading to the degrees of B.A. and B.S. The average yearly enrollment is 5,000.

MIAMISBURG, mī-ăm′ĭz-bûrg, city, Ohio, in Montgomery County, at an altitude of 711 feet, 10 miles south of Dayton, situated on the Miami River, and served by the Cleveland, Cincinnati, Chicago and St. Louis, the Erie, and the Baltimore and Ohio railroads. It is in a tobacco growing region, and having abundant water power, is an important manufacturing center. It ships tobacco and cereals, and manufactures paper goods, furniture, binder twine, and tobacco and foundry products. A large Indian mound, 68½ feet high and 250 feet in circumference, is just outside the city, and there are atomic energy laboratories located here. The city was laid out in 1818. Pop. (1950) 6,329.

MIANA BUG, mĭ-ä′nà, a Persian tick of the genus *Argas,* greatly dreaded by travelers in former times, although its reputed powers of poisoning and otherwise harming humanity have been greatly exaggerated.

MIANI, mē-ä′nē, or **MEEANEE,** village, Pakistan, in Sind Province, six miles north of Hyderabad, scene of the victory of a small British force under Sir Charles Napier over the mirs of Sind, eventually leading to the conquest and annexation of Sind.

MIANI, town, Pakistan, in Shahpur District, northwest West Punjab, 100 miles northeast of Lahore. There are large salt mines nearby, and there is handloom weaving in the town. Pop. (1941) 6,713.

MIANTONOMO, mī-ăn-tŏ-nō′mō, American Indian chief: d. 1643. He was a sachem of the Narragansetts, with his uncle Canonicus, by 1632. In 1637 he assisted the early settlers of Massachusetts in the Pequot War. He was accused several times by the British authorities of plotting their destruction but was each time cleared of the charges. In 1643 he was attacked by Uncas, a sachem of the Mohegans and his bitter rival, and was captured and eventually turned over to the commissioners of the United Colonies at Boston. He was placed on trial, found guilty, and condemned to death, and Uncas was commissioned to carry out the sentence. He was buried where he fell and a monument was erected over the spot in 1841.

MIANWALI, mĭ-än-wä′lĭ, town, Pakistan, in Rawalpindi Division, West Punjab, on the left bank of the Indus about 105 miles south of Peskawar, at an altitude of 655 feet. Along the river the land is fertile though liable to overflow in

time of flood, but in the highlands the soil is barren and sandy, and can be cultivated only when irrigation is possible. The chief products of the region are wheat, other grains, oil seeds, hides, and wool, and the city is the trading center for all these items. Pop. (1941) 22,825.

MIAO, mē-ä'ō, the general name of numerous aboriginal Chinese tribes dwelling in the provinces of Yunnan, Kweichow, Hunan, Kwangsi, and Kwangtung, China. They are hillmen and number some 80 tribes, with a population running into millions, although their numbers are decreasing.

MIAOULES or **MIAULIS,** mē-ou'lyēs, **Andreas Vokos,** Greek admiral: b. Negropont, about 1768; d. Athens, June 24, 1835. His family name was Vokos or Bokos, his surname Maioules being derived from the Turkish word for a felucca. He was a wealthy merchant captain living on the Island of Hydra at the outbreak of the Greek War of Independence in 1821, and was appointed to the command of the Greek Fleet. He assisted at the relief of the besieged Missolonghi in 1822–1823, and succeeded in blocking the Turks' further advances after their capture of Psara in 1824. He was able to supply troops and stores to Missolonghi (Mesólongion) in the second siege of 1825, although he could not prevent the fall of the town. He was outnumbered by the Egyptian naval forces, but succeeded in hampering their movements. He was superseded in the command of the Greek naval forces by Lord Dundonald in 1827, and thereafter ably supported his successor, the representative of the powers intervening in behalf of Greece. After the establishment of Greek independence he was a vigorous antagonist of the Capodistrias and the Russian party, and again commanded the fleet in the insurrection of 1831. He was one of the deputation commissioned to offer the Greek crown to King Otto I and he remained his stanch supporter. He was named by King Otto I rear admiral and later, vice admiral.

MICA (Lat. *mico,* flash), a mineral group marked by high basal cleavage, and laminae which may be made very thin by a process of continued separation. The micas are silicates; muscovite, the commonest, is a silicate of potassium and aluminum, and is often styled potassium mica; paragonite, of sodium mica, corresponds closely to muscovite, but has sodium instead of potassium; biotite, a silicate of magnesium, potassium and iron, is marked by its darker tints, and is commonly called magnesium iron mica; lepidolite is a lithium mica, with fluorine, potassium and aluminum in its composition, and a rose tint. Mica is widely scattered in North America and Asia, especially India. Ruby colored mica, no matter what its provenance, is now called "Indian." Europe has no commercial supply, but worthwhile deposits have been found in Argentina, Brazil, and Peru in South America, and promising ones in Southern Rhodesia, the Union of South Africa and elsewhere in Africa. Deposits are most frequently found in pegmatite (q.v.) dikes, varying in thickness from a few inches to several hundred feet, and correspondingly in length. Many other minerals accompany it, especially quartz and feldspar, and the mica is scattered through the dike, or vein, as the miners call it. Moreover, scarcely more than ten per cent, and sometimes as little as two per cent, is commercially useful. Mica was well known in prehistoric America, traces of its use being widespread. A great shaft near Mount Mitchell, in North Carolina, was discovered in 1869. This not merely solved the question as to the origin of the early supply, but gave the first impulse to the mining of mica in the United States. Mica lands in North Carolina became tremendously valuable. This boom was quickly followed by the development of the industry in southern New Hampshire, and this, in turn, by important discoveries in the 1880's in Canada and India. In Quebec, Ottawa and Perth and Renfrew counties, Ontario, the supply is of excellent quality, and is easily mined and cheap. Hindu labor and an excellent grade of mica made the output of Bengal, Bombay, and the Madras presidency even cheaper. To classify the various sources of supply roughly, it may be said that India gives the world one half, and Canada, the United States, Brazil and Argentina furnish the bulk of the remainder. Everywhere the "veins" start near the surface, hence mining is simple.

Since 1895 there has been a fresh and most important use for mica, namely, as an insulator. For this purpose the sheets are split very thin and glued to cloth, then wound into rings for armatures. As a result of this variation of the uses of mica, only the colorless sorts, notably muscovite, are largely used for lamp chimneys and stove doors. Mica is also valuable as a lubricant, as an absorbent of glycerine in making dynamite, and in the manufacture of lithium salts. See also Mineral Production of the United States; Strategic and Critical Mineral Supplies.

MICA SCHIST, shĭst, a schistose rock, metamorphic in nature, containing mica and quartz. The origin of most of the mica schists is uncertain; the sericite variety seems to be the result of mountain-building forces acting upon igneous rocks; other sorts are almost as certainly due to the same force acting upon sedimentary rocks. Mica occurring in schist is usually muscovite, that is, the colorless sort; biotite, or dark mica, is less frequent. Various embedded minerals also occur, notably garnets.

MICAH, mī'kȧ or **MICHAH** (in Douay Version, Michaeas) the sixth of the minor prophets, dwelt in Moresheth, a little town, once a dependency of the Philistine city of Gath, but by the conquests of Uzziah reduced with the whole of western Judah, including Gath, to Hebrew domination. His main public work was accomplished during the reign of Hezekiah. He dwelt on the great international highway between Egypt and Assyria, and was led to take a wide view of the political movements in Western Asia in their effect upon his own people. He lived in the 8th century B.C., and he witnessed the ending of the northern kingdom, and the invasion of Palestine by Sargon and Sennacherib. He witnessed also the corruption of morals which Hezekiah only partially corrected. His prophecy is directed against Samaria and Jerusalem, whose sufferings for their sins and irreligion, he declares, shall be greater than those of Babylon and the other gentile cities. His style is pure and correct, his images bold, his denunciations full of strength and severity.

MICAH, Book of. The title of the book, i, 1, describes it as "the word of Yahweh that came to Micah the Morashtite in the days of Jotham, Ahaz, and Hezekiah, kings of Judah." In Jeremiah xxvi, 18, is a quotation from the words of the elders: "Micah the Morashtite prophesied in the days of Hezekiah king of Judah." The chronology of this period is somewhat uncertain. The probable dates, however, are Jotham, 740–736; Ahaz, 736–727; Hezekiah, 727–695. The title, like most similar titles, is doubtless a later editorial addition. Hence the evidence indicates most definitely the activity of Micah during the reign of Hezekiah. The most probable period is shortly before the capture of Samaria, i, 5–6, perhaps about 724 B.C., although this might refer to a later period, inasmuch as Samaria was not entirely destroyed at that time and, according to the Assyrian records, was active again not long after that event.

It is now quite generally agreed that Micah was not the author of the whole of the book. But there is much difference of opinion concerning the details of authorship. The most of chapters i–iii is a unity, with the exception principally of ii, 12–13, and was doubtless written by Micah. This is throughout a message of condemnation with a prediction of punishment upon Judah, and to a minor degree upon Israel, for their sins. The remainder of the book contains some portions of a tenor similar to this, but consists for the most part of messages of blessing and restoration. There are two parts, chapters iv–v, and vi–vii. It seems reasonably certain that Micah was not the author of all of iv–vii, especially because of obvious inconsistencies, both within these chapters and as compared with i–iii: v, 2–4, e.g., is out of harmony with v, 5–6; iv, 11–13 is inconsistent with iii, 12. The connection of thought in iv–vii is not close so that evidently either the original order has been changed, or it was originally a composite of miscellaneous portions. The following portions in iv–vii are similar, as messages of punishment, to i–iii, and were probably written by Micah: v, 1, 10–13; vi, 9–16; vii, 1–6. Most of the remainder of iv–vii together with ii, 12–13 contains messages of hope and restoration after disaster. It is a possibility that most of this may have been written by Micah. But, if so, it must have been at a different period, presumably much later, as Isaiah probably gave some messages that were distinctly of hope at the latter end of his ministry. The strong probability remains, however, that these portions were not written by Micah but consist of various later fragments, mostly of the time of the exile and after the exile. The change of tone is less probable for Micah than for Isaiah, because Micah's original message had in it no real hope, while that of Isaiah did, at least from an early period in his ministry.

Micah is described as the Morashtite, meaning probably an inhabitant of Moresheth-gath, Micah i, 14. This place is not mentioned outside of this verse. It probably was a town named Moresheth, a dependency of the well-known Philistine city Gath. He was thus of the country, and shows a corresponding type of message, differing markedly from that of his contemporary Isaiah who was a city-dweller, an inhabitant of Jerusalem. Micah's denunciation of the sins of the people and threats of punishment are similar to those of Amos. His most characteristic specific addition to the prophetic message is the prediction, first given by him, that Jerusalem shall be destroyed for the sins of the people, iii, 12. The later additions to Micah for the most part contain no specially notable message. vi, 6–8 give, however, a clear statement of the high prophetic ideal of life.

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MICAH CLARKE, a novel by Sir Arthur Conan Doyle, published in 1888. It presents in the form of fiction a graphic and vivid picture of the political condition in England during the Monmouth Rebellion (1685).

MICAWBER, mĭ-kâ'bẽr, **Mr. Wilkins,** a shiftless, unsuccessful optimist, always in trouble, but always sure "something will turn up," one of the secondary characters in Dickens 'David Copperfield' (1849). He is a portrait of the novelist's father, not only in character but in the principal incidents in his career, and Mrs. Micawber, who has great faith in her husband, was patterned after Dickens' mother.

MICELLAR THEORY, *in botany,* the theory, proposed in 1862 by the Swiss botanist K. W. Nägeli (q.v.), that the accretion of starch-grains and similar bodies within cells in a living plant, and the formation and growth of the walls of cells, was by means of molecules, each an aggregation of lesser molecules, to which he gave the name *micellæ.* They are invisible to even the highest powers of a microscope. Two or more having united, the growth of the grain to be composed, or the cell-wall to be broadened, is accomplished by more micellæ crowding into crevices between those already in place. Some important plant-physiologists have always refused to accept this hypothesis, which is now generally distrusted.

MICHAEL, mī'kĕl or mī'kā-ĕl (Hebrew, "who is Godlike"), is spoken of in Daniel (x, 13, 21; xii, 1) as one of the "chief princes," and the "great prince." In Jude (verse 9) he is called the archangel who disputed with the devil about the body of Moses. In the Revelation (xii, 7) it is said "there was war in heaven: Michael and his angels fought against the dragon." From this expression it has been inferred that he was the chief of the celestial hierarchy. Milton calls him "of celestial armies prince," and "prince of angels," and attributes to him the command of the heavenly forces. He was ranked by Thomas Aquinas, followed by Dante, as the first of the seven archangels, a character in which he first appears in the Ethiopian Enoch, in which he is represented as executing the commands of God at Judgment Day, or presenting the prayers of the saints before the throne of God. In France especially churches dedicated to this saint, whose day in the Western Church is 29 September, are often built on the loftiest hill tops, to afford the

warrior angel a vantage ground in warring against the evil «powers of the air» and driving off plague, drought and murrain.

MICHAEL I, RHANGABE, or **RHAGABE,** Byzantine emperor: d. about 845. He succeeded Stauracius in 811 and after carrying on war with the Bulgarians was deposed in 813 by Leo V, an Armenian general in his service, and spent the rest of his life in a convent.

MICHAEL II Balbus (THE STAMMERER), Byzantine emperor: d. 829. He came of an obscure Phrygian family, but was ennobled by Leo V. The latter, however, suspecting Michael of conspiracy against him, ordered the Phrygian to be put to death. Michael saved himself by the assassination of Leo and became emperor in 820. During his reign Sicily and Crete were lost to the Western empire.

MICHAEL III (THE DRUNKARD), Byzantine emperor: d. 867. He was a grandson of Michael II, and in 842 succeeded his father, Theophilus, though his mother Theodora continued regent till 856. With his uncle, Bardas, he made an expedition against the Bulgarians in 861 and converted the king of Bulgaria. In 866 he associated Basilius the Macedonian with himself in the government and was assassinated by him the next year.

MICHAEL IV (THE PAPHLAGONIAN), Byzantine emperor: d. 1041. He received his surname from the place of his nativity, and became chamberlain to Zöe, wife of the Emperor Romanus III. On the death of Romanus in 1034 he became emperor and the husband of Zöe, who is presumed to have murdered Romanus because of her love for Michael.

MICHAEL V, Calaphates (THE CALKER), Byzantine emperor. He was a nephew of Michael IV, whom he succeeded on the throne. His banishment of the Empress Zöe led to a revolt in Constantinople, in which he was overthrown and compelled to retire to a convent.

MICHAEL VI (THE WARRIOR), Byzantine emperor. He succeeded the Empress Theodora in 1056, but after the expiration of a year was deposed by Isaac Comnenus and spent the rest of his life in a convent. He was the last of the Macedonian dynasty.

MICHAEL VII, Ducas or **Parapinaces,** Byzantine emperor. He was the son of Constantine XI, and came to the throne in 1071. He was a weak monarch, the prey of unscrupulous favorites, and an insurrection in 1078 drove him from the throne and into a monastery.

MICHAEL VIII, Palæologus, Byzantine emperor: b. 1234; d. 1282. After having commanded the French mercenaries employed by the emperor of Nicæa he became one of the guardians of the Emperor John Lascaris in 1259. The next year he was proclaimed joint emperor of Nicæa in 1260, and the next year, after deposing his colleague Lascaris, became sole monarch. In the same year he wrested Constantinople from the Latins and was shortly afterward crowned emperor of the Byzantine empire. He made an unsuccessful attempt to effect the union of the Western and Eastern Churches.

MICHAEL IX, Palæologus, Byzantine emperor: d. 1320. He was the son of Andronicus II, with whom he was associated in the government after 1295, but died before his father.

MICHAEL, Tsar of Russia. See ROMANOFF.

MICHAEL, Arthur, American chemist: b. Buffalo, N. Y., 7 Aug. 1853. He was educated at the universities of Berlin and Heidelberg, and at the École de Médécine de Paris. He was professor of chemistry at Tufts College in 1882–89 and in 1894–1907, and was professor emeritus there in 1907–12. From 1912–36 he held the professorship of organic chemistry at Harvard University. He was a member of the National Academy of Sciences. He made extensive researches in pure chemistry and published reports of his investigations in the 'Proceedings' of the National Academy of Sciences; the *American Chemical Journal;* and the 'Berichte der deutschen hemischen Gesellschaft.' D. Orlando, Fla., 8 Feb. 1942.

MICHAEL, Attaliates, Byzantine jurist: lived in 11th century. He wrote a history of the years 1034–79; and published a succinct and methodic abridgment of the Basilicæ (1073).

MICHAEL, a pastoral narrative in 482 lines of blank verse, by William Wordsworth, was composed and published in 1800. In a letter to Fox, 14 Jan. 1801, Wordsworth writes: «In the two poems, 'The Brothers' and 'Michael,' I have attempted to draw a picture of the domestic affections, as I know they exist among a class of men who are now almost confined to the north of England. They are small independent proprietors of land, here called statesmen, men of respectable education, who daily labor on their little properties . . . Their little tract of land serves as a rallying-point for their domestic feelings, as a tablet upon which they are written, which makes them objects of memory in a thousand instances, when they would otherwise be forgotten.» The theme of Michael, as suggested in Wordsworth's letter, has two phases: the love of a «statesman» for his little landed property in the hills, and of a father for his son. The story of the poem is founded upon fact. To Michael and his wife in their old age is born a son, Luke, whom his father cherishes both as a companion and as his heir. When Luke is 18 years old, Michael, through the fault of another, loses a portion of his property. Luke must go to the city and there earn enough to redeem the land. Before the boy leaves, he lays the corner-stone of the sheepfold which he and his father were to build together, now left for the old man to build alone. Far away in the city, Luke is finally led away by bad companions and is heard from no more. The old father's heart is broken; the sheepfold, symbol of his faith and love, is never finished.

'Michael' is an illustration of Wordsworth's theory that the emotions find their best soil in common life, where they «are incorporated with the beautiful and permanent forms of nature.» Michael himself is perhaps Wordsworth's ideal man, and, possibly because he was the type best known to the poet, is more clearly portrayed and more highly individualized than any other of Wordsworth's characters. He has the ruggedness, strength

and majesty of the Westmoreland hills among which he lives. The setting, the characters and the story of the poem are too interdependent, too integrally fused, to be separately analyzed. The style, classical in its simplicity and restraint, and stripped of all extraneous ornament almost to severity, is merely a crystal medium through which appears the essential poetry of the subject. The magical suggestiveness of such lines as

"Hence had he learned the meaning of all winds,"

and

". . . . . he had been alone
"Amid the heart of many thousand mists,"

are far surpassed both in suggestiveness and essential poetry by the simple passage which states that the old broken-hearted father often tried to complete the sheepfold, and that

"many and many a time he thither went
"And never lifted up a single stone."

MARION TUCKER.

MICHAEL AND HIS LOST ANGEL. Mr. Henry Arthur Jones during his long career as a playwright wrote more than half a hundred plays which may be roughly divided into three categories,— melodramas, comedies of manners and serious plays. Of the latter group 'Michael and His Lost Angel' is generally regarded by writers on modern drama as the most notable. This consensus of opinion is the more interesting in view of the fact that although on 15 Jan. 1896 the play received the rare distinction of a simultaneous production in London and New York, with Forbes-Robertson and Marion Terry in the principal rôles in London and Henry Miller and Viola Allen in New York, it failed in both places, was withdrawn in its second week and has never been revived. The two chief characters are familiar ones on the stage and especial favorites with Jones, namely, the priestly ascetic and the worldly siren. The opening scene is thoroughly effective. Michael Feversham, an austere young clergyman, has forced the erring daughter of his secretary to public confession of her sin in the church before all the townspeople. When Audrie Lesden, a mysterious and charming new parishioner, presently appears on the scene, we are left in no doubt from the moment of her entrance that she is the temptress; her tempting, indeed, is so obvious, the fall of Michael so predestined, and the expiation of his guilt by public confession so plainly foreshadowed in the first scene, that there are no surprises. A more serious defect is that the author fails to enlist the sympathy of his audience for either of his main characters. Michael remains a «holier than thou» prig with what the Freudians would call an «impurity complex,» and Audrie is so patently selfish and frivolous that only an actress of very great personal charm could make Michael's infatuation convincing.

MICHAEL KOHLHAAS. This story by Heinrich von Kleist was published as the first of his *Erzählungen,* «Stories» (1810), after a fragment of the story had been issued in a periodical, *Phœbus,* two years before. Michael Kohlhaas, an upright and highly respected horse-dealer, is wantonly wronged by a young nobleman; after fruitless efforts to obtain justice from the legally constituted authorities, he resolves to take matters into his own hands, even in rebellion against the social order which has failed to afford him protection. With pathetic obstinacy he still insists upon the simple terms of his original claim, even after the forces which he has gathered about him have engaged in a kind of civil war. Ultimately he gains his contention, recompense for his loss and the punishment of the privileged offender, but he himself suffers death as a penalty for crimes committed while seeking justice in his own way. The outlines of the story Kleist took from the career of Hans Kohlhase (executed in 1540), which was probably familiar to him both by oral tradition and through the chronicles of Hafftitz and Leutinger. But Kleist used the artist's prerogative and altered the material at will, creating the characters anew, and supplying the substance with an ethical problem. Through a sense of personal wrong, following his own conception of justice, a man of spotless integrity becomes a criminal and an outlaw. The problem of so-called folk-justice, which is here illustrated, has been notably treated elsewhere in German literature, conspicuously in Ludwig's 'Erbförster.' Kleist followed his historical source in introducing Martin Luther into the story of his hero, and presents a firmly drawn portrait of the German reformer. The story is a masterpiece of narrative skill; it is all narrative, without description of people or of places, without comment or sentiment; it moves forward with the simplicity of a chronicle, one event following another in tragic and inevitable succession. 'Michael Kohlhaas' is one of the most powerful stories in the whole range of German fiction. It was translated into English by Frances H. King in 'The German Classics' (Vol. IV).

HARVEY W. THAYER.

MICHAEL OBRENOVITCH III, ō-brĕn'-ō-vĭch, Prince of Serbia: b. Kragujevatz, 4 Sept. 1823; d. near Belgrade, 29 May 1868. He was the youngest son of Prince Milosh, and after the abdication of his father, in 1839, and the death of his brother Milan Obrenovitch II, in 1840, he succeeded to the throne of Serbia. His effort to continue the policy of his father, which was to free Serbia and the Christian peoples of the Balkans generally from Turkish rule, met with the support of Russia and the determined opposition of Turkey and Austria, together with that of the party which had deposed his father. A revolt in 1842 resulted in the election of Alexander Karageorgevich as Prince of Serbia, and Prince Michael was forced to leave the country. In 1858 his father, Prince Milosh Obrenovitch II, was recalled to the throne and upon his death in 1860 Michael succeeded him. He at once set about securing the emancipation of Serbia's internal affairs from Turkish domination, secured an understanding with Montenegro, Greece, Austria and the Bulgarian, Bosnian and Albanian leaders for either support or non-intervention in case of war with Turkey, and demanded the withdrawal of Turkish troops from Serbian fortresses. He was supported in his demands by the influence of Great Britain, Russia and Austria, and Turkey yielded, the forts being surrendered 26 April 1867. He largely reorgan-

ized the administration of public affairs, strengthened the military organization, and placed his country in the ranks of civilized European states. A plot against him was organized by followers of the deposed Karageorgevich dynasty and he was assassinated. He was succeeded by a cousin, Milan I (r. 1868–1889).

MICHAELIS, mĭ-kä-ā'lĭs, **Adolf,** German archaeologist: b. Kiel, Germany, June 22, 1835; d. Strasbourg, Aug. 12, 1910. He was educated at Berlin, Leipzig, and Kiel universities, was professor of archaeology at Strasbourg after 1872, and was a member of the German Central Archaeological Institute at Rome after 1874. He was the author of numerous works on classical archaeology, notably *Der Parthenon* (1871), *Ancient Marbles in Great Britain* (1882), and *Kunstgeschichte des Altertum* (*History of the Art of Ancient Times,* 1898). He edited successive issues of volume 1 of Anton Springer's *Handbuch der Kunstgeschichte* after Springer's death in 1891.

MICHAELIS, Georg, German statesman: b. Haynau, Germany, Sept. 8, 1857; d. Bad Saarow, July 24, 1936. He entered the Prussian civil service in 1879, held various administrative posts in the German Imperial government after 1915, and in 1917 succeeded Theobald von Bethmann-Hollweg as chancellor of the German Empire. As chancellor he tried unsuccessfully to reconcile demands for peace with moderate nationalistic aims. He was dismissed by Emperor William II in November 1917, because, it is said, he failed to take a decisive stand on the question of peace with the Allies. He was the author of an autobiography, *Für Staat und Volk: Eine Lebensgeschichte* (1922) and a book of travel essays, *Weltreisegedanken* (1923).

MICHAELIS, Johann David, German Biblical scholar: b. Halle, Germany, Feb. 27, 1717; d. Göttingen, Aug. 22, 1791. He studied at the University of Halle, traveled in Great Britain and the Netherlands, and subsequently joined the faculty of the University of Göttingen, where he was professor of philosophy (after 1746) and of Oriental languages (after 1750). He was the author of numerous works on the structure of Hebrew and other Near Eastern languages and on the social and cultural background of the Bible. He is considered the founder of modern Biblical studies in Germany. Michaelis was the editor of *Orientalische und exegetische Bibliothek,* 24 vols. (1771–1779) and 8 vols. (new ser., 1786–1791).

Consult Smend, Rudolf, *Johann David Michaelis* (Göttingen 1898).

MICHAELIS, mē-kà-ē'lēs, **Karin** (or MICHAELIS-STANGELAND, -stäng'ĕ-lân), Danish author: b. Randers, Denmark, March 20, 1872; d. Copenhagen, Jan. 11, 1950. Privately educated, she turned from an early interest in music to literature and social problems, working and writing on behalf of the underprivileged and the rights of women. She wrote pro-German stories and novels in World War I, but in World War II was active in the anti-German Free Danish movement in the United States. Twice-married, in 1895 to Sophus Michaelis (q.v.), from whom she was divorced, and in 1912 to Charles Emil Stangeland, an American diplomat, she advocated trial marriage and insurance policies to protect women from the financial difficulties of divorce or perpetual maidenhood. Her novel *The Dangerous Age* (1910), dealing with the emotional problems of a woman of 45, created a sensation, was translated into 20 languages, and sold a million copies. Her other works include *The Child* (1902), *The Governor* (1913), *The Girl with the Flowerpot* (1925), *Mother* (1935), and an autobiography, *Little Troll* (1946).

MICHAELIS, mĭ-kä-ā'lĭs, **Leonor,** German-American physical chemist: b. Berlin, Germany, Jan. 16, 1875; d. New York, N. Y., Oct. 9, 1949. He received a doctorate in medicine from the University of Berlin in 1896, and subsequently studied at the University of Freiburg and again in Berlin under Paul Ehrlich, discoverer of the Salvarsan treatment for syphilis. At the Ehrlich laboratories he discovered the histologic staining properties of Janus green, useful in preparing certain cell structures (mitochondria) for microscopic examination. Michaelis also worked at the Berlin Institute of Cancer Research (1902–1906), the Berlin Municipal Hospital (1906–1922), the Medical School, Nagoya, Japan (1922–1926), the Johns Hopkins University (1926–1929), and the Rockefeller Institute for Medical Research (1929–1940). He made important contributions to knowledge concerning the properties of enzymes and proteins and the nature of metabolic oxidation and reduction. His discovery that keratin, a protein of the hair is soluble in thioglycolic acid, made possible cold-permanent-wave coiffures for women.

MICHAELIS, mē-kà-ē'lēs, **Sophus,** Danish author: b. Odense, Denmark, May 14, 1865; d. Copenhagen, Jan. 28, 1932. He was the author of numerous works of fiction, poetry, and drama, *Sirenen* (*Siren,* 1898), and *Das Fest des Lebens* (*Festival of Life,* 1902), *Die Palmen* (*Palms,* 1904), volumes of verse; the novel *Aebelö* (1895), and the dramas *Revolutionsbryllup* (*The Revolutionary Wedding,* 1906), and *Den evige Sövn* (*The Eternal Sleep,* 1912). He was celebrated for his translations of Goethe's *Faust* and novels by Gustave Flaubert.

MICHAELIUS, mē-kā'lĭ-ŭs, **Jonas,** first minister of the Dutch Reformed Church at New Amsterdam: b. Grootebroek, the Netherlands, 1584; d. the Netherlands, after 1637. Educated at the Latin school of Hoorn, near Grootebroek, and at the Theological College, Leiden, he was a minister of the Dutch Reformed Church in Brabant and Holland between 1605 and 1624. In 1628 he emigrated with his family to New Amsterdam, where he organized a church that subsequently became the Collegiate Church of New York City. He quarreled with Director General Peter Minuit and his council, whom he accused of fraud, immorality, and oppression. The directors of the Dutch West India Company, who controlled New Amsterdam, refused to hear his charges and prevented his reappointment to the ministry at New Amsterdam after 1637. Michaelius returned to the Netherlands, probably permanently, in 1633. Three of his letters are extant, including one in Latin containing a hostile account of Minuit and his council.

Consult Eekhof, Albert, *Jonas Michaelius, Founder of the Church in New Netherland* (Leiden 1926).

MICHAELMAS, mĭk'ĕl-mâs, or MICHAELMAS DAY, a feast honoring St. Michael and all

the angels, celebrated annually on September 29 by the Roman Catholic Church and the churches of the Anglican Communion.

In England, Michaelmas is one of four traditional quarter-days (q.v.), and its name designates a quarterly court term (October 12 to December 21) and academic terms at Oxford (October 1 to December 17) and Cambridge (October 1 to December 19). Formerly, English civil magistrates were elected at Michaelmas, perhaps in allusion to St. Michael as the prince of guardian angels. Another Michaelmas custom in England is the eating of roast goose, traditional since the 15th century or earlier. According to an old English proverb, one who eats goose on Michaelmas Day will not lack money all the year.

MICHAELMAS DAISY. See ASTER.

MICHAL, mī'kĕl, in the Old Testament, a daughter of Saul (I Samuel 14:49; 18:20). Michal was offered by Saul to David on condition that he kill 100 Philistines. The offer was intended as a snare, but the feat was accomplished, and Saul in jealousy sent soldiers to kill David. Michal contrived David's escape (I Samuel 19:11-17). Subsequently Saul gave her to Phalti who was eventually compelled to relinquish her to David (I Samuel 25:44; II Samuel 3:13-16). Michal and David became estranged when she rebuked him for immodest dancing before the Ark in celebration of its restoration to Jerusalem (II Samuel 6:16-23).

MICHALAKOPOULOS, mē-kä-lä-kô'pōō-lôs, **Andreas,** Greek statesman: b. Patras, Greece, 1875; d. Athens, March 27, 1938. A lawyer, he entered politics as a Liberal, was elected deputy for Patras in the national assembly of 1910, and held several posts (1912–1916) in cabinets formed by Elutherios Venizelos, whose pro-Allied policy in World War I Michalakopoulos supported. He became prime minister of Greece in 1924, and subsequently was also minister of foreign affairs; but in 1925 he was overthrown by Gen. Theodoros Pangalos and exiled. His later career was marked by successive returns to office as foreign minister (1926, 1932, 1933). He was again exiled, shortly before his death, by Gen. Ioannes Metaxas.

MICHAUD, mē-shō', **Joseph François,** French journalist and historian: b. Albens, France, June 19, 1767; d. Passy, Sept. 30, 1839. He was a journalist in Paris, where, he edited the royalist periodical *La Quotidienne* (1796). His monarchist writings caused him in 1795 to be sentenced to death by a tribunal of the First French Republic, but the sentence was revoked and he escaped to Switzerland. He soon returned to Paris, produced several political satires and historical works, and in 1815, when the Bourbon monarchy was restored, resumed publication of *La Quotidienne.* After 1813 he was a member of the Académie Française.

Michaud's writings include *Adieux à Bonaparte* (1799); *Histoire des progrès et de la chute de l'empire de Mysore sous Hider Aly et Tippov-Saëb* (1801); *Histoire des croisades,* 7 vols. (1812–1822); *Histoire des quinze semaines ou le dernier règne de Bonaparte* (1815). With Jean Joseph François Poujoulat he edited *Collection de mémoires pour servir à l'histoire de France depuis le XIII^e siècle,* 32 vols. (1836–1839). With his brother, LOUIS GABRIEL MICHAUD (1773–1858), he compiled *Biographie Universelle,* 52 vols. (1811–1828), a standard reference work, several times reprinted and sometimes called *Biographie Michaud.* Louis Gabriel Michaud was the author of several independent biographies, notably of Louis Philippe (1849) and of Charles Maurice de Talleyrand-Périgord (1853).

MICHAULT, mē-shō', **Pierre,** French poet and rhetorician: b. in Franche-Comté; d. c.1467. He was a retainer of Charles the Bold, comte de Charolais and duc de Bourgogne. He composed an allegorical satire called, variously in successive editions, *Le doctrinal du temps présent* (1466) or *Le doctrinal de court, par lequel on peut estre clerc sans aller à l'escole* (1522). In mingled prose and verse, it tells how the author was conducted by Merit (*Vertu*) through various schools in which the students were graded according to their vices. Michault also composed *La danse des aveugles* (1506), a kind of satiric drama, in prose and verse, the principal characters of which include Fortune, Love, and Death, three blind persons "before whom everyone must dance." He may have collaborated in the writing of *Cent nouvelles nouvelles* (q.v.), a collection of tales which was later used as source material by Jean de La Fontaine for his *Fables.*

MICHAUX, mē-shō', **André,** French botanist: b. near Versailles, France, March 7, 1746; d. in Madagascar, Nov. 16, 1802. He studied under the French botanist Bernard de Jussieu and subsequently visited England, Persia, and the United States, collecting specimens and data for botanical studies. He was the author of *Histoire des chenes . . . de l'Amerique septentrionale* (1801) and *Flora boreali-americana . . .* (1803).

His son, FRANÇOIS ANDRÉ MICHAUX (1770–1855), collaborated with him in botanical researches in the United States and was the author of *Histoire des arbres forestiers de l'Amérique septentrionale* (3 vols., 1810–1813; trans. as *The North American Sylva*).

MICHAUX, Henri, French poet and painter: b. Namur, Belgium, May 24, 1899. His poems, in mingled verse and prose, exhibit a surrealistic play of fantasy and a great variety of prosodic effects. He is the author of *Un certain plume* (1930), *Un barbare en Asie* (1947; trans. *A Barbarian in Asia,* 1949), *Epreuves, exorcismes 1940–1944* (1945), and *Arriver a se reveiller* (1950).

MICHEL, Claude. See CLODION.

MICHEL, mĭch'ĕl, DAN (Middle English "sir," "master"), or **MICHEL OF NORTHGATE,** English monk and translator: fl. 1340. A brother in the cloister of St. Augustine of Canterbury, he is remembered for his translation of a French moral treatise by Laurentius Gallus entitled *La somme des vices et des vertues* (1279). Dan Michel's translation, in the Kentish dialect of Middle English, is called *The Ayenbite of Inwit* (that is, *The Remorse of Conscience*). A manuscript bearing the autograph of Dan Michel and dated 1340 is preserved in the British Museum, London. The poem is valued by scholars as a dated specimen of the Kentish dialect spoken in the middle of the 14th

century. Consult editions by Stevenson for the Roxburghe Club (1855); Morris for the Early English Text Society (1876).

MICHEL, Francisque Xavier, French archæologist: b. Lyons, 18 Jan. 1809; d. Paris, 18 May 1887. He was educated at Lyons and became known for his work in editing French manuscripts of the Middle Ages. He was sent to England in 1833 and to Scotland in 1837 for the purpose of making researches for the French government. He was appointed professor of foreign literature at the Faculté des lettres at Bordeaux in 1839. He edited numerous manuscripts written between the 11th and 14th centuries, among them 'Chanson de Roland' and 'Roman de la Rose.' He later translated into French many works of Goldsmith, Shakespeare, Sterne and Tennyson; and he was author of 'Histoire des races naudites de la France et de l'Espagne' (2 vols., 1847); 'Recherches sur le Commerce pendant le moyen-âge' (2 vols., 1852–54); 'Etudes de Philologie comparée sur l'argot' (1856); 'Histoire du commerce et de la navigation á Bordeaux' (2 vols., 1867–71), etc.

MICHEL, François Emile, fräṅ-swä ā-mēl mē-shĕl, French painter and art critic: b. Metz, 19 July 1828; d. 24 May 1909. After studying under Migette and Marechal, he made his début in the Salon in 1853, since which he has produced 'Summer Nights' (1872); 'Sowing in Autumn' (1873); 'The Harlem Sound' (1885); the two latter being now in the Luxembourg. He was elected to the Institute in 1892. Among his works are 'Rembrandt' (1886); 'Jacob van Ruysdael et les paysagistes de l'école de Haarlem' (1890); 'Le maître du paysage' (1906); 'Nouvelles études sur l'histoire de l'art' (1908); 'La forêt de Fontainebleau' (1909).

MICHEL, Louise, French anarchist: b. Vroncourt, Upper Marne, France, 29 May 1830; d. Paris, 9 Jan. 1905. When very young she wrote verses of unusual power and in 1860 opened a school in Paris. In the Franco-German War she tended the sick and wounded and took part in the sorties from Paris; and during the government of the Commune in 1871 she fought at the barricades, was made prisoner, sentenced to deportation for life, and spent some years in New Caledonia, but was pardoned by the amnesty of 1880 and returned to Paris, where she edited 'La Révolution sociale' and continued her anarchistic teachings. She was imprisoned in 1883 and in 1886, later made her home in London, where she continued her work and returned to Paris in 1895. Her sobriquet, «The Red Virgin of Montmartre,» was a tribute to the purity of her life. She published 'Le Coq Rouge'; 'Les Méprisées'; 'Ses Mémoires'; 'L'Ere Nouvelle.' Consult Gerault, E., 'La bonne Louise' (1906).

MICHELANGELO, Buonarroti, mī-kĕl-ăn'jĕ-lō or mē-kĕl-än'jä-lō, boo-ō-när-rō'tē, whose name during his lifetime was written as Michelagnolo (or Michelangiolo) di Ludovico di Buonarroti-Simoni; Italian sculptor, painter and architect: b. Caprese, Tuscany, 6 March 1475; d. Rome, 18 Feb. 1564. The family was well established as a family of citizens in Florence; but had been allowed heraldic bearings, a custom not unusual in relation to the controlling families of the Italian cities.

At a very early age Michelangelo became a student of fine art, entering first the workshop of Domenico Bigordi, called Ghirlandajo, and studying also in a primitive kind of art school which had been formed in the palace and gardens of Lorenzo dei Medici. It appears that the extraordinary abilities of the boy were noticed by his patrons and also by the artists of the epoch from the first. Michelangelo thought of himself only as a sculptor, and he put his energies into the study of bas-relief and statuary; studying the remains of Græco-Roman antiquity which were accessible, and producing works of such importance as caused surprise to his contemporaries, although most of these very early works are either lost altogether or are uncertain — pieces which are usually ascribed to this epoch not having certain ascriptions. The earliest very important work which has remained to us is the Pietà, which is now in a chapel of Saint Peter's Church at Rome. The figures are slightly larger than life, the Madonna holding the body of Christ on her lap in a not unusual attitude; a belt passing over the left shoulder of the Virgin is inscribed with the name of Michelangelo the Florentine: which is for years the only case in which Michelangelo signed a piece with his name. The famous group of the Madonna and Child in the Church of Notre Dame at Bruges, in Belgium, is generally accepted as the work of Michelangelo, and if so, was of this early epoch. The reason for its transportation to Bruges is disputed. An entirely authentic piece of the time is a colossal David, which having been for three centuries in the open air at the portal of the Palazzo Vecchio at Florence, is now under shelter in the Accademia in the same city. This extraordinary work is a frank attempt to render the as yet imperfectly developed form of a very young man.

The only portable painting which can with certainty be ascribed to Michelangelo belongs to the closing years of the 15th century, when Michelangelo was approaching the age of 25 years. This is the circular picture, a Madonna with the Child and Saint Joseph, in the Uffizi Gallery. The fact of his producing this and several other small works of painting is not to be counted against his accepted position as a sculptor; for most of the artists of the time practised in the different arts, and it is probable that Michelangelo was at this time much less in the habit of painting than were other sculptors of well-known ability. His own continual occupation upon works of pure form in marble was a sufficient reason for his continued abstention from the sister arts.

With the election of Pope Julius II began the Roman life of Michelangelo, for he was called upon by the new Pope in 1505 to build a great monument which the Pope desired to finish within his own lifetime. This monument was never completed, however, and the controversies and other difficulties which arose continually with regard to it, embittered a large part of the great artist's life and consumed time which could but ill be spared from actual work. The great statue of Moses, which was executed at a somewhat later time (not to be exactly fixed), was the only very important piece of statuary completed for this tomb.

In 1506 Michelangelo returned to Florence

and at that time there was a decided pause in the work upon the tomb, as other thoughts had taken up the mind of the Pope. Indeed, his return to Rome was followed immediately by the commencement of the painting upon the vault of the Sistine Chapel. This work as we have it is much the most important piece of mural painting of the modern world, for it occupies the whole vaulted room, 133 feet long and 45 feet wide, and is one continuous and unbroken composition containing hundreds of figures, life-size, of heroic size, and colossal, and done in pure fresco, except as it has been retouched in places, either by the artist himself or in later times, in what is called dry fresco — that is to say, the colors laid upon the dry plaster. There is this marked characteristic of the painting — that it has no landscape backgrounds except in the small compartments devoted to The Deluge and The Temptation, nor any other accessories as of costume, arms, buildings and the like, but is everywhere a simple architectural composition of painted pedestals and corbels seeming to carry figures which themselves are painted in the most abstract way — studies of the human form simply dressed and having no artistic interest other than that. It has generally been considered that the paintings draw their only importance from the astonishing power of the draughtsmanship and the great composition of abstract lines; but a more careful consideration of what they were before their partial defacement by the smoke of candles and the injuries and repairs which they have received, shows that the work is one of interest as to color composition as well. Michelangelo has never shown himself to be a colorist in the sense in which Correggio and the great Venetians were colorists, but then the medium in which he painted was fresco, that is, painting upon wet plaster, which does not lend itself to elaborate combinations of warm and profuse coloring — its tendency is always toward pale combinations and the expression of delicately modulated form rather than of chromatic splendor. It is not, however, intelligent criticism to say that these paintings are the work of a sculptor taken rudely from the practice of his own art. On the other hand, it is quite unreasonable to say, as some English critics have said, that the turning of Michelangelo to sculpture had been unfortunate, as depriving us of the greatest of Christian religious painters while giving us only a melodramatic sculptor. The truth is that this artist is the most perfect exemplar of that way of treating all fine art, of which form alone (pure and abstract and almost separated from its usual purpose, as that of description and narrative), is the subject studied and gives the effect sought. Everything else — truth of anatomy, expression of face, energy of pose and of apparent movement — is subordinated to the one important thing, the getting of form which would be splendid in the artist's eyes. If, then, we have to regret a frequent excessiveness and extravagance of design, it can only be said that the extraordinary energy and force of the man, driving him on to undertake more than mortal man could achieve even had he been (as Michelangelo was not) left to pursue his own course in peace, resulted as of necessity in frequent exaggeration in the very desire to give vigor and as yet untried combinations of form as shown in the human body posed singly or in elaborate groups.

After 1513, when Julius II died, Michelangelo undertook a façade for the church of Saint Lorenzo in Florence. This front was never finished; but not long after he began the building of a new sacristy for this church, in which square room, very finely adorned with classical architectural forms, are the two remarkable tombs of the princes Lorenzo and Giuliano dei Medici. These monuments have each a seated statue of the prince in question, raised high above the sarcophagus; and on the lid of the sarcophagus two colossal reclining figures, in each case one man and one woman. The sculptures are not all completed. The extraordinary power of their modeling has made these monuments very famous in the modern world.

About 1535 Michelangelo settled finally in Rome, and from that time until his death was very much occupied as an architect in connection with the great church of Saint Peter. The building had been going on for many years, and different architects had successively changed the design, so that Michelangelo took up the work at that point where it became necessary to roof the central mass. This he did by means of the famous cupola which dominates the city of Rome and the country around, although the rounded shell of stone itself was not erected during his lifetime.

As an architect Michelangelo was not, on the whole, beneficial to Italy or to the art of the 16th century, because he had never, as a youth, studied construction or the use of details, and because his almost exclusive devotion to more elaborate and organic forms than those possible to architectural masses, prevented his designing such features as frontons and consols with gravity and simplicity. The architecture inspired by him, and more especially that produced by his immediate successors, ran to extravagance; and the worst period of Italian decorative art was to follow upon his own epoch of work. The sculpture of his later years is much less important and much less in quantity than might have been expected; but the work upon the church occupied his energies, and in 1535 he was appointed by Pope Paul III, architect, sculptor and painter to the papal palace, and he began work immediately upon the east wall of the Sistine Chapel. Here he painted that prodigious 'Last Judgment' filling all the wall above the altar, including the lunette, and up to the nearly semi-circular vault. The picture is, like the ceiling paintings, entirely a study of the human body in vigorous action, and in highly studied pose. As a work of color, or even of light and shade, it is almost unrecognizable for what it was, as the smoke of the candles on the altar has caused very great changes in color, and has led to repainting, and because of certain painted additions made in the next century in order to disguise the complete nudity of the figures.

Throughout his life Michelangelo had been a writer of verse, and it is known that important sonnets of his were left by him. These, however, were edited in a destructive manner by his nephew, so much so that we have at the present day no certain knowledge, even, of what the poems were as they left Michelangelo's hand. This part of his intellectual life has been

Ewing Galloway

MICHELANGELO: "Moses" (1513-1516) by Michelangelo, in the church of San Pietro in Vincoli, in Rome

New York Public Library

The "Delphic Sibyl" (1508–1512) by Michelangelo, painted on the ceiling of the Sistine Chapel in the Vatican in Rome.

Ewing Galloway, N.Y.

"Lorenzo de' Medici" (1524–1533) by Michelangelo, on Lorenzo's tomb in the Medici Chapel of San Lorenzo, Florence.

Above: The tomb of Giuliano de' Medici (1524–1533) by Michelangelo, in the Medici Chapel in San Lorenzo, Florence.

Left: The head of "David" (1501–1503), a colossal statue by Michelangelo, in the Gallery of the Academy, Florence.

Below: The Sistine Chapel, the Vatican, Rome, with paintings (1508–1512) by Michelangelo: on the ceiling, Biblical subjects, especially from Genesis, and prophets and sibyls; on the end wall, "The Last Judgment."

(Above and below) New York Public Library; (left) Ewing Galloway

treated with great thoroughness by John Addington Symonds in his life of the artist (1892); and on which Walter Pater writes fascinatingly in 'The Renaissance: Studies in Art and Poetry' (1912). The frescoes of the Sistine Chapel have been peculiarly the study of Heath Wilson who, about the middle of the 19th century, had a scaffolding erected in the chapel and studied the paintings inch by inch, and who recorded his observations in a valuable book (1876). Apart from these two books and the life by Harford (1857), the best book on Michelangelo is the volume of the 'Gazette de Beaux-Arts,' published in 1876. This volume contains papers by the sculptor, Eugène Guillaume, the architect, Charles Garnier, and the competent writers, Charles Blanc, Paul Mantz, A. Mézières and Anatole de Montaiglon. Karl Frey's 'Michaelagniolo Buonarrotti' publication of which began in 1907; Thode's 'Michelangelo und das Ende der Renaissance' (1902–12); and Venturi's 'Michelangelo' (1928) are among the more recent authoritative sources.

RUSSELL STURGIS.

MICHELANGELO, Life of. Herman Grimm's Life of Michelangelo, apart from its value as the record of a notable life, is one of the masterpieces of German prose. Written at a time when photographic illustrations were unknown (it was published in 1860) and when the expense of travel barred Italy to most young artists, its purpose was to give them a vivid and realizable word-picture of the sculptures, paintings and architectural creations of the most universal of all artists, and at the same time to show how constructive a part art can play in the spiritual life of a nation when artists are large enough for leadership.

It is not only a biography; it is a history of the Italian Renaissance with Michelangelo as the central figure. During the 80 years of his life Italian art knew Donatello, Ghirlandajo, Leonardo da Vinci, Titian and Raphael; Savanarola lived and died praying for the soul of Florence; the Popes — Borgias, Farneses, Medicis — exerted their power for good and ill in the world of the sword as well as the world of the spirit; the Medicis fought for the temporal mastery of Florence and conquered, fought and lost again. In every part of this seething political, religious and artistic life Michelangelo had his share. His life and that of Florence ran parallel lines. The star of Florence had barely risen when Michelangelo sculptured his first marbles in the garden of the Medicis; it had set, never to rise again, before his body was brought back for burial from the Rome which had been his refuge when Florence deserted her tradition of freedom.

It is the achievement of Herman Grimm — that which places this biography with Boswell's Life of Johnson and the Autobiography of Benvenuto Cellini — that he has known how to make the city and the times live equally with the man whom he portrays, and how to give form and color to the figures of the lesser men and women in his picture. Fine illustrations heighten the value and the interest of new editions, both in the original and in the translation by Miss Bunnett.

MICHELET, Jules, zhül mēsh-lā, French historian: b. Paris, 21 Aug. 1798; d. Hyères, 9 Feb. 1874. His father was an unsuccessful printer, and his boyhood was one of poverty and want. He was educated at the Lycée Charlemagne and in 1821 became a professor at the Collège Rollin. After the revolution of 1830 he was appointed chief of the historical section in the Archives, and in 1838 professor of history at the Collège de France. He lost his offices by his refusal to take the oath of allegiance to Napoleon III (1851) and thereafter devoted himself to his busy literary labors. His 'Histoire de France' (18 vols. 1833–67; new ed. 19 vols. 1879) is among the monumental productions of historical composition, and definitely established his fame. His 'Histoire de la Révolution' (1847–53; new ed. 1889) is a splendid specimen of eloquent writing, but hardly a great history. In all his historical writing Michelet has been criticized for unduly subordinating historical values to dramatic effect and for permitting his prejudices to destroy his perspective. But his descriptions are remarkably vivid, and his rendering of certain episodes is unsurpassed. Among his further writings are 'Précis de l'histoire moderne' (1827); 'Histoire romaine' (1831); several volumes of impressions of nature — 'L'Oiseau' (1856), 'L'Insecte' (1857), 'Z'Amowe' (1859); 'La Mer' (1861); 'La Montagne' (1868); and several volumes of polemics. Consult 'Lives' or studies by brushes (1898); 'Corréard' (1886); 'Monot' (1905); and 'Jules Simon' (1886).

MICHELET, Karl Ludwig, kärl lood'vĭg mēshĕ-lā, German philosopher: b. Berlin, 4 Dec. 1801; d. 16 Dec. 1893. He was graduated from the University of Berlin in 1824, and in 1829 was appointed to the professorship of philology and philosophy in the French gymnasium, which he held for 25 years. In 1829 he also became professor of philosophy in the University of Berlin. He devoted himself especially to the doctrines of Aristotle and published 'Die Ethik des Aristoteles' (1827), an edition of the Nicomachean ethic with Latin commentary (1829–33), and a memoir entitled 'Examen critique du livre d'Aristotle, intitulé Métaphysique' (1836), which was crowned by the Academy of Moral and Political Sciences. From 1832 to 1842 he was engaged as one of the editors of Hegel's works, in illustration of whose system he wrote 'Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel' (1837–39); 'Entwickelungsgeschichte der neuesten Deutschen Philosophie' (1843); and a controversial dissertation, 'Schelling und Hegel' (1839). His own standpoint and tendency are most decisively shown in his 'Vorlesungen über die Persönlichkeit Gottes und die Unsterblichkeit der Seele, oder die ewige Persönlichkeit des Geistes' (1841); and 'Die Epiphanie der ewigen Persönlichkeit des Geistes' (1844–52).

MICHELL, mĭch'ĕl, **John,** English physicist, geologist and astronomer: b. about 1724; d. Thornhill, Yorkshire, 29 April 1793. He was educated at Queen's College, Cambridge, became a Fellow there, and in 1762 was made professor of geology. From 1767 until his death he was rector at Thornhill. His invention of the torsion balance shortly before his death preceded that of Coulomb, and was used by Henry Cavendish in his famous experiment determining the mean density of the earth.

Michell also described a method of making magnets, *A Treatise of Artificial Magnets, in which is shown an easy and expeditious method of making them superior to the best natural ones* (1750). He also made valuable contributions to the knowledge of astronomy. Author of *Conjectures Concerning the Cause and Observations upon the Phenomena of Earthquakes* (1760); *A Recommendation of Hadley's Quadrant for Surveying* (1765); *Proposal of a Method for Measuring Degrees of Longitude upon the Parallels of the Equator* (1766); *An Inquiry into the Probable Parallax and Magnitude of the Fixed Stars* (1767); *On the Means of Discovering the Distance, Magnitude, etc., of the Fixed Stars* (1784).

MICHELL, John Henry, Australian mathematician: b. Maldon, Victoria, Australia, Oct. 26, 1863; d. Camberwell, Victoria, Feb. 3, 1940. Educated at Trinity College, Cambridge, he later became a fellow there. As assistant professor of mathematics at the University of Melbourne he earned an international reputation for researches in mathematical physics. A Fellow of the Royal Society, he contributed to the Mathematical Society *Proceedings* (London); other publications include *Theory of Free Stream Lines* (1890), *The Wave Resistance of a Ship* (1898), and *Theory of Uniformly Loaded Beams* (1900).

MICHELOZZO, mē'kâ-lôt'tso, or **MICHELOZZI** (full name, MICHELOZZO DI BARTOLOMMEO), Italian goldsmith, sculptor, and architect: b. Florence, 1391 or 1396; buried there, Oct. 7, 1472. He studied sculpture under Donatello and architecture under Brunelleschi, and was a protégé of Cosimo dei Medici. He worked in silver, bronze and marble as a sculptor and attained a high reputation for his work; but his fame rests principally upon his achievements as an architect, his name ranking among the foremost of the famous Florentine architects of the 15th century. He executed the silver statue of Saint John in the Duomo, Florence, and also the bronze statue of that saint in the Bargello, and the terra cotta figure of him in the court of the church of the Annunziata, Florence. Much of his work as a sculptor was done with Donatello and it is difficult to establish its identity. He designed the library of San Giorgio Maggiore at Venice, as well as other buildings there, during the period when he shared the exile of his patron, Cosimo dei Medici. He designed the Riccardi Palace in Florence for the Medici, and his skill as an engineer was attested by his repairing and partially rebuilding the Palazzo Vecchio, which was falling to ruin. He also undertook the repairs and remodeling of the monastery of San Marco at Florence when it was given to the Dominicans of Fiesole by the Medici. He designed the Medici summer villa at Careggi, the pilgrim's guest-house, Jerusalem, the Medici palace at Fiesole and many other buildings. His style effected a combination of early Italian Gothic and the classical type with marvelous simplicity and lightness, withal stateliness of line. Consult Müntz, E., *Histoire de l'art pendant la Renaissance* (1890–1895).

MICHELS, Roberto, Italian economist and sociologist: b. Cologne, Germany, Jan. 9, 1876; d. Rome, Italy, May 2, 1946. Educated at the universities of Paris, Munich, Leipzig and Halle, he was successively docent at the University of Brussels (1905), professor of economics at Turin (1907), of economics and statistics at Basel (1913), of economics and sociology at Perugia (1928). His publications include *Brautstandsmoral* (1903); *Patriotismus und Ethik* (1906); *Storia del Marxismo in Italia* (1908); *Der Patriotismus* (1929); *Il Boicottaggio* (1934).

MICHELSEN, Peter Christian Hersleb Kjerschow, Norwegian statesman and philanthropist: b. Bergen, Norway, Mar. 15, 1857; d. near Bergen, June 29, 1925. Elected to the Storting in 1903, two years later he was appointed prime minister. A persuasive advocate of the independence movement and also of international conciliation, he led his country through the crisis ending in 1905 in dissolution of the union with Sweden and restoration of the independent kingdom of Norway. In 1907 he retired from political life. The greater part of his fortune was bequeathed to the Christian Michelsen Institute of Science and Intellectual Freedom, its charter receiving royal confirmation in 1929. Situated at Bergen, the institute has as its guiding principle the founder's ideal of contributing to a spirit of tolerance on national as well as international levels. This it seeks to accomplish by giving 5-year appointments to research workers of outstanding ability engaged in disinterested scientific investigations, also by undertaking "cultural or scientific work for the promotion of tolerance and forbearance between nations and races, in religious, social, economic and political life."

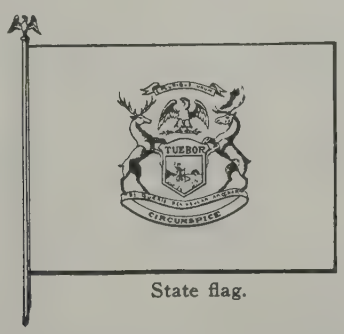
MICHELSON, Albert Abraham, American physicist: b. Strelno, Posen, Germany, Dec. 19, 1852; d. Pasadena, Calif., May 9, 1931. He came to the United States when a boy; was graduated at the U. S. Naval Academy in 1873; took graduate courses in physics in Berlin and Heidelberg and in Paris; and resigned from the navy in 1883 to become professor of physics at the Case School of Applied Science, Cleveland, Ohio. From 1889 to 1892 he was professor of physics at Clark University, and from 1892 to 1929 was head of the department of physics in the University of Chicago. His experiments resulted in new figures for the velocity of light *in vacuo,* and his inferential refractometer (1886–1887) enabled the use of wave-lengths of light as a measuring unit. He also invented the echelon spectroscope, and in 1920 demonstrated the diameter of Alpha Orionis to be 260,000,000 miles, the first measurement of a star's diameter. The Nobel Prize for physics was conferred on him in 1907. He wrote *Light Waves and Their Uses* (1903).

MICHIE, mĭk'ĭ, **Peter Smith,** American military engineer and author: b. Brechin, Scotland, March 24, 1839; d. West Point, N. Y., Feb. 16, 1901. He came early to Cincinnati, graduated from West Point (1863), and joined the engineers as lieutenant. He served as assistant engineer in the operations around Charleston in 1863–1864 and as chief engineer of districts in the Department of the South. In 1864 he was transferred to the Army of the James, served in the operations against Richmond and was present at Ap-

pomattox in 1865. He was promoted brevet brigadier general and later brevet lieutenant colonel of volunteers in 1865, and was promoted captain in the regular army. He was appointed first assistant in the department of engineering and chemistry at West Point in 1867, and from 1871 until his death he was professor of natural and experimental philosophy there. He served on the board of overseers of the Thayer School of Civil Engineering at Dartmouth from 1871. He was a member of a government commission to Europe in June–November 1870 studying fortifications. In addition to textbooks on physics, he was author of *The Life and Letters of Emery Upton* (1885), *The Personnel of the Sea Coast Defenses* (1887), and *General McClellan* (1901).

MICHIGAN, mĭsh'ĭ-găn, one of the north central states of the United States, within the region of the Great Lakes. It is composed of two peninsulas, a southern and northern, separated by the Straits of Mackinac. The Upper Peninsula is bounded on the north by Lake Superior; on the east by Lake Superior, Whitefish Bay, Lake Huron, and St. Marys River which separates Michigan from the Province of Ontario, Canada; on the south by Lake Huron, Straits of Mackinac which separate the two peninsulas, and Lake Michigan; and on the southwest and west, by Wisconsin. The Lower Peninsula is bounded on the north by Lake Huron, Straits of Mackinac, and Lake Michigan; on the east by Lake Huron, St. Clair River, Lake St. Clair, Detroit River, and Lake Erie (the rivers separating the state from Ontario, Canada); on the south by Ohio and Indiana; and on the west by Lake Michigan.

The origin of the name is somewhat obscure. Dr. William Jones of the Field Museum of Natural History, Chicago, Ill., notes that the Chippewa Indians on the north shore of Lake Superior referred to Lake Michigan by the name *Mishawiguma,* meaning expansive waste, since there were few or no islands in the lake. The Algonquian expression for great water was *michi guma.* A name frequently applied to Mackinac, and later spread to include a considerable area, was *Michilimackinac,* meaning the place of the big lame person, and was derived from the name of an allegedly extinct Algonquian tribe, the Mishinimaki, or Mishinimakinagog. While the origin of the state name is uncertain, Perry F. Powers states, however, that the name Michigan first appeared in the congressional proceedings of 1804.



State flag.

Land area	57,022 square miles
Water area (inland)	1,194 square miles
Water area (other than inland)	38,575 square miles
Upper Peninsula (approx. land)	16,538 square miles
Lower Peninsula (approx. land)	40,484 square miles
Total area	58,216 square miles
Latitude	41° 41′—47° 30′ N.
Longitude	82° 26′—90° 31′ W.
Altitude	578 feet to 2,023 feet
Population (1940)	5,256,106
Population (1950)	6,371,766
Capital city—Lansing; Pop. (1950)	92,129
Admitted as 26th state	Jan. 26, 1837
Bird (adopted 1931)	Robin
Flower (adopted 1897)	Apple Blossom
Motto	*Si Quaeris Peninsulam Amoenam Circumspice* (*If You Seek a Pleasant Peninsula, Look Around You*)
Nicknames	Auto State; Lady of the Lakes; Lake State; Wolverine State
Song	*Michigan, My Michigan* (Douglas Malloch) Not Official
Tree	None

State seal.

Physical Characteristics. — *Topography.* — The western half of the Upper Peninsula is a part of the Laurentian upland area of North America. Upon a foundation of ancient Archean rocks are laid old sedimentary formations of limestone and sandstone containing iron and copper deposits. The eastern half of the Upper Peninsula and the entire Lower Peninsula are composed of more recent sedimentary formations. These occur one above the other like a nest of shallow dishes filling a structural basin the rim of which is represented by the Archean rocks of the western half of the Upper Peninsula. Glacial ice made the exact outlines of the state. The structural basin of Lake Superior was deepened and glacial tongues dug the present depressions occupied by Lakes Michigan, Huron, and Erie. Retreating ice spread over the state a mantle of glacial drift which forms the present surface features and covers the underlying rock over all of the state except the higher parts of the western half of the Upper Peninsula. This material was arranged by the ice fronts into hilly belts, rolling plains, and uplands. It blocked the previous drainage channels and left thousands of undrained depressions making Michigan a state of many lakes, swamps, and marshes. In the southern half of the Lower Peninsula the glacial mantle formed fairly rich loamy soils but over most of the northern parts sandy and poorer soils. This difference in soil material between the southern part of the Lower Peninsula and the remainder of the state divides Michigan into a southern part which is agriculturally well developed and prosperous and a northern part where farming is successful only in some localities.

The southern half of the Lower Peninsula bears a level to gently rolling surface, the most conspicuous features of which are chains of low glacial hills. The highest points of these hilly chains reach altitudes between 1,000 and 1,200

feet above sea level. The northern half of the Lower Peninsula is composed largely of a tableland capped by hilly belts of glacial origin attaining elevations between 1,200 and 1,700 feet. This tableland is the water divide between the rivers flowing westward, northward, and eastward into the bordering Great Lakes. The eastern half of the Upper Peninsula is fairly level nowhere more than 400 feet above the surrounding lake levels and contains considerable areas of swampy land. The western half is higher and more rugged with successions of rocky ridges, sandy plains, and wet shallow valleys. The highest elevations in the state occur along the Lake Superior shore on rocky, almost mountainous, ridges called the Huron Mountains (elevation 1,950 feet) in Marquette and Baraga counties, and the Porcupine Mountains (elevation 2,023 feet) in Ontonagon County.

Rivers and Lakes.—Approximately 70 per cent of the surface of the state is drained by 34 primary river systems; the remaining 30 per cent draining directly into the lakes by smaller streams. The Saginaw, with its tributaries the Shiawassee, the Tittabawassee, and the Cass, form the largest system draining approximately 6,500 square miles into Lake Huron. Other principal rivers of the Lower Peninsula which empty into Lakes Huron or Erie are the Raisin, the Huron, the Au Sable, the Thunder Bay and the Cheboygan River. The Lake Michigan drainage is accomplished principally by the Kalamazoo, the Grand, the Muskegon, the Manistee, and the Boardman. The Upper Peninsula rivers flowing into Lakes Michigan and Huron are the Menominee, the Escanaba, the Whitefish, the Manistique, and the St. Marys which latter form the international boundary with Canada. The north-flowing rivers of the Upper Peninsula are the Montreal which is the boundary with Wisconsin, the Ontonagon, the Sturgeon, and the Tahquamenon. There are more than 11,000 lakes in the state, of which 6,454 are large enough to be listed in the *Michigan Lakes and Streams Directory*. Houghton Lake in Roscommon County is the largest of these, with 31 square miles of surface. The length of the courses of the major rivers is 5,499 miles; in addition there is an estimated 30,000 miles of tributaries. The state has 3,177 miles of shore lines, more than any other in the Union; of this 120 are in harbors. Because of their glacial origin some of the best soils in the state are improved by artificial drainage and drainage project areas cover nearly one quarter of the state. The largest areas of drained lands are located in the southern half of the Lower Peninsula.

Climate.—Michigan is characterized by well marked seasons. January temperatures average below 16°F. along the northern coast of the Upper Peninsula and over 26°F. in the southwest and southeast corners of the state. July temperatures in the same localities will average under 65° and over 72°F. respectively. The growing season varies considerably over the state. In the interior of the Upper Peninsula it is 80 to 90 days and along the shores of that peninsula 140 days. In the Lower Peninsula it varies from a minimum of 90 to 100 days in the northern interior to a maximum of 180 days in the extreme southwest. The effects of the lakes are important especially in a narrow belt along the Lake Michigan shore devoted to fruit cultivation. Precipitation is adequate for agriculture and is fairly evenly distributed throughout the months. It varies from 26 inches annually in the northern interior of the Lower Peninsula to 36 inches along the Ohio border. Some of this is in the form of snow; 140 inches falling in the "Copper Country" of the Upper Peninsula diminishing to 30 inches in the southeast corner of the state. Over Michigan as a whole, one day in three is rainy and one in two is cloudy. In summer there is a preponderance of clear, and in winter of cloudy days.

Political Divisions.—*Cities.*—Detroit, with a population of 1,849,568 in 1950, is the fifth most populous city of the United States and the largest city in Michigan. Its standard metropolitan area, comprising Wayne, Macomb, and Oakland counties, accounts for more than 45 per cent of the state's population. Situated in southeastern Michigan on the Detroit River, across from Windsor, Ontario, Detroit has many and varied industries and is the principal automobile manufacturing center of the world. Grand Rapids (pop. 1950, 176,515), Michigan's second city, is located in the west central part of the state, 25 miles east of Lake Michigan. It is nationally known for the manufacture of furniture and household equipment, and also produces automobile parts and bodies. Flint (163,143), 50 miles northwest of Detroit, is the third largest city of the state and ranks second to Detroit in the manufacture of automobile bodies and parts. Michigan's fourth city, Dearborn (94,994), situated 10 miles west of Detroit, is important for the manufacture of automobiles and aircraft. Saginaw (92,918), 31 miles northwest of Flint, is the principal city of the Saginaw Valley and the fifth most populous city in the state. Formerly one of the greatest lumber producing cities of the world, it is now occupied with diversified manufacturing and with sugar beet refining and other food-processing activities. Lansing (92,129), the capital city, located in the central part of the southern portion of the state, is the sixth city in size, is the principal trading center for central Michigan, and is an important automobile manufacturing city. Adjoining it is East Lansing, the seat of Michigan State College of Agriculture and Applied Science, the first state institution of its kind to be established in the United States. Pontiac (73,681), 24 miles northwest of Detroit, is an automobile manufacturing city, and Kalamazoo (57,704) is a noted paper manufacturing city located in southwestern Michigan. In 1950, Michigan had 10 cities with populations of more than 50,000 and 33 other cities with more than 15,000 inhabitants. (For populations of cities, see reverse side of state map.)

Counties.—The state is organized into 83 counties, 68 in the Lower and 15 in the Upper Peninsula. A list of counties and county seats follows:

UPPER PENINSULA

County	County Seat	County	County Seat
Alger	Munising	Keweenaw	Eagle River
Baraga	L'Anse	Luce	Newberry
Chippewa	Sault Ste. Marie	Mackinac	St. Ignace
Delta	Escanaba	Marquette	Marquette
Dickinson	Iron Mountain	Menominee	Menominee
Gogebic	Bessemer	Ontonagon	Ontonagon
Houghton	Houghton	Schoolcraft	Manistique
Iron	Crystal Falls		

MICHIGAN

© Philip Gendreau

The Michigan capitol building at Lansing.

Courtesy Chesapeake and Ohio Railway

Scene during the Tulip Festival at Holland, Ottawa County, where most of the population is of Dutch descent.

MICHIGAN

Courtesy New York Central System

The great Ford automobile plant at River Rouge, adjacent to Detroit.

Courtesy Michigan Tourist Council

Part of the Sault Sainte Marie canal system, an important waterway connecting lakes Superior and Huron.

LOWER PENINSULA

County	County Seat	County	County Seat
Alcona	Harrisville	Lapeer	Lapeer
Allegan	Allegan	Leelanau	Leland
Alpena	Alpena	Lenawee	Adrian
Antrim	Bellaire	Livingston	Howell
Arenac	Standish	Macomb	Mount Clemens
Barry	Hastings	Manistee	Manistee
Bay	Bay City	Mason	Ludington
Benzie	Beulah	Mecosta	Big Rapids
Berrien	Saint Joseph	Midland	Midland
Branch	Coldwater	Missaukee	Lake City
Calhoun	Marshall	Monroe	Monroe
Cass	Cassopolis	Montcalm	Stanton
Charlevoix	Charlevoix	Montmorency	Atlanta
Cheboygan	Cheboygan	Muskegon	Muskegon
Clare	Harrison	Newaygo	White Cloud
Clinton	St. Johns	Oakland	Pontiac
Crawford	Grayling	Oceana	Hart
Eaton	Charlotte	Ogemaw	West Branch
Emmet	Petoskey	Osceola	Reed City
Genessee	Flint	Oscoda	Mio
Gladwin	Gladwin	Otsego	Gaylord
Grand Traverse	Traverse City	Ottawa	Grand Haven
Gratiot	Ithaca	Presque Isle	Rogers City
Hillsdale	Hillsdale	Roscommon	Roscommon
Huron	Bad Axe	Saginaw	Saginaw
Ingham	Mason	St. Clair	Port Huron
Ionia	Ionia	St. Joseph	Centerville
Iosco	Tawas City	Sanilac	Sandusky
Isabella	Mount Pleasant	Shiawassee	Corunna
Jackson	Jackson	Tuscola	Caro
Kalamazoo	Kalamazoo	Van Buren	Paw Paw
Kalkaska	Kalkaska	Washtenaw	Ann Arbor
Kent	Grand Rapids	Wayne	Detroit
Lake	Baldwin	Wexford	Cadillac

The People.—The first white settlers in Michigan were Frenchmen who took up land around the frontier forts. The French and the British who succeeded them discouraged immigration preferring the profitable fur trade to extensive land settlement. In 1810 there were less than 5,000 people in the state and of these nearly half lived at Detroit. By 1837 when Michigan was admitted into the Union, transportation from the east and roads through the territory had induced a population of 87,273, two thirds of whom had come from New York and the New England states. Within a few years after statehood immigrants began to arrive from Europe. These came both as individuals and as colony groups, in response to a program of advertising conducted by the commissioner of immigration. German colonies were settled near Saginaw, Ann Arbor and other locations in the southeastern part of the state. Beginning in 1846, the Dutch built up communities in the western part at Holland and Zeeland and later Dutch immigration extended these areas of settlement. Large numbers of Irish came to the state but did not settle in distinct districts. Except for the Dutch these early elements have lost their identities with the mother countries although some Lutheran churches still hold German language services. During the period from 1860 to 1900 lumbering and mining operations drew Swedes, Norwegians, and Finns, as well as many Italians into the state. The Finns migrated principally to the Upper Peninsula and remain in the population of that area as distinct racial groups in many localities. Industrial development around Detroit provided employment opportunities for unskilled immigrants who spoke little English, and beginning about 1910 these arrived in large numbers from Poland, Italy, Russia, Austria-Hungary and many other European countries. This later immigration was largely urban and industrial, in contrast to the earlier which had been rural and agricultural. There was little increase in the rural population after 1870 although there was some exchange as rural people were attracted to the cities and immigrants succeeded them on the land. During World War I the need for industrial manpower brought to Detroit and other Michigan cities an influx of Negroes from the southern states. In 1910 there were 17,115 Negroes in the state; in 1920, 60,082; in 1930, 169,453; in 1940, 208,345.

Until 1910 there were more rural than urban people in the state but since that time the growth of industrial cities has shifted the balance to the urban side.

Famous Men and Women.—In the field of government and politics, Michigan numbers among her sons Henry Hastings Sibley (Detroit, 1811–1891), fur trader and later governor of Minnesota; William Lawrence Penfield (Dover, 1846–1909), jurist; Truman Handy Newberry (Detroit, 1864–1945), businessman and politician; and Frank Murphy (Harbor Beach, 1890–1949), lawyer and member of the United States Supreme Court; Thomas E. Dewey (Owosso, 1902), governor of New York.

In military affairs, there are Alexander Macomb (Detroit, 1782–1841), soldier; Henry Jackson Hunt (Detroit, 1819–1889), soldier and artillery officer; William Rufus Shafter (Kalamazoo County, 1835–1906), soldier; George Le Roy Irwin (Fort Wayne, 1868–1931), soldier; and George Owen Squier (Dryden, 1865–1934), soldier, scientist, and electrical engineer.

Outstanding industrialists include Robert Hawley Ingersoll (Delta, 1859–1928), manufacturer of the famous Ingersoll one-dollar watch; Martin Antoine Ryersson (Grand Rapids, 1856–1932), capitalist, philanthropist, and art collector; Roy Dikeman Chapin (Lansing, 1880–1936), industrialist; and Henry Ford (Dearborn Township, 1863–1947), automobile manufacturer.

In the field of science and education, there are Alfred Noble (Livonia, 1844–1914), civil engineer; Calvin Thomas (Lapeer, 1854–1919), Goethe scholar and educator; William James Beal (Adrian, 1833–1924), botanist and educator; Alfred Hulse Brooks (Ann Arbor, 1871–1924), geologist and geographer; William Albert Locy (Troy, 1857–1924), zoologist, teacher, and historian of biological science; Robert Simpson Woodward (Rochester, 1849–1924), engineer, mathematical physicist, and teacher; Max Levy (Detroit, 1857–1926), photoengraver and inventor of the hemocytometer; Jeremiah Whipple Jenks (St. Clair, 1856–1929), economist, teacher, and author; Henry Rogers Seager (Lansing, 1870–1930), economist and teacher; Claude Halstead Van Tyne (Tecumseh, 1869–1930), historian and teacher; James William Toumey (Lawrence, 1865–1932), forester and teacher; and Paul de Kruif (Zeeland, 1890–), bacteriologist and author.

Among those who have won fame in music, art, and literature are Brownson Crocker Howard (Detroit, 1842–1902), playwright; Frederick Russell Burton (Jonesville, 1861–1909), composer and student of Indian music; Will [William McKendree] Carleton (near Hudson, 1845–1912), poet; Henry Edward Krehbiel (Ann Arbor, 1854–1923), music critic, historian, author and lecturer; Frederick Stuart Church (Grand Rapids, 1842–1924), painter; James Oliver Curwood (Owosso, 1878–1927), novelist; Julius Rolshoven (Detroit, 1858–1930), painter; John Albert Macy (Detroit, 1877–1932), author, literary critic, poet, and socialist; [Julius] Gari Melchers (Detroit, 1860–1932), painter; and Stewart Edward White (Grand Rapids, 1873–), fiction writer.

Other native born sons include Charles Michel De Langlade (Mackinac, 1729–c. 1801), remarkable French half-breed, became known as "Father of Wisconsin" and to tribesmen as Akewaugeketauso; Leonard Bacon (Detroit, 1802–1881), clergyman; James Anthony Bailey (Detroit, 1847–1906), showman who united with P. T. Barnum in 1881; Olympia Brown (Prairie Ronde, 1835–1926), minister and suffragist; Cressy Livingston Wilbur (Hillsdale, 1865–1928), vital statistician; Delos Franklin Wilcox (near Ida, 1873–1928), franchise and public utility expert; and Milton Alexander McRae (Detroit, 1858–1930), newspaper publisher.

Other prominent citizens whose fame is linked with the history of the state are Douglass Houghton (Troy, N. Y., 1809–1845), geologist; Henry Rowe Schoolcraft (Albany County, N. Y., 1793–1864), ethnologist; Lewis Cass (Exeter, N. H., 1782–1866), lawyer and governor of Michigan Territory; George A. Custer (New Rumley, Ohio, 1839–1876), headed Michigan brigade in the Civil War; Zachariah Chandler (Bedford, N. H., 1813–1879), politician; Robert McClelland (Greencastle, Pa., 1807–1880), lawyer, congressman, and governor of Michigan; Thomas McIntyre Cooley, (near Attica, N. Y., 1824–1898), jurist and writer on constitutional law; Russell Alexander Alger (Lafayette, Ohio, 1836–1907), politician and governor of Michigan; Henry Billings Brown (South Lee, Mass., 1836–1913), jurist and member of the United States Supreme Court; James Burrill Angell (near Scituate, R. I., 1829–

1916), president of the University of Michigan (1871–1909); Donald McDonald Dickinson (Port Ontario, N. Y., 1846–1917), lawyer; Eliza Maria Mosher (Cayuga County, N. Y., 1846–1928), physician, educator, and civic worker; Edwin Denby (Evansville, Ind., 1870–1929), politician; and Edgar Albert Guest (Birmingham, Eng., 1881–), poet; and Thomas A. Edison (Milan, Ohio, 1847–1931) inventor.

Natural Resources.—The soils of the southern part of the Lower Peninsula are of good quality for agriculture and the climate conducive to the growth of forage crops. The immense harvest of timber from the northern part of the state is now past but regrowth of the forest promises a smaller but a steady supply of lumber. Iron, limestone, and salt deposits have produced vast quantities of materials and still contain large reserves. The abundant surface waters of the state make a remarkably even flow in the rivers which is utilized by 80 hydroelectric plants with 347,670 kilowatts capacity. Its position on the Great Lakes waterway and in the communication network of the United States has enhanced importance of the state in the industrial scheme of the country. For detailed information, consult the section on *Production and Manufacture*.

Fauna.—Michigan is well represented in its stock of fish, game, and birds. Its many streams and lakes are abundant with trout, pike, bass, perch, smelt, sunfish, crappies, and catfish; the commercial catches are lake trout, whitefish, suckers, chubs, and lake herring. Among its more important game and fur-bearing animals are the deer, black bear, rabbit, hare, beaver, wolf, coyote, muskrat, weasel, mink, otter, marten, raccoon, opossum, red fox, and badger. Most of the birds are migratory, although a considerable number remain all year. The pheasant, woodcock, partridge, and wild geese and ducks are the more important game birds.

Flora.—Michigan boasts of more species of trees on native soil than in all of Europe. After the settlers arrived, large areas were stripped by lumbermen, although many acres have been reforested. While evergreens are predominant, the Lower Peninsula abounds in hardwoods such as elm, oak, maple, and hickory. There is also an abundance of fruits and vines which produce nuts, berries, and tubers. Among the shrubs are the currant, blackberry, raspberry, and gooseberry. There is a large variety of wild flowers, mosses, and ferns.

Parks and Preserves.—Much of the cut over land in the northern part of the state is not of good enough quality to support agriculture. Through the process of tax delinquency a large acreage has come into state ownership and is assigned to the jurisdiction of the state department of conservation. The public lands are organized into 22 state forests, 71 state parks and recreation areas, 1 national park, 5 national forests which include the 2,948-acre Brady District game refuge, several state game projects, and various other types of development.

Recreation.—This public land together with the dense urban populations of southern Michigan and adjoining states has made recreation one of the principal sources of income within the state. The income from recreation is impossible to measure with accuracy but is estimated variously between $175,000,000 and $400,000,000 annually, ranking third behind manufacturing and agriculture. Numerous lakes and streams and an abundance of wooded country attract vacationers, summer residents, hunters, and fishermen and the income derived from these is of principal importance in northern parts of the state. Good highways furnish access to the recreational areas and the state maintains an active program of research and improvement in forestry, fish and game through its department of conservation.

Points of Interest.—Detroit, the hub of the automobile universe, is also of international interest for its Ambassador Bridge, the longest international suspension bridge in the world, and the Detroit and Windsor Fleetway Tunnel, the only international tube on earth. The Detroit Institute of Arts houses among other things, collections of Italian Gothic sculptures and Dutch and Flemish paintings of special note.

Dearborn, 10 miles west of Detroit, is the home of the Ford Motor Company. Besides the Rouge Plant, there are the Greenfield Village Museum built near the site of Ford's birthplace, the Edison Institute of Technology erected by Ford in honor of his friend, and the Edison Museum.

Cranbrook, 20 miles north of Detroit, in contrast with the industrial center, has won attention for its educational and cultural facilities. Eliel Saarimen, a Finnish-American architect who heads the Academy of Art, is considered one of the country's best authorities on city planning. The statues of Carl Milles, Swedish-American sculptor, are plentiful on the campus of Cranbrook School and the Cranbrook Christ Church contains the work of Johann Kirchmayer, American woodcarver, and Anton Lang, formerly of Oberammergau, Germany.

Mackinac Island, in the Straits of Mackinac, is a quiet place of six square miles where no automobiles are permitted; transportation is entirely by horse and carriage. It was here that John Jacob Astor set up his headquarters for the American Fur Company in 1817. Hundreds of thousands of visitors annually are attracted to this quaint, historic spot.

Marquette, in the Upper Peninsula, is the center of one of the states' all year recreational areas. Sugar Loaf Mountain lies seven miles northwest, and Presque Isle Park is on a small peninsula to the north. The Tahquamenon district on Whitefish Bay is unexcelled in Michigan for fishing.

Isle Royale, lying in the northwestern part of Lake Superior, is Michigan's largest island and the state's first national park. Originally a part of the French dominion, it became a part of the United States in 1783, but was held by the Ojibway Indians until 1842. Evidence of the prehistoric copper mines still remains in several places.

Holland, at the mouth of the Black River on Lake Macatawa, transforms itself the third week in May from a typical midwestern town into a typical Dutch town with its ceremonious Tulip Festival. Dressed in Dutch costumes, the inhabitants, who are 90 per cent of Dutch ancestry, open the celebration by the scrubbing of Eighth Street. The week-long dignified event includes parades, native dances, and colorful tulip exhibits.

Production and Manufactures.—*Agriculture.*—In terms of area, agriculture is the most important land use in the state. The southern half of the Lower Peninsula below the latitude of Saginaw Bay is the most fully developed

agricultural part of the state. Within this area more than 60 per cent of the land is in farms and most of the counties have more than 80 per cent in farms. North of the latitude of Saginaw Bay and in the Upper Peninsula less than 50 per cent of the land is in farms and a smaller proportion of the farm land is cultivated.

All of the state except a small part of the southeastern corner lies within the hay and dairy belt of the United States; Lenawee, Monroe, and Hillsdale counties are included within the corn belt. Over the state as a whole the principal agricultural emphasis is on the production of crops for animal foods and the chief sources of farm income are from dairy products and animals.

The principal field crops on the farms of the state are hay, corn, oats, wheat, beans, fruit, and potatoes. Approximately 19 per cent of the tillable land is occupied by pasture and approximately one per cent by each of the following crops: sugar beets, rye, clover seed, and truck crops.

Specialized cash crops are produced on farms in several parts of the state. Navy and red kidney beans are concentrated in the Saginaw Bay area. Sugar beets are grown in parts of this same area as well as other localities. Potatoes are an important crop in all of the agricultural sections of the state. Concentrations of potato growing are located in the central part of the state and on the light loam soils of Oakland, Macomb, Lapeer and Tuscola counties where the proximity of the Detriot market is a factor in production. Along the Lake Michigan shore of the Lower Peninsula the principal fruit growing area of the state is located. Within a narrow belt the air temperatures from the lake inhibit early budding of trees in spring and likewise prevent early frosts in fall. In the southern part of this belt the principal crops are apples, cherries, peaches, and pears; in the northern, apples and cherries. Grapes are produced in the southern part of the fruit belt and farther inland near the town of Paw Paw. Drained muck lands are utilized for the production of celery, chicory, and peppermint; vegetables are grown on the light soils near to city markets.

Except for cash specialty crops, most of the products of agriculture are used on the farm for animal foods. This emphasis on the livestock phases of agriculture is brought about by the combination of climatic conditions favorable to forage crops, an abundance of land most economically used for pasture, and the presence of large markets for animal products in the industrial cities. Dairy farming is dependent upon rapid transportation of whole milk supplies and of butterfat to the cities.

Fisheries.—The Great Lakes which border the state are sources of considerable amounts of fish of fine quality. The intensity with which commercial fishing is carried on depends partially upon the market prices in effect; between 1,500 and 2,000 men are engaged during the season and the annual value of the catch varies from $1,500,000 to $3,000,000.

Lumbering and Forestry.—In its original condition the state was almost completely covered with forests. South of the latitude of Saginaw Bay in the Lower Peninsula they were composed chiefly of the hardwood trees, oak, hickory, maple, and others. North of the latitude of Saginaw Bay and in the Upper Peninsula the forests were of mixed character, hardwoods, pines, and considerable areas of swamp conifers principally spruce and fir. The southern hardwoods were removed in the process of converting this part of the state to agriculture. Beginning about 1860, large scale lumbering operations cut the pine timber in the northern part of the state. For some years Michigan was the leading lumber producing state of the union. By 1890 most of the pine had been taken, but the lumbering of hardwood timber continued as a major industry until 1915. Approximately half of the area of the state is classified as forest land. In 1945 one third of this was potential lumber and pole producing area and two thirds was deforested or being restocked.

Mineral Extraction.—Michigan has had a long history as a producer of minerals. It was the leading state in copper production until 1887 and in iron production until 1901 and has ranked first or second in salt production for many years. The commercial copper deposits are located in the Upper Peninsula in the Keweenaw area. There is archeological evidence that copper was mined by some prehistoric race prior to the period of the latest North American Indians. Copper mining began in 1845 and for more than 40 years Michigan was the leading producer in the nation. Michigan copper occurs as native metal rather than as an ore and after nearly one hundred years of exploitation the mine shafts are so deep as to make operations very expensive. The low grade, cheaply handled ores in the western states provide copper at less expense than does the native metal of Michigan. During World War II production was stimulated by bounty payments from the government but at present the copper is a marginal resource.

Iron ore is the most valuable mineral product of Michigan. Deposits occur in three localities in the Upper Peninsula; Marquette County, Iron and Dickinson counties, and Gogebic County. Most of the mines are operated by shaft methods in which the ore is mined underground and brought to the surface in cars. It is sent by railroad to docks at Escanaba, Marquette, and to Ashland, Wisconsin, where it is loaded into lake freighters for shipment to manufacturing areas along the lower lakes. Since 1854 the Michigan mines have shipped a tonnage of iron ore equal to the total excavation of the Panama Canal. The reserves were estimated in 1935 to be 162,000,000 tons. The opening of the great strip mines of the Mesabi Range in Minnesota dropped Michigan to second place in iron ore production in 1901 although the greatest shipments from the Michigan mines occurred from 1916 to 1920. The annual production in the state is about one third of that in Minnesota.

Petroleum and natural gas occur in the Saginaw Bay area in Saginaw, Midland, Isabella, Clare, Gladwin, and Ogemaw counties; and in the southwestern part in Allegan and Van Buren counties. There are many other producing locations and the oil bearing structures of the state have not been completely explored. Drilling began in 1886. Petroleum is its second most valuable mineral production but Michigan is not among the leading producers of the United States.

Salt, a third most valuable mineral product,

has made Michigan for many years the leading producer in the United States. Table salt is obtained by evaporating natural brines from wells at Midland, Saginaw, Bay City, Ludington, and Manistee; and by evaporating artificial brines from salt deposits at Detroit, St. Clair, and Port Huron. Rock salt is also obtained at Detroit by deep-shaft mining.

There are extensive deposits of limestone at several places within the state. Of these the most important are located in Alpena and Presque Isle counties. More than half of the Michigan limestone is used for blast furnace flux in the iron and steel industry and for chemical purposes. The location of the Alpena and Presque Isle deposits is of especial importance because they are near the shore and the limestone can be quarried cheaply and shipped by lake freighters engaged in the iron ore commerce.

The Michigan coal basin underlies all or parts of approximately 30 counties in the south central part of the Lower Peninsula. The coal is of relatively low quality bituminous. It is found at many places (but not everywhere within the coal basin) in beds ranging in thickness from five feet to a few inches. Coal has been mined in the state since about 1835 with varying intensity. In 1947 the last operating mine ceased producing.

Other minerals of importance are portland cement, gypsum, and lime. At Midland, the treatment of brines from wells produces quantities of magnesium, bromine and calcium chloride in the production of each of which Michigan is a leading state.

Manufacturing.—In terms of the value of its output, manufacturing is the most important productive enterprise in the state and Michigan ranks fifth in the value of manufactures in the United States. The automobile industry centered in Detroit has attracted and stimulated a great variety of manufacturing establishments both within the city and at other places in the state. Manufacturing is carried on in most of the counties of the southern half of the Lower Peninsula and some of those in the north. There are three general centers: Detroit with its attached and satellite cities, producing automobiles and numerous other products; the Grand Rapids-Muskegon district, producing furniture, household manufactures, engines and light products; and the Battle Creek-Kalamazoo area, producing paper, processed foods, drugs, stoves, and other goods. The development of transportation, especially of highway truck carriers has enabled the automobile industry to extend into these other centers and to draw into the Detroit area some of the production of their factories in the form of parts and semifinished materials. The principal industries in terms of their value are automobiles, parts, and accessories; iron ore; salt, chemical, and other drugs; food products; iron and steel products; furniture; printing and publishing; paper and paper products; and copper.

In its earlier stages manufacturing in the state was based upon the exploitation of natural resources. Mining and lumbering and to a certain extent furniture manufacturing depended upon native materials. The present location and nature of industry must be attributed more to historical causes than to the presence of materials. The location of Michigan in reference to lake transportation and to the population pattern of the United States are factors of importance but other states also share these advantages. The idea of precision manufacturing and mass production of automobiles originated in Detroit and the developments from that idea drew engineers, workmen and equipment to Michigan cities. Automobile manufacturing became the core around which similar and supplementary industries established themselves to ultilize the labor supply and technological skill established by the motor industry.

Transportation and Communication.—The southern border of the state lies slightly north of the principal communication lines between the Atlantic coastal cities and those of the Middle West. The industrial importance of Detroit and other southern Michigan cities, however, draws into the state many railroads and highway routes, especially those which pass through Canada, north of Lake Erie, between Buffalo and Detroit. In 1830 construction was begun on Michigan's first railroad, and two years later the line connecting Detroit and St. Joseph was incorporated.

Supplementing this system is a network of trunkline highways, national, state, and county, which have followed in many cases the Indian trails made before the white settlers arrived. The Old Shore Trail, the Canadian Montreal, the St. Joseph, and the Saginaw trails have become 5 of the 16 national highways within the state. The first road, a military highway, was built in 1818. Early transportation was considerably hindered by the large number of settlers traveling westward on the narrow roads. The roads and trails left from the lumbering days in the sparsely settled northern districts of the state even now permit automobiles to be driven almost everywhere.

The location of Michigan on the Great Lakes is strategic in water borne traffic. In 1679 La Salle sailed the first ship, the *Griffon,* up the Detroit River. *Walk-in-the-Water,* the first steamboat in Detroit, appeared in 1818, and in 1825 the opening of the Erie Canal greatly stimulated agriculture and communication with the eastern part of the country. In 1830 a daily boat line began operation between Buffalo and Detroit, and the locks at Sault Ste. Marie, which facilitated the shipment of ore, were completed in 1855. Four fifths of the lake commerce passes through these locks and the tonnage passing through the Detroit River is five times the foreign tonnage of New York harbor. In addition to the bulky cargoes of ore, coal, limestone, and grain, lake commerce carries finished automobiles and other manufactured goods. There are several passenger and excursion lines, and automobile and train ferries operating on the lake. The navigation season is generally from about April 1 until December 1, although the icebreaking train and automobile ferries operate across the Straits of Mackinac throughout the year. Marquette and Escanaba, outlets for iron ore, and Rockport, near Alpena, where limestone is loaded are the principal lake shipping points in the state for these cargoes. The upbound cargoes, principally coal, are delivered to Detroit, Bay City, Muskegon, and other cities along the lakes. Mackinaw City and St. Ignace are ports for the busy ferry route across the Straits of Mackinac.

Most of the principal air lines of the northeastern United States stop at Willow Run Air-

MICHIGAN

1950 Total Population 6,371,766

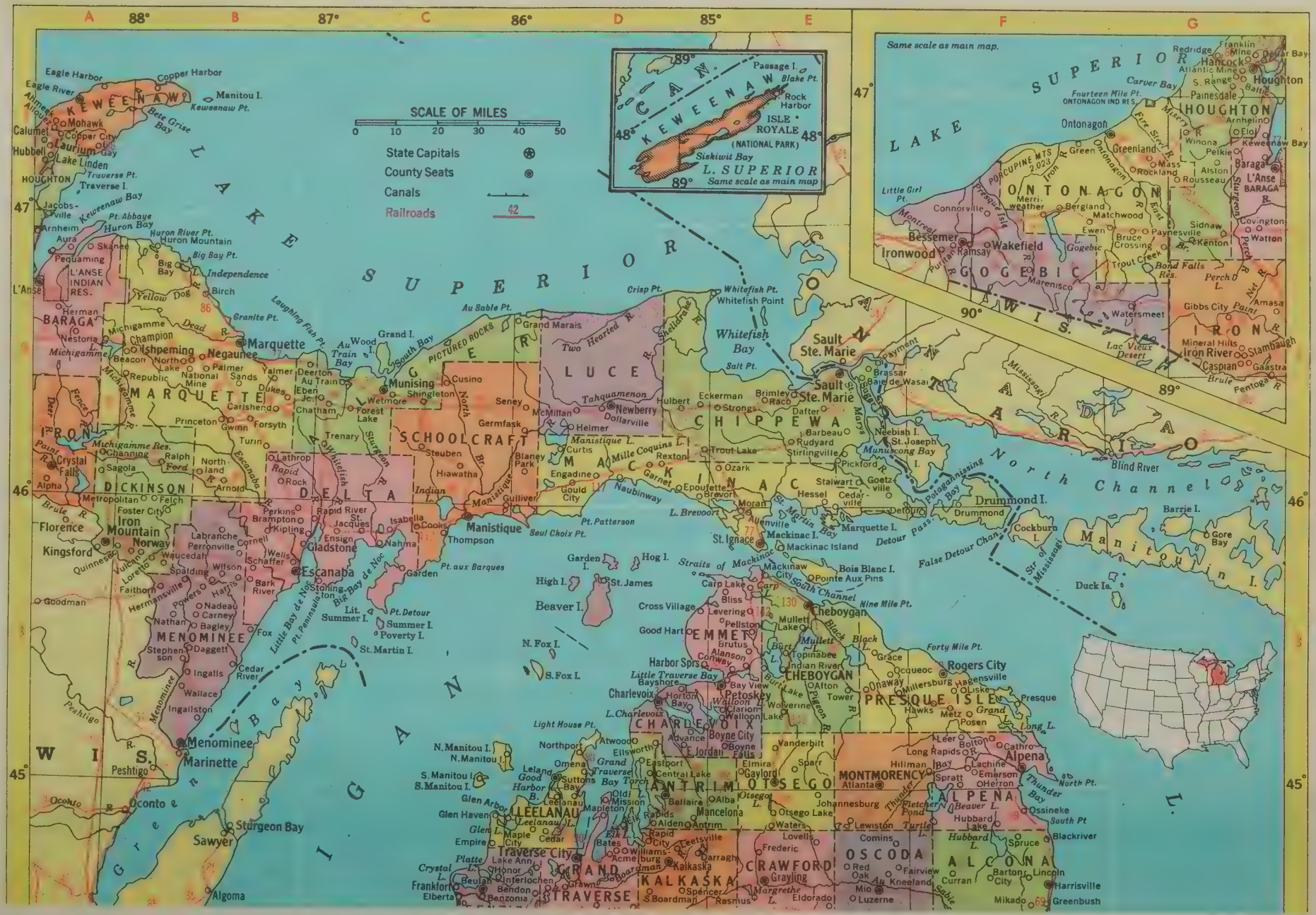
Acme (D4) 300
Ada (D6) 500
Addison (E7) 488
Adrian ◉(F7) 18,393
Afton (E3) 450
Ahmeek (A1) 360
Akron (F5) 431
Alabaster (F4) 125
Alanson (E3) 319
Alaska (D6) 335
Alba (E4) 500
Albion (E6) 10,406
Alden (D4) 350
Alger (E4) 445
Algonac (G6) 2,639
Allegan ◉(D6) 4,801
Allen (E7) 340
Allen Park (B7) 12,329
Allenville (E3) 200
Allouez (A1) 310
Alma (E5) 8,341
Almont (F6) 1,035
Alpena ◉(F3) 13,135
Alpha (A2) 378
Alpine (D5) 100
Alston (G1) 150
Alto (D6) 400
Altona (D5) 85
Amasa (G2) 700
Amble (D5) 51
Amelith (F5) 150
Anchorville (G6) 950
Ann Arbor ◉(F6) .48,251
Antrim (D4) 300
Applegate (G5) 244
Arcadia (C4) 450
Argyle (G5) 400
Arlene (D4) 86
Armada (G6) 961
Ashley (E5) 449
Ashton (D5) 178
Assyria (D6) 200
Athens (D6) 768
Atlanta ◉(E3) 350
Atlantic Mine (G1). 800
Atwood (D3) 60
Au Gres (F4) 442
Au Sable (F4) 300
Au Sable (point) (F4) .....
Au Sable (riv.) (E4)
Au Train (C2) 106
Auburn (F5) 869
Auburn Hts. (F6) 2,500
Augusta (D6) 898
Aura (A2) 295
Averill (E5) 100
Avoca (G5) 300
Azalia (F6) 110
Bach (F5) 125
Bad Axe ◉(G5) 2,973
Bagley (B3) 60
Baie de Wasai (E2). 100
Bailey (D5) 300
Baldwin ◉(D5) 835
Baltic (G1) 500
Bancroft (E6) 615
Bangor (C6) 1,694
Bannister (E5) 300
Baraga (G1) 942
Bark River (B3) 500
Baroda (C7) 344
Barques (point) (C3)
Barryton (D5) 445
Barton City (F4) 100
Batavia (D7) 124
Bates (D4) 75
Bath (E6) 600
Battle Creek (D6) ..48,666
Bay City ◉(F5) 52,523
Bay Port (F5) 557
Bay View (E3) 25
Bayshore (D3) 200
Beacon (B2) 300
Beal City (D5) 338
Bear Lake (C4) 364
Beaver (isl.) (D3)...
Beaverton (E5) 794
Belding (D5) 4,436
Bellaire ◉(D4) 693
Belle (riv.) (G6) .....
Belleville (F6) 1,722
Bellevue (E6) 1,168
Belmont (D5) 200
Bendon (D4) 79
Bentley (E5) 150
Benton Harbor (C6) 18,769
Benton Heights (C6) 6,160
Benzonia (D4) 407
Bergland (F1) 800
Berkley (B6) 17,931
Berrien Spgs. (C7) ...1,761
Bessemer ◉(F2) 3,509
Beulah ◉(C4) 458
Big Bay (B2) 670
Big Bay de Noc (bay) (C3) .....
◉ County Seat

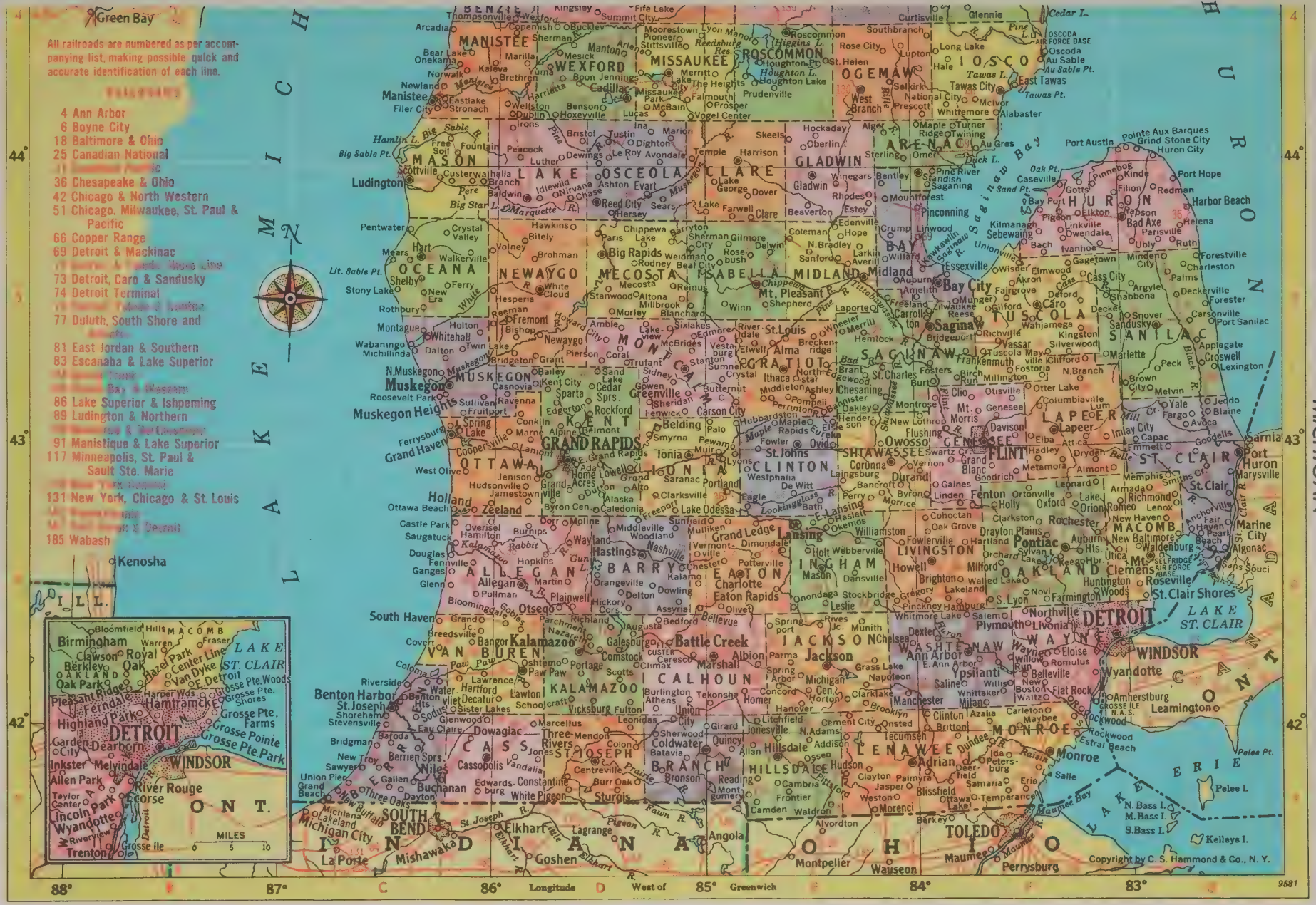
Big Rapids ◉(D5) 6,736
Big Sable (riv.)(C4)
Birch Run (F5) 800
Birmingham (B6) ...15,467
Bishop (D5) 100
Bitely (D5) 200
Black (lake) (E3) ....
Black (riv.) (E3) .....
Black (riv.) (G5) .....
Blackriver (F4) 259
Blake (point) (E1)..
Blanchard (D5) 300
Blaney Park (D2) 30
Blissfield (F7) 2,365
Bloomfield Hills (B6) 1,468
Bloomingdale (C6). 465
Boardman (riv.) (D4)
Bois Blanc (isl.) (E3)
Boon (D4) 260
Boyne City (E3) 3,028
Boyne Falls (E3) 236
Brampton (B3) 300
Branch (D5) 150
Breckenridge (E5)... 985
Breedsville (C6) 239
Brethren (D4) 500
Brevort (E2) 80
Brevort (lake) (D3)
Bridgeport (F5) 1,200
Bridgman (C7) 977
Brighton (F6) 1,861
Brimley (E2) 500
Britton (F6) 517
Brohman (D5) 150
Bronson (D7) 2,106
Brooklyn (E6) 862
Brown City (G5) 878
Bruce Crossing(G2) 200
Brule (riv.) (A3) .....
Brutus (E3) 200
Buchanan (C7) 5,224
Buckley (D4) 194
Burlington (D6) 329
Burnips (D6) 170
Burr Oak (D7) 814
Burt (F5) 200
Burt (lake) (E3) .....
Burt Lake (E3) 60
Butternut (E5) 128
Byron (E6) 439
Byron Center (D6).. 650
Cadillac ◉(D4) 10,425
Caledonia (D6) 619
Calumet (A1) 1,256
Cambria (E7) 210
Camden (E7) 380
Capac (G5) 1,104
Carleton (F6) 1,039
Carney (B3) 325
Caro ◉(F5) 3,464
Carp (lake) (E3) .....
Carp Lake (E3) 200
Carrollton (E5) 2,000
Carson City (E5) 1,168
Carsonville (G5) 487
Caseville (F5) 482
Casnovia (D5) 312
Caspian (G2) 1,608
Cass (riv.) (F5) .....
Cass City (F5) 1,762
Cassopolis ◉(C7) 1,527
Cedar (D4) 249
Cedar Spgs. (D5) 1,378
Cedarville (E2) 250
Cement City (E6) 500
Center Line (B6) 7,659
Central Lake (D3).. 692
Centreville ◉(D7) ... 879
Champion (B2) 567
Channing (B2) 497
Charlevoix ◉(D3) 2,695
Charlevoix (lake) (D3) .....
Charlotte ◉(E6) 6,606
Chase (D5) 300
Chatham (B2) 650
Cheboygan ◉(E3) 5,687
Chelsea (E6) 2,580
Chesaning (E5) 2,264
Chippewa (riv.)(E5)
Chippewa Lake(D5) 125
Clare (E5) 2,440
Clarklake (E6) 500
Clarkston (F6) 722
Clarksville (D6) 339
Clawson (B6) 5,196
Clayton (E7) 467
Clifford (F5) 330
Climax (D6) 524
Clinton (F6) 1,344
Clio (F5) 1,963
Cohoctah (F6) 150
Coldwater ◉(D7) 8,594
Coleman (E5) 1,024
Coloma (C6) 1,041
Colon (D7) 1,000
Columbiaville (F5).. 789
Comins (E4) 87

Comstock (D6) 8,314
Concord (E6) 730
Conklin (D5) 350
Connorville (F1) 50
Constantine (D7) 1,514
Conway (E3) 100
Cooks (C3) 300
Coopersville (C5) 1,371
Copemish (D4) 255
Copper City (A1) 336
Copper Harbor (B1) 30
Coral (D5) 300
Corunna ◉(E6) 2,358
Covert (C6) 450
Covington (G2) 260
Cross Village (D3).. 200
Croswell (G5) 1,775
Crump (E5) 75
Crystal (E5) 450
Crystal (lake) (C4).
Crystal Falls ◉(A2) .2,316
Crystal Valley (C5). 250
Curran (F4) 50
Curtis (D2) 300
Curtisville (F4) 25
Cusino (C2) 50
Custer (C5) 260
Dafter (E2) 125
Daggett (B3) 341
Dalton (C5) 500
Dansville (E6) 433
Davison (F5) 1,745
Dayton (C7) 125
De Tour (F3) 611
De Witt (E6) 824
Dearborn (B7) 94,994
Decatur (C6) 1,664
Decker (F5) 100
Deckerville (G5) 719
Deerfield (F7) 725
Deerton (B2) 225
Deford (F5) 200
Delton (D6) 700
Delwin (E5) 100
Detour (point) (C3) .....
Detroit ◉(B7) 1,849,568
Detroit (riv.) (B7)...
Dexter (F6) 1,307
Dighton (D4) 100
Dimondale (E6) 774
Dollar Bay (G1) 600
Dollarville (D2) 100
Dorr (D6) 428
Douglas (C6) 447
Dowagiac (D6) 6,542
Dowling (D6) 126
Drayton Plains (F6) 3,500
Drummond (isl.) (F2) .....
Drummond I. (F3).. 443
Dryden (F6) 476
Dublin (D4) 25
Dukes (B2) 150
Dundee (F7) 1,975
Durand (E6) 3,194
Dutton (D6) 150
Eagle (E6) 145
Eagle Harbor (A1).. 75
Eagle River ◉(A1).. 65
E. Ann Arbor (F6)..1,826
E. Detroit (B6) 21,461
E. Grand Rapids (D6) 6,403
E. Jordan (D3) 1,779
E. Lansing (E6) 20,325
E. Tawas (F4) 2,040
Eastlake (C4) 376
Eastport (D3) 125
Eaton Rapids (E6)..3,509
Eau Claire (C6) 480
Eben Jct. (B2) 400
Eckerman (E2) 300
Ecorse (B7) 17,948
Edenville (E5) 140
Edgerton (D5) 200
Edgewood (E5) 50
Edmore (E5) 971
Edwardsburg (C7)... 616
Elberta (C4) 597
Elk (lake) (D4) .....
Elk Rapids (D4) 889
Elkton (F5) 854
Ellsworth (D3) 369
Elmira (E3) 230
Elmwood (F5) 100
Elo (G1) 35
Eloise (F6) 5,000
Elsie (E5) 911
Elwell (E5) 150
Emmett (G6) 230
Empire (C4) 251
Engadine (D2) 500
Ensign (C3) 446
Erie (F7) 800
Erie (lake) (G7) .....
Escanaba ◉(C3) 15,170
Escanaba (riv.) (B2)
Essexville (F5) 3,167

Estral Beach (F7)... 188
Evart (D5) 1,578
Ewen (F2) 817
Fair Haven (G6) 1,200
Fairgrove (F5) 570
Fairview (F4) 300
Faithorn (B3) 233
Falmouth (E4) 300
Farmington (F6) 2,325
Farwell (E5) 694
Felch (B3) 200
Fennville (C6) 639
Fenton (F6) 4,226
Fenwick (D5) 150
Ferndale (B6) 29,675
Ferry (C5) 200
Ferrysburg (C5) 1,454
Fife Lake (D4) 347
Filer City (C4) 340
Filion (G5) 200
Fire Steel (riv.) (G1)
Flat Rock (F6) 1,931
Fletcher (pond) (F4)
Flint ◉(F6) 163,143
Flint (riv.) (F5) .....
Flushing (F5) 2,226
Ford (riv.) (B2) .....
Forest Lake (C2) 110
Forsyth (B2) 400
Fort Custer (D6) .....
Foster City (B3) 300
Fostoria (F5) 275
Fountain (C4) 247
Fowler (E5) 675
Fowlerville (F6) 1,466
Frankenmuth (F5)...1,208
Frankfort (C4) 1,858
Fraser (B6) 1,379
Frederic (E4) 250
Free Soil (C4) 208
Freeland (E5) 1,000
Freeport (D6) 452
Fremont (D5) 3,056
Frontier (E7) 265
Fruitport (C5) 638
Fulton (D6) 200
Gaastra (G2) 575
Gagetown (F5) 401
Gaines (F6) 352
Galesburg (D6) 1,200
Galien (C7) 610
Ganges (C6) 150
Garden (C3) 399
Garden City (B7) 9,012
Gay (A1) 156
Gaylord ◉(E3) 2,271
Genesee (F5) 600
Germfask (C2) 300
Gibbs City (G2) 200
Gilford (F5) 200
Girard (E6) 275
Gladstone (C3) 4,831
Gladwin ◉(E5) 1,878
Glen (lake) (C4) .....
Glenn (C6) 180
Glennie (F4) 250
Gobles (D6) 622
Goetzville (E2) 150
Gogebic (lake) (F1)
Good Harbor (bay) (D3) .....
Good Hart (D3) 50
Goodells (G5) 600
Goodrich (F6) 525
Gould City (D2) 350
Gowen (D5) 200
Grand (isl.) (C2) ....
Grand (riv.) (D6) ....
Grand Beach (C7)... 105
Grand Blanc (F6) 998
Grand Haven ◉(C5) 9,536
Grand Jct. (C6) 350
Grand Ledge (E6) 4,506
Grand Marais (D2). 600
Grand Rapids ◉ (D5) 176,515
Grand Traverse (bay) (D3) .....
Grandville (D6) 2,022
Grant (D5) 646
Grass Lake (E6) 878
Grawn (D4) 175
Grayling ◉(E4) 2,066
Green (bay) (B4) ....
Greenland (G1) 600
Greenville (D5) 6,668
Gregory (E6) 300
Grosse Ile (B7) 2,500
Grosse Ile N. A. S. (F6) .....
Grosse Pointe (B7)..6,283
Grosse Pointe Farms (B6) 9,410
Grosse Pointe Park (B7) 13,075
Grosse Pointe Shores (B6) 1,032
Grosse Pointe Woods (B6) 10,381

Gulliver (D2) 300
Gwinn (B2) 900
Hadley (F6) 275
Hale (F4) 500
Hamburg (F6) 350
Hamilton (C6) 600
Hamtramck (B6)...43,335
Hancock (G1) 5,223
Hanover (E6) 377
Harbor Beach (G5) .2,349
Harbor Spgs. (D3)...1,626
Harper Woods (B6)..9,148
Harrietta (D4) 152
Harris (B3) 150
Harrison ◉(E4) 884
Harrisville ◉(F4) 485
Hart ◉(C5) 2,172
Hartford (C6) 1,838
Haslett (E6) 1,000
Hastings ◉(D6) 6,096
Hawks (F3) 250
Hazel Park (B6) 17,770
Helena (G5) 75
Hemlock (E5) 700
Henderson (E5) 200
Herman (A2) 155
Hermansville (B3).. 800
Herron (F3) .....
Hersey (D5) 239
Hesperia (D5) 760
Hessel (E2) 200
Hiawatha (C2) 150
Hickory Corners (D6) 180
Higgins (lake) (E4)
Highland Park(B6) 46,393
Hillman (F3) 442
Hillsdale ◉(E7) 7,297
Holland (C6) 15,858
Holly (F6) 2,663
Holt (E6) 6,500
Holton (C5) 350
Home Acres (D6)..20,000
Homer (E6) 1,301
Honor (D4) 269
Hope (E5) 100
Hopkins (D6) 531
Horton (E6) 350
Houghton ◉(G1) 3,829
Houghton (lake) (E4) .....
Howard City (D5)... 791
Howell ◉(E6) 4,353
Hoxeyville (D4) 128
Hubbard (lake) (F4)
Hubbard Lake (F4) 150
Hubbardston (E5)... 335
Hubbell (A1) 1,690
Hudson (E7) 2,773
Hudsonville (D6) 1,101
Hulbert (D2) 400
Huntington Woods (F6) 4,949
Huron (lake) (G4)..
Huron (bay) (A2)...
Huron (riv.) (F6) ....
Huron River (point) (B2) .....
Huron City (G4) 55
Huron Mountain (B2) 20
Ida (F7) 950
Idlewild (D5) 450
Imlay City (F5) 1,654
Indian (lake) (C2)..
Indian River (E3)... 600
Ingalls (B3) 150
Inkster (B7) 16,728
Interlochen (D4) 150
Ionia ◉(D6) 6,412
Iron Mountain ◉ (B3) 9,679
Iron River (G2) 4,048
Ironwood (F2) 11,466
Ishpeming (B2) 8,962
Isle Royale Nat'l Park (E1) .....
Ithaca ◉(E5) 2,377
Jackson ◉(E6) 51,088
Jacobsville (A1) 145
Jamestown (D6) 300
Jasper (E7) 300
Jeddo (G5) 150
Jenison (D6) 300
Jennings (D4) 250
Johannesburg (E4).. 250
Jones (D7) 300
Jonesville (E6) 1,594
Kalamazoo ◉(D6) .57,704
Kalamazoo (riv.) (C6) .....
Kalamo (D6) 135
Kaleva (C4) 346
Kalkaska ◉(D4) 1,250
Kawkawlin (F5) 500
Keego Harbor (F6) .7,700
Kent City (D5) 506
Kenton (G2) 400
Keweenaw(bay)(A1)


MICHIGAN
SCALE OF MILES
0 10 20 30 40 50
State Capitals
County Seats
Canals
Railroads
42
Same scale as main map.
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
North Channel
Georgian Bay
CANADA
WIS.
IND.
Keweenaw Pt.
Eagle Harbor
Copper Harbor
Eagle River
Manitou I.
Calumet
Mohawk
Copper City
Hubbell
Lake Linden
HOUGHTON
Traverse Pt.
Traverse I.
Keweenaw Bay
Jacobsville
Pt. Abbaye
Huron Bay
Arnheim
Aura
Skanee
Huron River Pt.
Huron Mountain
Pequaming
L'ANSE INDIAN RES.
L'Anse
Big Bay
Big Bay Pt.
Independence
Yellow Dog
Birch
Granite Pt.
Laughing Fish Pt.
Au Sable Pt.
Crisp Pt.
Whitefish Pt.
Whitefish Point
Whitefish Bay
Salt Pt.
Grand Marais
Two Hearted R.
Shelldrake R.
Grand I.
Au Wood
Au Train Bay
South Bay
PICTURED ROCKS
Munising
Shingleton
Cusino
Seney
Wetmore
Forest Lake
North Br.
Germfask
McMillan
Newberry
Dollarville
Hulbert
Eckerman
Strongs
Brimley
Raco
Dafter
Barbeau
Rudyard
Stirlingville
Pickford
Neebish I.
St. Joseph
Munuscong Bay
Blind River
Sault Ste. Marie
Brassar
Baie de Wasai
Payment
Mississagi R.
St. Marys R.
Tahquamenon
Manistique L.
Curtis
Helmer
Trout Lake
Rexton
Ozark
Engadine
Gould City
Naubinway
Garnet
Epoufette
Brevort
L. Brevoort
Moran
Hessel
Cedarville
Detour
Drummond I.
Drummond
Marquette I.
Mackinac I.
Mackinac Island
St. Ignace
Detour Passage
Pt. Patterson
Seul Choix Pt.
Manistique
Thompson
Gulliver
Indian L.
Rapid River
Jacquet River
Isabella
Cooks
Nahma
Gladstone
Escanaba
Garden
Pt. aux Barques
Garden I.
Hog I.
Straits of Mackinac
Mackinaw City
Boie Blanc I.
Pointe Aux Pins
South Channel
Carp Lake
Bliss
Levering
Mullett Lake
Cheboyga
Nine Mile Pt.
False Detour Chan.
Str. of Mississagi
Duck Is.
Gore Bay
Barrie I.
Manitoulin I.
High I.
St. James
Beaver I.
Cross Village
Good Hart
Pellston
Brutus
Alanson
Conway
Harbor Springs
Little Traverse Bay
Bayshore
Bay View
Petoskey
Charlevoix
Horton Bay
L. Charlevoix
Light House Pt.
Northport
Atwood
Boyne City
Boyne Falls
E. Jordan
Eastport
Central Lake
Ellsworth
Grand Traverse Bay
Torch
Elmira
Gaylord
Vanderbilt
Sparr
Atlanta
Hillman
Long Rapids
Leer
Bolton
Cathro
Alpena
Lachine
Emerson
Herron
Spratt
Thunder Bay
North Pt.
Ossineke
South Pt.
Blackriver
Hubbard Lake
Spruce
Alcona
Harrisville
Greenbush
Mikado
Lincoln
Curran
Bartons City
Fairview
Oak
Red
Mio
Luzerne
Au Kneeland
Sable
Frederic
Lovells
Comins
Waters
Lewiston
Turtle L.
Fletcher Pond
Beaver L.
Johannesburg
Otsego Lake
Otsego L.
Alba
Bellaire
Mancelona
Antrim
Rapid City
Leetsville
Williamsburg
Acmeburg
Kalkaska
Spencer
S. Boardman
Rasmus
Grayling
Margrethe
Eldorado
Crawford
Oscoda
Iosco
Arenac
Ogemaw
Roscommon
Missaukee
Wexford
Manistee
Benzie
Leelanau
Grand Traverse
Antrim
Otsego
Montmorency
Alpena
Presque Isle
Cheboygan
Emmet
Charlevoix
Menominee
Delta
Schoolcraft
Marquette
Baraga
Dickinson
Iron
Chippewa
Mackinac
Luce
Alger
Gogebic
Ontonagon
Houghton
Keweenaw
Rogers City
Onaway
Millersburg
Hagensville
Liske
Presque
Hawks
Metz
Posen
Grand
Long L.
Thunder
Fletcher Pond
Hubbard L.
Spruce
Curran
Bartons City
Lincoln
Harrisville
Greenbush
Mikado
Fairview
Oak
Red
Mio
Luzerne
Au Kneeland
Sable
Frederic
Lovells
Comins
Waters
Lewiston
Turtle L.
Johannesburg
Otsego Lake
Otsego L.
Alba
Bellaire
Mancelona
Antrim
Rapid City
Leetsville
Williamsburg
Acmeburg
Kalkaska
Spencer
S. Boardman
Rasmus
Grayling
Margrethe
Eldorado
Crawford
Oscoda
Iosco
Arenac
Ogemaw
Roscommon
Missaukee
Wexford
Manistee
Benzie
Leelanau
Grand Traverse
Antrim
Otsego
Montmorency
Alpena
Presque Isle
Cheboygan
Emmet
Charlevoix
Menominee
Delta
Schoolcraft
Marquette
Baraga
Dickinson
Iron
Chippewa
Mackinac
Luce
Alger
Gogebic
Ontonagon
Houghton
Keweenaw
Redridge
Franklin Mine
Hancock
Atlantic Mine
Dollar Bay
S. Range
Houghton
Painesdale
Carver Bay
Fourteen Mile Pt.
ONTONAGON IND RES.
Arnhelin
Elo
Winona
Pelkie
Keweenaw Bay
Baraga
L'Anse
BARAGA R.
Covington
Watton
Sidnaw
Paynesville
Kenton
Alston
Rousseau
Ontonagon
Greenland
Rockland
Mass
Bruce Crossing
Trout Creek
Bond Falls Res.
Perch L.
Perch R.
Gibbs City
Amasa
Paint R.
IRON R.
Iron River
Mineral Hills
Stambaugh
Caspian
Gaastra
Brule R.
Pentoga R.
Lac Vieux Desert
Watersmeet
Matenisco
Gogebic
Ramsay
Wakefield
Bessemer
Ironwood
Merriweather
Bergland
Matchwood
Ewen
Connorville
Little Girl Pt.
Presque Isle
Montreal R.
Porcupine Mts 2,023
Iron R.
Ontonagon R.
Fire Steel R.
Misery R.
Sturgeon R.
Baltic
Pelkie
Alston
Rousseau
Sidnaw
Paynesville
Kenton
Covington
Watton
Baraga
L'Anse
BARAGA R.
Keweenaw Bay
Houghton
Hancock
Redridge
Franklin Mine
Dollar Bay
Atlantic Mine
S. Range


All railroads are numbered as per accompanying list, making possible quick and accurate identification of each line.
RAILROADS
4 Ann Arbor
6 Boyne City
18 Baltimore & Ohio
25 Canadian National
36 Chesapeake & Ohio
42 Chicago & North Western
51 Chicago, Milwaukee, St. Paul & Pacific
66 Copper Range
69 Detroit & Mackinac
73 Detroit, Caro & Sandusky
74 Detroit Terminal
77 Duluth, South Shore and
81 East Jordan & Southern
83 Escanaba & Lake Superior
86 Lake Superior & Ishpeming
89 Ludington & Northern
91 Manistique & Lake Superior
117 Minneapolis, St. Paul & Sault Ste. Marie
131 New York, Chicago & St. Louis
185 Wabash
Green Bay
Kenosha
LAKE MICHIGAN
HURON
ONTARIO
ERIE
ST. CLAIR
MICHIGAN
MANISTEE
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
WEXFORD
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
HURON
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
KENT
GRAND RAPIDS
IONIA
CLINTON
SHIAWASSEE
LAPEER
GENESEE
FLINT
ST. CLAIR
OTTAWA
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
DETROIT
WINDSOR
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
TOLEDO
SOUTH BEND
Ludington
Muskegon
Muskegon Heights
Holland
Zeeland
Grand Haven
Kalamazoo
Battle Creek
Benton Harbor
St. Joseph
Niles
Dowagiac
Three Rivers
Coldwater
Hillsdale
Adrian
Monroe
Ypsilanti
Ann Arbor
Jackson
Lansing
Pontiac
Flint
Saginaw
Bay City
Midland
Mt. Pleasant
Big Rapids
Sarnia
Port Huron
Marysville
Algonac
Harbor Beach
Port Austin
Pinconning
Essexville
Owosso
Ionia
Greenville
Sturgis
Elkhart
Goshen
La Porte
Michigan City
Mishawaka
Angola
Montpelier
Wauseon
Perrysburg
Maumee
Pelee I.
Kelleys I.
N. Bass I.
M. Bass I.
S. Bass I.
Lake Michigan
Lake St. Clair
Lake Erie
Saginaw Bay
Maumee Bay
Detroit River
St. Clair River
Grand River
Kalamazoo River
Saginaw River
Au Sable R.
Manistee R.
Muskegon R.
Big Sable R.
Pere Marquette R.
Lit. Sable Pt.
Pelee Pt.
Au Sable Pt.
Tawas Pt.
Oak Pt.
Sand Pt.
Duck L.
Tawas L.
Higgins L.
Houghton L.
Cedar L.
Pine L.
Hamlin L.
Big Star L.
Lake Orion
Oakland
Royal Oak
Birmingham
Bloomfield Hills
Warren
Dearborn
Inkster
Melvindale
Allen Park
River Rouge
Ecorse
Lincoln Park
Wyandotte
Trenton
Grosse Ile
Grosse Pte.
Grosse Pte. Farms
Grosse Pte. Park
Grosse Pte. Woods
Grosse Pte. Shores
Harper Wds.
Hamtramck
Highland Park
Pleasant Ridge
Ferndale
Oak Park
Berkley
Clawson
Hazel Park
Center Line
Van Dyke
E. Detroit
Roseville
St. Clair Shores
Mt. Clemens
Harrison Twp.
Fraser
Utica
Sterling Heights
Warren
Dearborn Heights
Taylor
Southgate
Wyandotte
Riverview
Gibraltar
Flat Rock
Monroe
Dundee
Milan
Saline
Ypsilanti
Willis
Belleville
Romulus
Wayne
Westland
Garden City
Livonia
Northville
Plymouth
Canton Twp.
Salem
Novi
Farmington
Southfield
Lathrup Village
Oak Park
Huntington Woods
Ferndale
Royal Oak
Troy
Rochester
Rochester Hills
Auburn Hills
Pontiac
Waterford
Orion
Lake Orion
Oxford
Lapeer
Imlay City
Capac
Almont
Romeo
Armada
Richmond
Lenox
New Haven
New Baltimore
Chesterfield
Mt. Clemens
Clinton Twp.
Harrison Twp.
Fraser
Roseville
Eastpointe
St. Clair Shores
Grosse Pte. Woods
Grosse Pte. Shores
Grosse Pte. Park
Grosse Pte. Farms
Grosse Pte.
Harper Woods
Hamtramck
Highland Park
Detroit
Dearborn
Dearborn Heights
Inkster
Melvindale
Allen Park
River Rouge
Ecorse
Lincoln Park
Wyandotte
Riverview
Trenton
Grosse Ile
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Flat Rock
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Rochester Hills
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Lapeer
Imlay City
Capac
Almont
Romeo
Armada
Richmond
Lenox
New Haven
New Baltimore
Chesterfield
Mt. Clemens
Clinton Twp.
Harrison Twp.
Fraser
Roseville
Eastpointe
St. Clair Shores
MILES
0 5 10
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9581
88°
87°
86°
85°
84°
83°
Longitude West of Greenwich
44°
43°
42°

Keweenaw (point) (B1) .....
Keweenaw Bay(G1) 300
Kinde (G5)..... 571
Kingsford (A3).....5,038
Kingsley (D4)..... 425
Kingston (F5)..... 371
Kipling (B3)..... 335
Laingsburg (E6)..... 942
Lake (E5)..... 300
Lake City ◉(D4)..... 719
Lake George (E5)..... 145
Lake Leelanau (D4) 400
Lake Linden (A1)....1,462
Lake Odessa (D6)....1,596
Lake Orion (F6).....2,385
Lakeland (F6)..... 300
Lakeview (D5)..... 975
Lamont (D6)..... 350
L'Anse ◉(G1).....2,376
L'Anse Ind. Res. (A2) .....
LANSING (E6).....92,129
Lapeer ◉(F5).....6,143
Laporte (E5)..... 300
Laurium (A1).....3,211
Lawrence (C6)..... 679
Lawton (D6).....1,206
Le Roy (D4)..... 243
Leelanau (lake) (D4)
Leer (F3)..... 20
Leetsville (D4)..... 35
Leland ◉(D3)..... 536
Lenox (G6)..... 975
Leonard (F6)..... 391
Leonidas (D6)..... 225
Leslie (E6).....1,543
Levering (E3)..... 387
Lewiston (E4)..... 700
Lexington (G5)..... 594
Light House (point) (D3) .....
Lincoln (F4)..... 409
Lincoln Park (B7)..29,310
Linden (F6)..... 933
Litchfield (E6)..... 882
Little Bay de Noc (bay) (B3) .....
Little Sable (point) (C5) .....
Little Traverse (bay) (D3) .....
Livonia (F6).....17,534
Long (lake) (F3).....
Long Lake (F4)..... 100
Lookingglass (riv.) (E6) .....
Loretto (B3)..... 350
Lowell (D6).....2,191
Ludington ◉(C5)....9,506
Lum (F5)..... 300
Lupton (E4)..... 200
Luther (D4)..... 314
Luzerne (E4)..... 150
Lyon Manor (E4).... 87
Lyons (E6)..... 693
Mackinac (isl.)(E3)
Mackinac (strs.)(E3)
Mackinac Isl. (E3).. 572
Mackinaw City (E3) 970
Mancelona (E4).....1,000
Manchester (E6)..... 1,388
Manistee ◉(C4).....8,642
Manistee (riv.)(C4)
Manistique ◉(C3)...5,086
Manistique (lake) (D2) .....
Manistique (riv.) (C2) .....
Manton (D4).....1,085
Maple (riv.) (E5).....
Maple City (D4)..... 190
Maple Rapids (E5).. 645
Marcellus (D6).....1,014
Marenisco (F2).....1,300
Margrethe (lake) (E4) .....
Marine City (G6)....4,270
Marion (D4)..... 879
Marlette (G5).....1,489
Marne (D5)..... 600
Marquette ◉(B2)...17,202
Marshall ◉(E6).....5,777
Martin (D6)..... 407
Marysville (G6).....2,534
Mason ◉(E6).....3,514
Mass (G1).....
Maumee (bay) (F7)
Maybee (F6)..... 428
Mayville (F5)..... 888
Mc Bain (D4)..... 506
Mc Brides (D5)..... 223
Mc Millan (D2)..... 336
Mears (C5)..... 262
Mecosta (D5)..... 305
Melvin (G5)..... 204
Melvindale (B7).....9,483
Memphis (G6)..... 800
Mendon (D7)..... 844
Menominee ◉(B3).11,151
Menominee(riv.)(B3)
Merrill (E5)..... 809
Merriweather (F1).. 100
Mesick (D4)..... 359
Metamora (F6)..... 390
Metropolitan (A3)... 250
Michiana (C7)..... 102
Michigamme (A2)... 600
Michigamme (riv.) (A2) .....
Michigan (lake)(B5)
Michigan Center (E6) 3,012
Middleton (E5)..... 450
Middleville (D6).....1,047
Midland ◉(E5).....14,285
Mikado (F4)..... 204
Milan (F6).....2,768
Milford (F6).....1,924
Millbrook (D5)..... 200
Millersburg (F3)..... 281
Millington (F5).....1,043
Minden City (G5).... 359
Mineral Hills (G2).. 333
Mio ◉(E4)..... 975
Missaukee Park(D4) 30
Mohawk (A1)..... 900
Moline (D6)..... 300
Monroe ◉(F7).....21,467
Montague (C5).....1,530
Montgomery (E7).... 397
Montreal (riv.)(F1)
Montrose (F5)..... 937
Moran (E2)..... 310
Morenci (E7).....1,983
Morley (D5)..... 413
Morrice (F6)..... 401
Mt. Clemens ◉ (G6) 17,027
Mt. Morris (F5).....2,890
Mt. Pleasant ◉(E5)11,393
Muir (D5)..... 466
Mullett (lake) (E3).
Mullett Lake (E3)... 75
Mulliken (E6)..... 411
Munger (F5)..... 250
Munising ◉(C2).....4,339
Munith (E6)..... 500
Muskegon ◉(C5)...48,429
Muskegon (riv.)(C5)
Muskegon Heights (C5) 18,828
Nadeau (B3)..... 400
Nahma (C3)..... 750
Napoleon (E6)..... 530
Nashville (D6).....1,374
National City (F4)... 100
National Mine (B2). 250
Naubinway (D2)..... 200
Nazareth (D6)..... 500
Neebish (isl.)(E2)...
Negaunee (B2).....6,472
New Baltimore (G6)2,043
New Boston (F6)..... 800
New Buffalo (C7)....1,565
New Era (C5)..... 247
New Haven (G6).....1,082
New Lothrop (F5)... 459
New Troy (C7)..... 300
Newaygo (D5).....1,385
Newberry ◉(D2).....2,802
Niles (C7).....13,145
North (chanl.)(F2).
North (point)(F3)..
N. Adams (E7)..... 499
N. Bradley (E5)..... 300
N. Branch (F5)..... 832
N. Lake (B2)..... 200
N. Manitou (isl.) (C3) .....
N. Muskegon (C5)..2,424
Northland (B2)..... 100
Northport (D3)..... 582
Northstar (E5)..... 285
Northville (F6).....3,240
Norway (B3).....3,258
Novi (F6).....1,000
Oak Grove (F6)..... 125
Oak Park (B6).....5,267
Oakley (E5)..... 333
Ocqueoc (F3)..... 90
Okemos (E6)..... 950
Olivet (E6)..... 887
Omer (F4)..... 321
Onaway (E3).....1,421
Onekama (C4)..... 435
Onondaga (E6)..... 423
Onsted (E6)..... 486
Ontonagon ◉(F1)....2,307
Ontonagon (riv.) (G1) .....
Ontonagon Ind. Res. (G1) .....
Orangeville (D6)..... 900
Orchard Lake (F6).. 696
Ortonville (F6)..... 702
Oscoda (F4).....1,800
Oscoda A.F.B. (F4)
Oshtemo (D6)..... 300
Osseo (E7)..... 300
Ossineke (F4)..... 150
Otisville (F5)..... 592
Otsego (D6).....3,990
Otsego (lake) (E4)..
Ottawa Beach (C6).. 40
Ottawa Lake (F7)... 200
Otter Lake (F5)..... 523
Overisel (C6)..... 350
Ovid (E5).....1,410
Owendale (F5)..... 307
Owosso (E5).....15,948
Oxford (F6).....2,305
Ozark (E2)..... 70
Painesdale (G1).....1,100
Palmer (B2)..... 825
Palms (G5)..... 100
Palmyra (E7)..... 250
Palo (E5)..... 300
Parchment (D6).....1,179
Paris (D5)..... 225
Parisville (G5)..... 150
Parma (E6)..... 680
Paw Paw ◉(D6).....2,382
Payment (E2)..... 100
Paynesville (G2)..... 250
Peacock (D4)..... 25
Pearl Beach (G6).....
Peck (G5)..... 471
Pelkie (G1)..... 25
Pellston (E3)..... 442
Pentoga (G2)..... 50
Pentwater (C5).....1,097
Pere Marquette (riv.) (D5) .....
Perkins (B3)..... 500
Perrinton (E5)..... 383
Perronville (B3)..... 100
Perry (E6).....1,203
Petersburg (F7).....1,001
Petoskey ◉(E3).....6,468
Pewamo (E5)..... 432
Pickford (E2)..... 600
Pictured Rocks (C2)
Pierson (D5)..... 169
Pigeon (F5).....1,015
Pinckney (F6)..... 695
Pinconning (F5).....1,223
Pine River (F5)..... 24
Pinnebog (F5)..... 100
Pittsford (E7)..... 600
Plainwell (D6).....2,767
Pleasant Ridge (B6).3,594
Plymouth (F6).....6,637
Pointe Aux Barques (G4) 9
Pointe Aux Pins (E3) 42
Pompeii (E5)..... 171
Pontiac ◉(F6).....73,681
Porcupine (mts.) (F1) .....
Port Austin (F4)..... 724
Port Hope (G5)..... 353
Port Huron ◉(G6).35,725
Port Sanilac (G5).... 247
Portage (D6).....1,677
Portland (E6).....2,807
Posen (F3)..... 274
Potterville (E6)..... 624
Powers (B3)..... 510
Prescott (F4)..... 281
Presque Isle (F3)..... 75
Princeton (B2)..... 330
Prosper (E4)..... 150
Prudenville (E4)..... 800
Pullman (C6)..... 300
Puritan (F2)..... 150
Quincy (E7).....1,527
Quinnesec (A3)..... 600
Raco (E2)..... 100
Raisin (riv.) (F7)....
Ramsay (F2).....1,200
Rapid City (D4)..... 250
Rapid River (C3)..... 700
Ravenna (D5)..... 551
Reading (E7).....1,125
Red Oak (E4)..... 51
Redridge (G1)..... 94
Reed City ◉(D5).....2,241
Reeman (D5)..... 150
Reese (F5)..... 632
Remus (D5)..... 600
Republic (B2).....1,092
Rexton (D2)..... 200
Rhodes (E5)..... 107
Richland (D6)..... 389
Richmond (G6).....2,025
Richville (F5)..... 400
Rifle (riv.) (E4).....
River Rouge (B7)..20,549
Riverdale (E5)..... 304
Riverside (C6)..... 500
Riverview (B7).....1,432
Rives Jct. (E6)..... 350
Rochester (F6).....4,279
Rock (B2)..... 550
Rock Harbor (E1).. 50
Rockford (D5).....1,937
Rockland (G1)..... 500
Rockwood (F6).....1,044
Rogers City ◉(F3)..3,873
Romeo (F6).....2,985
Romulus (F6).....1,300
Roosevelt Park (C5)1,254
Roscommon ◉(E4).. 877
Rose City (E4)..... 446
Rosebush (E5)..... 507
Roseville (G6).....15,816
Rothbury (C5)..... 350
Royal Oak (B6).....46,889
Royale (isl.)(E1).....
Rudyard (E2)..... 800
Ruth (G5)..... 222
Saganing (F5)..... 67
Saginaw ◉(F5).....92,918
Saginaw (bay) (F5)
Sagola (B2)..... 300
St. Charles (E5).....1,469
St. Clair (G6).....4,098
St. Clair (lake)(G6)
St. Clair (riv.) (G6)
St. Clair Shores (G6) 19,823
St. Ignace ◉(E3).....2,946
St. James (D3)..... 400
St. Johns ◉(E6).....4,954
St. Joseph ◉(C6)....10,223
St. Joseph (riv.)(C7)
St. Louis (E5).....3,347
St. Marys (riv.)(E2)
Salem (F6)..... 350
Saline (F6).....1,533
Samaria (F7)..... 315
Sand Lake (D5)..... 394
Sands (B2)..... 125
Sandusky ◉(G5).....1,819
Sanford (E5)..... 550
Sans Souci (G6)..... 100
Saranac (D6)..... 885
Saugatuck (C6)..... 770
Sault Sainte Marie ◉ (E2) 17,912
Sawyer (C7)..... 800
Schaffer (B3)..... 200
Schoolcraft (D6).....1,078
Scotts (D6)..... 375
Scottville (C5).....1,142
Sears (D5)..... 76
Sebewaing (F5).....1,911
Selfridge A. F. B. (G6) .....
Seney (C2)..... 300
Shabbona (G5)..... 100
Shelby (C5).....1,500
Shepherd (E5)..... 899
Sheridan (D5)..... 535
Sherman (D4)..... 100
Sherwood (D6)..... 362
Shiawassee (riv.) (E5) .....
Shingleton (C2)..... 400
Shoreham (C6)..... 391
Sidnaw (G1)..... 400
Sidney (D5)..... 100
Silverwood (F5)..... 75
Sister Lakes (C6).... 175
Sixlakes (D5)..... 221
Skanee (A2)..... 190
Smiths Creek (G6).. 400
Smyrna (D5)..... 350
Snover (G5)..... 350
Sodus (C6)..... 300
S. Boardman (D4)... 125
S. Fox (isl.) (D3).....
S. Haven (C6).....5,629
S. Lyon (F6).....1,312
S. Manitou (isl.) (C3) .....
S. Range (G1)..... 712
S. Rockwood (F7)..1,100
Southbranch (E4).... 70
Spalding (B3)..... 600
Sparr (E3)..... 85
Sparta (D5).....2,327
Spencer (D4)..... 49
Spratt (F3)..... 52
Spring Arbor (E6)... 650
Spring Lake (C5).....1,824
Springport (E6)..... 598
Stambaugh (G2).....1,969
Standish ◉(F5).....1,186
Stanton ◉(D5).....1,123
Stanwood (D5)..... 189
Stephenson (B3)..... 791
Sterling (E4)..... 444
Stevensville (C6).... 480
Stirlingville (E2)..... 100
Stockbridge (E6).....1,098
Stonington (C3)..... 408
Stony Lake (C5)..... 38
Stronach (C4)..... 350
Strongs (E2)..... 250
Sturgeon (riv.) (G1)
Sturgis (D7).....7,786
Sugar (isl.) (E2).....
Sullivan (C5)..... 250
Sumner (E5)..... 150
Sunfield (D6)..... 400
Superior (lake) (C2)
Suttons Bay (D3).... 485
Swartz Creek (F6)...1,000
Sylvan Lake (F6)....1,165
Tahquamenon (riv.) (D2) .....
Tawas (point) (F4) .....
Tawas City ◉(F4)...1,441
Taylor Center (B7)20,000
Tecumseh (E7).....4,020
Tekonsha (E6)..... 647
Temperance (F7).....1,062
Temple (E4)..... 150
Thompson (C3)..... 250
Thompsonville (C4) 313
Three Oaks (C7).....1,572
Three Rivers (D7)...6,785
Thunder (bay) (F4)
Tittabawassee (riv.) (E5) .....
Topinabee (E3)..... 390
Torch (lake)(D3)....
Tower (E3)..... 400
Traverse City ◉ (D4) 16,974
Trenary (C2)..... 150
Trenton (B7).....6,222
Trout Lake (E2)..... 350
Trufant (D5)..... 215
Turin (B2)..... 236
Turner (F4)..... 193
Tuscola (F5)..... 150
Tustin (D4)..... 229
Twin Lake (C5)..... 550
Twining (F4)..... 196
Two Hearted (riv.) (D2) .....
Ubly (G5)..... 743
Union City (D6).....1,564
Union Pier (C7)..... 700
Unionville (F5)..... 531
Utica (F6).....1,196
Van Dyke (B6).....21,000
Vandalia (D7)..... 360
Vanderbilt (E3)..... 410
Vassar (F5).....2,530
Vermontville (E6).... 707
Vernon (F6)..... 678
Vestaburg (E5)..... 450
Vicksburg (D6).....2,171
Vulcan (B3)..... 650
Wahjamega (F5).....1,613
Wakefield (F2).....3,344
Waldenburg (G6)..... 350
Waldron (E7)..... 427
Walhalla (C5)..... 210
Walkerville (C5)..... 233
Wallace (B3)..... 200
Walled Lake (F6)....2,788
Walloon (lake)(D3)
Walloon Lake (E3). 214
Waltz (F6)..... 350
Warren (B6)..... 727
Watersmeet (G2)..... 600
Watervliet (C6).....1,327
Watton (G2)..... 400
Waucedah (B3)..... 260
Wayland (D6).....1,591
Wayne (F6).....9,409
Webberville (E6)..... 600
Weidman (D5)..... 410
Wells (B3)..... 600
Wellston (D4)..... 150
W. Branch ◉(E4)....2,098
Weston (E7)..... 270
Westphalia (E6)..... 459
Wetmore (C2)..... 150
Wheeler (E5)..... 300
White (riv.) (C5).....
White Cloud ◉(D5) 977
White Pigeon (D7)..1,113
Whitefish (point) (E2) .....
Whitefish (bay) (E2) .....
Whitefish Point(E2) 75
Whitehall (C5).....1,819
Whitmore Lake(F6)1,500
Whittaker (F6)..... 300
Whittemore (F4)..... 452
Williamsburg (D4).. 200
Williamston (E6).....2,051
Willis (F6)..... 200
Willow Run (F6)...11,365
Wilson (B3)..... 450
Winegars (E5)..... 125
Winn (E5)..... 350
Winona (G1)..... 125
Wolverine (E3)..... 318
Woodland (D6)..... 410
Wyandotte (B7).....36,846
Yale (G5).....1,641
Yalmer (B2)..... 200
Ypsilanti (F6).....18,302
Zeeland (D6).....3,075
Zilwaukee (F5).....1,219

◉ County Seat

port near Detroit and there is regular air service between the major cities of the state.

Economic and Financial Factors.—*Banking.*—Michigan's early banking experiences were unfortunate. In 1837 there were only 15 banks in the state and these had less than $1,500,000 in actual capital. President Jackson's specie circular (1836) so aggravated the money crisis that a state law was passed permitting wildcat banks with little capital and excessive issues of notes. This law was declared unconstitutional in 1844 and a provision was inserted into the 1850 revision of the constitution providing that no banking law could be enacted without a two-thirds vote in the legislature and approval by a majority of the electors. On Feb. 14, 1932, Gov. William A. Comstock proclaimed a state-wide banking holiday to avoid bank runs following the disclosure of the condition of the Union Guardian Trust Company in Detroit. This action precipitated similar closings over the nation, resulting in the national banking holiday. A state banking department, created in 1937, consisting of a commissioner and his associates, has jurisdiction over and the execution of the state laws relating to banking. It examines banks, defines certain types of investment securities, and licenses small loan agencies. On Dec. 31, 1948, the number of banks, with their assets and deposits were as follows:

Active National banks	78
Assets	$2,678,872,000
Deposits	$2,522,901,000
Active State banks	356
Assets	$2,616,557,000
Deposits	$2,449,868,000
Other than State or National	12
Assets	$ 12,132,000
Deposits	$ 11,487,000

Public Finance and Public Debt.—After its experiences in the panic of 1837, the state government has always maintained a strong fiscal policy, has avoided floating debt, and reduced the public debt. On Nov. 15, 1944, the last of the bonded indebtedness was paid off. In 1947 the state was authorized to borrow up to $270,000,000 to finance bonuses for resident veterans of World War II. By 1947, $230,000,000 in bonds had been sold for this purpose. The assessed valuation of real property in 1947 was $6,366,577,761. At the beginning of the 1947–1948 fiscal year, the state had a balance of $157,356,760.46. For the year ending in June 1948, the state collected $781,319,313.52 from all sources; disbursements were $792,327,246.60; indebtedness was $219,200,000. The balance at the beginning of the 1948–1949 fiscal year was $146,348,827.38.

Taxation.—Taxes are mainly derived from a use tax, automobile and gasoline taxes, real and personal property taxes, and a 3 per cent sales tax. The state has no poll or income tax.

Industrial Relations.—During the first fifty years of Michigan history, craft unions were the principal means by which workmen treated with their employers. The ephemeral Knights of Labor, an early attempt at general organization, was the principal labor body in Michigan from 1879 to 1890. In 1885 it won a ten-hour day for the lumbermen in the Saginaw Valley. The American Federation of Labor, a craft union body, became the central organization after 1890. Strikes for improved conditions and higher wages occurred in the Marquette iron range in 1895, in the copper mines in 1910, and in the Grand Rapids furniture factories in 1911. Automobile manufacturing employs great numbers of unskilled and semiskilled workers and but few artisans or craftsmen, and was therefore poorly suited to craft union organization. Henry Ford's policy of a five-dollar wage for an eight-hour day set a general precedent in the industry. Beginning in 1936 the United Automobile Workers of America, a unit of the Committee for Industrial Organization, conducted a series of sit down and other strikes in the automobile plants and as a result bargaining agreements were signed with most of the corporations. The National Labor Relations Act of 1935 aided the cause of the unions by permitting plant elections for the selection of bargaining organizations. During and following World War II the industrial unions maintained and strengthened their position in industry. Once an "open shop" city, Detroit is now one of the labor centers of the nation and organized workers staff most of the manufacturing plants of the state.

Government.—*Executive.*—Michigan has revised its constitution twice since the original adoption. Under the present revision which went into effect on Jan. 1, 1909, the chief executive officer is the governor, who is elected for a two-year term. The governors have been:

GOVERNORS

UNDER FRENCH DOMINION

Samuel Champlain	1622–1635
M. de Montmagny	1636–1647
M. d'Aillebout	1648–1650
M. de Lauson	1651–1656
M. de Lauson (Jr.)	1656–1657
M. d'Aillebout	1657–1658
M. d'Argenson	1658–1660
Baron d'Avangour	1661–1663
M. de Mesey	1663–1665
M. de Courcelles	1665–1672
Count de Frontenac	1672–1682
M. de la Barre	1682–1685
M. de Nonville	1685–1689
Count de Frontenac	1689–1698
M. de Callieres	1699–1703
M. de Vaudreuil	1703–1725
M. de Beauharnois	1726–1747
M. de Galissoniere	1747–1749
M. de la Jonquiere	1749–1752
M. Duquesne	1752–1755
M. de Vaudreuil de Cavagnac	1755–1763

UNDER BRITISH DOMINION

James Murray	1763–1767
Guy Carleton	1768–1777
Frederick Haldimand	1777–1785
Henry Hamilton	1785–1786
Lord Dorchester	1786–1796

UNDER NORTHWEST TERRITORY

Arthur St. Clair	1796–1800

INDIANA TERRITORY

William Henry Harrison	1800–1805

MICHIGAN TERRITORY

William Hull	1805–1813
Lewis Cass	1813–1831
John T. Mason (acting)	1831
George B. Porter	1831–1834
Stevens T. Mason (*ex officio*)	1834–1835

STATE

Stevens T. Mason	Democrat	1835–1840
Edward Mundy (acting)	"	1838
William Woodbridge	Whig	1840–1841
James W. Gordon (acting)	"	1841–1842
John S. Barry	Democrat	1842–1846
Alpheus Felch	"	1846–1847
William L. Greenly (acting)	"	1847–1848
Epaphroditus Ransom	"	1848–1850
John S. Barry	"	1850–1851
Robert McClelland	"	1851–1853
Andrew Parsons (acting)	"	1853–1855
Kinsley S. Bingham	Republican	1855–1859

STATE (*Continued*)

Moses Wisner		"	1859–1861
Austin Blair		"	1861–1865
Henry H. Crapo		"	1865–1869
Henry P. Baldwin		"	1869–1873
John J. Bagley		"	1873–1877
Charles M. Croswell		"	1877–1881
David H. Jerome		"	1881–1883
Josiah W. Begole	Democrat and Greenback		1883–1885
Russell A. Alger	Republican		1885–1887
Cyrus G. Luce		"	1887–1891
Edwin B. Winans	Democrat		1891–1893
John T. Rich	Republican		1893–1897
Hazen S. Pingree		"	1897 -1901
Aaron T. Bliss		"	1901–1905
Fred M. Warner		"	1905–1911
Chase S. Osborn		"	1911–1913
Woodbridge N. Ferris	Democrat		1913–1917
Albert E. Sleeper	Republican		1917–1921
Alexander J. Groesbeck		"	1921–1927
Fred W. Green		"	1927–1931
Wilber M. Brucker		"	1931–1933
William A. Comstock	Democrat		1933–1935
Frank D. Fitzgerald	Republican		1935–1937
Frank Murphy	Democrat		1937–1939
Frank D. Fitzgerald	Republican		1939 (died 1939)
Luren D. Dickinson		"	1939–1941
Murray D. Van Wagoner	Democrat		1941–1943
Harry F. Kelly	Republican		1943–1947
Kim Sigler		"	1947–1949
G. Mennen Williams	Democrat		1949–

The other executive officers elected to two-year terms are: lieutenant-governor, secretary of state, treasurer, auditor general, attorney general, and superintendent of public instruction. The highway commissioner is elected for four years.

Legislature.—The legislative body consists of a Senate of 32 members and a House of Representatives of 100 members elected for two-year terms. Its membership is reapportioned each ten years on the basis of the national census. A newly elected legislature meets on the first Wednesday in January for an indeterminate session. It may be called into special session by the governor to consider only matters named in his message. All legislation is by bill and to become a law a bill must be passed by a majority of the members elected to both houses and signed by the governor. The governor may veto any bill or any specific item of an appropriation bill within ten days after its presentation by the legislature; a two-thirds majority of each house is required to override a veto.

Courts.—The judicial system is composed of a supreme court, circuit courts, probate courts, justices of the peace and other inferior courts established by the legislature. The supreme court consists of a chief justice and seven associate justices, two elected at each biennial election for eight-year terms. The court holds four terms each year at Lansing. Forty circuit courts, each having one or more judges elected for six years, hold four terms per year in each of the counties within their circuits. Probate judges are elected in each county to four-year terms. Four justices of peace are elected in each township for four-year terms and are qualified to establish courts and hear cases.

Local Government.—In each of the counties, officers are elected to terms of two years or longer. Each county has a board of supervisors to which representatives are elected annually by the townships and which contains representatives of the cities within the counties. The cities are governed by special charters of many forms. Approximately 60 have city manager or commission-manager government.

Public Health.—In 1945, 69 of the counties and 11 cities had full time public health departments; there were 800 public health nurses and 1,500 industrial nurses in the state. It was estimated that 85 per cent of the population received benefits from city or county health departments or from both. The state department of public health maintains an education section, an engineering service, a laboratory for the benefit of the medical profession, an epidemiology section, a public health nursing section, and a section which compiles records and statistics for the state.

Public Welfare.—The state department of social welfare administers the Old Age Assistance Act whereby state and federal funds are distributed to the aged. This department assists and coordinates the work of the counties and licenses soliciting agencies. It administers restoration and training facilities for the blind; and aid, foster care, and placement for dependent children. Most of the counties maintain infirmaries or homes for the aged and there are many private and local charitable agencies throughout the state. The department of corrections maintains the state prison of southern Michigan at Jackson for adult males, the Michigan State Reformatory at Ionia for males through 25 years of age, the State House of Correction and Branch Prison at Marquette for long term male offenders, and the Cassidy Lake Technical School near Chelsea for youthful first offenders. The Detroit House of Correction, on contractual basis, cares for all female prisoners and the overflow of the males. Hospitals for the mentally ill are located at Kalamazoo, Newberry, Pontiac, Sault Ste. Marie, Traverse City, and Ypsilanti. Wayne County, which includes Detroit, operates a general hospital at Eloise, near Dearborn. A state hospital for the criminally insane is located at Ionia, and another for epileptics near Caro. For mentally deficient residents there are state homes and training schools at Coldwater, Lapeer, and Mount Pleasant, and a similar institution maintained by Wayne County at Northville. There are also the Michigan Employment Institution for the Blind which provides vocational training; the Boys' Vocational School and the Girls' Training School for delinquent children from 12 to 16 years; and Michigan's Children's Institute which acts as a child adoption and placement agency.

Social Legislation.—Child labor laws limit the employment age to 15 years with certificates required for those under 18. Workmen's compensation with full coverage for occupational diseases is in effect. There is social security in the form of an old age assistance law, but no minimum wage standard.

Suffrage.—There is a 6-month state and 20-day district resident requirement, although no minimum length of United States citizenship is necessary. Registration is required.

Education.—Public education follows in general the plan proposed by John D. Pierce, who became its first superintendent of public instruction (1836–1841). The superintendent is elected for a term of two years and has general supervision over elementary and secondary education, both public and private. The state board of education, consisting of the superintendent and three other members elected to terms of six years has supervision over certain state schools, examines textbooks in physiology and hygiene, and grants teachers' certificates. The superin-

tendent and his professional associates are known as the office of education. Education is free for all children five years of age and upwards and is compulsory for all between the ages of seven and sixteen. There are eight four-year public colleges in the state: the University of Michigan at Ann Arbor, governed by its board of regents, a constitutional corporation; Michigan State College at East Lansing, controlled by the state board of agriculture, also a constitutional corporation; Michigan College of Mining and Technology at Houghton, directed by its board of control appointed by the governor with Senate confirmations; four colleges of education at Ypsilanti, Kalamazoo, Mount Pleasant, and Marquette, under the supervision of the state board of education; and Wayne University in Detroit, a part of the Detroit public school system. In 1945 there were 6,029 school districts in the state of which 4,823 maintain one or more elementary schools. 629 of the school districts in the state maintain high schools and ten operate junior colleges. The average pupil enrollment in 1945 in the public schools in the districts was 934,206. There are 20 county normal schools in the state. Among the special and technical private institutions are Detroit College of Law, Detroit Institute of Musical Art, Detroit Institute of Technology, and Lawrence Institute of Technology.

Literacy.—Of the adult population, 28 per cent has finished eight grades, 18 per cent has completed high school and 3 per cent has attended four or more years of college. Only 2 per cent has had no formal education (1945).

Libraries.—Michigan libraries are outstanding in the technical field. Many of the manufacturing companies maintain libraries of considerable size, most of which permit inter-library loans. Among those of importance are the Ford Motor Company in Dearborn, General Motors in Detroit, Parke, Davis and Company in Detroit, and the Dow Chemical Company in Midland. Other libraries include the Michigan State Library at Lansing, established in 1828, with 454,246 volumes specializing in law, genealogy, and local history; the Detroit Public Library with its seven divisions; the library of the University of Michigan at Ann Arbor, strong in governmental problems; and Wayne University whose library is unusual in law, education, public affairs and social work, and pharmacy. The Hackley Public Library at Muskegon is unique in its collections on lumbering and local history.

History.—*Indian Period.*—The Ottawa and Potawatomie tribes occupied the Lake Michigan shore of the Lower Peninsula and the Ojibway (Chippewa) the Upper Peninsula and some of the northern parts of the Lower Peninsula. In the area between Saginaw Bay and Detroit were the minor tribes, the Hurons, the Sacs, and the Foxes. These tribes lived by garden agriculture, hunting, fishing, and gathering. Their villages were located near water bodies, along the shores of the Great Lakes or on the larger rivers and lakes of the forested interior. Their primitive weapons and techniques were not efficient enough to reduce the supply of game. When white men provided guns and traps and when furs acquired a commercial value the tribes became scattered into smaller groups and families.

French Occupation: 1634–1763.—French explorers, traders and missionaries entered Michigan from Canada and made it a part of the great fur-producing empire centering on Montreal. Until the discovery of the water connection between Lakes Huron and Erie the route of these explorers was by way of the Ottawa River to Lake Nipissing and over the French River into Georgian Bay. In 1634 Jean Nicolet, an agent of Champlain, then the governor of Canada, passed through the Straits of Mackinac in search for a water passage to the South Seas. However, as early as 1616, traders visited Sault Ste. Marie, and in 1641 the Jesuits, Fathers Raymbault and Jogues, had established a mission there. For seventy years thereafter, the French continued their explorations, spread Christianity, and traded with Indians. They established missions, settlements, and forts to secure the northeastern part of their great line of outposts extending from Canada to New Orleans by way of the Mississippi. The first permanent settlements were made by Fathers Dablon and Marquette; these were at Sault Ste. Marie in 1668 and at Michilimackinac, now Saint Ignace, in 1671. The latter location became the first French military post in the state. In 1701, Antoine de la Mothe Cadillac founded Fort Pontchartrain at the narrows (de troit) of the river connecting Lake Huron with Lake Erie by way of Lake Saint Clair. This fort became the city of Detroit. The French traders lived and worked with the Indians in their villages, gaining their respect and affection. By 1760 the French had lost their foothold and in 1763, the Treaty of Paris transferred to the British all of Canada and the Great Lakes area, but not the loyalties of the Indians.

British Control: 1763–1796.—The British immediately assumed control of the fur trade in Michigan and, like the French, discouraged settlement and restricted land acquisition. The Indians disliked the British and attempted to drive them out of the lake country. Under the leadership of the great Ottawa chief, Pontiac, in 1763, they made simultaneous attacks on the British posts from the Straits of Mackinac to western New York. Detroit was besieged for five months but not taken; most of the other posts were captured and many of the garrisons massacred. The warfare waned as the Indians were forced by the onset of winter to leave for their hunting grounds; the captured posts were retaken by British forces and opposition to their occupation ended. During the Revolutionary War the British posts in Michigan were used as bases for the frontier war against the settlements in Ohio and western Pennsylvania. The Peace of Paris in 1783 ended the "War of the Revolution" but the British were not anxious to relinquish the profitable fur trade. In the absence of effective forces from the new republic to supplant them, they found reasons to remain in the hope that the boundary between the British and American territories would eventually be fixed at the Ohio River rather than through the Great Lakes. In 1787 the garrison at Detroit was strengthened and presents were distributed to the Indians to increase their hostility toward the American settlements. The United States government sent two ineffective expeditions against the Indians, the first in 1790 under Gen. Josiah Harmar and the second in 1791 under Gen. Arthur St. Clair. In 1794 a more powerful force under Gen. Anthony Wayne defeated the Indians and British at the Battle of Fallen Timbers, near the present city

of Toledo, Ohio. This ended the attacks against the settlers and led to the Treaty of Greenville, Ohio on Aug. 3, 1795, by which the Indian tribes ceded to the United States certain parcels of land in Michigan. Jay's Treaty with Great Britain in 1794 required the removal of the British troops from the United States and the garrison of Detroit evacuated the post on July 11, 1796. During the period of British control the original French settlers had remained around the posts; some British merchants had come into Detroit but few persons had been attracted to this remote frontier of Indian trouble and doubtful sovereignty. The white population in 1800 was only 3,206.

Michigan as a Territory: 1805–1837.—The Ordinance of 1787 provided for the organization and government of the Northwest Territory which included Michigan. It stipulated that not less than three or more than five states should be made from the region; provided that a governor and three judges appointed by the president should make the laws under the ordinance and that the three judges should enforce them as the highest court. It contained a guarantee of religious liberty, a bill of rights, a provision for general education, a declaration against human slavery, and the means for erecting new states from the territory. In 1800 the western half of the Lower Peninsula and the eastern part of the Upper Peninsula became a part of the newly formed Territory of Indiana. The remainder of both peninsulas was added in 1802 and on July 1, 1805, the Territory of Michigan was separated from that of Indiana. Detroit was the capital city and William Hull, of Massachusetts, an aging officer of the Revolutionary War, was appointed the first governor. In 1810 there were 4,762 people within the territory of whom 1,650 resided in Detroit.

Governor Hull negotiated the Treaty of Detroit (1807) with the Indians whereby a large section of southeastern Michigan was ceded. The Indians were slow to realize the seriousness of the treaty but under the leadership of the Shawnee brave, Tecumseh, with the help of British agents and fur traders, began to harass the frontier settlements. Hull had insufficient forces to quiet this uprising but Gen. William Henry Harrison defeated the Indians at the Battle of Tippecanoe, near Lafayette, Indiana, on Nov. 7, 1811. The declaration of war against Great Britain on June 18, 1812, found Michigan helpless; the garrisons were meager and Congress had neglected to inform them of the state of war. Tecumseh and his Indians were the ready allies of the British. On July 17 the fort on Mackinac Island was taken without a shot being fired. Governor Hull, who a few months before had been commissioned brigadier general and entrusted with command of the army to protect Michigan Territory, considered this capture to be decisive and, when British forces under Gen. Isaac Brock arrived before Detroit, he surrendered the city on Aug. 16, believing that he had prevented the massacre of its inhabitants. For this act he was severely criticised, court martialed, and sentenced to be shot from which sentence President Madison pardoned him. The surrender of Detroit lost Michigan to the British and permitted their Indian allies to commit outrages against the settlements. On Aug. 23, 1813, following the capture of Frenchtown, on the Raisin River, its garrison was massacred by the Indians. The United States had constructed a flotilla of ships on Lake Erie which on Sept. 10, 1813, under the command of Lieut. Oliver H. Perry, engaged and defeated British ships near Gibraltar Island; opening the way for troops led by General Harrison to reoccupy Detroit on September 29, and to attack and defeat the British at the Battle of the Thames River in Canada on Oct. 5, 1813. This broke the British hold on Michigan and scattered the Indian allies; Tecumseh was killed on the battlefield and the state was restored. On Oct. 13, 1813, soon after the victory at Thames River, Lewis Cass was appointed as governor of Michigan Territory. He served until 1831 and under his able direction the territory progressed rapidly. He negotiated treaties with the Indians in 1819 and 1821 which transferred to the United States title to almost half of the Lower Peninsula. He also gained from Congress the authorization for five military roads across the state to accommodate settlers who were beginning to arrive in increasing numbers. The end of the Indian troubles and improved travel conditions turned some of the westward migration into Michigan. In 1818 the sale of public land began at Detroit. In the same year steamship navigation was established on the Great Lakes and the opening of the Erie Canal across New York in 1825 gave easy access to Michigan. The population in 1820 was 8,896; in 1830, 31,639; in 1837, 87,273.

The territorial legislature petitioned the Congress in 1834 for permission to form a state. A state convention assembled at Detroit and formulated a constitution. This was ratified by the electorate in 1835 and a complete set of state officers elected. The admission was opposed by southern senators who disliked the formation of another free state, and by Ohio delegates who protested the southern boundary where Michigan and Ohio had been in dispute over the ownership of the strip of land on which Toledo is located. The first of these objections was compromised by promising the admission of Arkansas as a slave state simultaneously with Michigan, and the second by awarding the Toledo strip to Ohio and giving Michigan in compensation the Upper Peninsula which had been up to this time a part of the Territory of Wisconsin. A Convention of Assent to these proposals met in Ann Arbor on Sept. 26, 1836, but would not accept the Toledo Strip compromise issue. In December of 1836 the Democrats assembled another Convention of Assent which accepted the federal proposal, and on Jan. 26, 1837, Michigan was admitted as a state and the officers elected in 1835 continued to serve.

Michigan as a State.—Development of the state was seriously hindered by the financial panic of 1837. An extensive program of internal improvement including the construction of three transpeninsular railroads had to be abandoned. These were assumed by private interests and the Michigan Central Railroad was completed to Chicago in 1852. The state was heavily in debt because of the failure of the eastern companies with whom a $5,000,000 loan for the improvements had been placed. Settlers were pouring into southern Michigan and taking up land. The southern part of the state was dotted with small towns connected by a net of passable roads built for the most part by local governments. The agricultural settlements extended northward to about the latitude of Sag-

inaw Bay. The discovery and exploitation of copper and iron deposits in the Upper Peninsula led to a demand for a ship canal around the rapids of the St. Marys River, which project was begun in 1853 and completed in 1855. Repeatedly enlarged and improved since that time the Soo Canal is one of the most important waterways in the world. In 1847 the state legislature fixed the location of the capital at Lansing, a city centrally located in the state. A new constitution was adopted in 1850 correcting weaknesses that had become apparent in the original.

During the Civil War, Michigan put nearly 100,000 troops into the field. Among these was Gen. George Armstrong Custer, commander of the Michigan Cavalry Brigade, who later was killed together with his entire column by Sitting Bull's Sioux Indians on the Little Big Horn River in Montana. In 1870 the population passed the million mark; increasing steadily it reached two million in 1890, three million in 1920, and over five million in 1940. Since 1870 the growth has come largely from increases in the urban population. Railroads penetrated the pine lands of the northern parts of the state early in the decade of 1870 and opened this area to large scale lumbering. This brought roads and settlements to the north. Much of the cut-over land was too poor to succeed under agriculture and great areas came into state ownership through tax abandonment. The problems of development and administration of this public domain are chief among those of the state department of conservation. As the lumbering declined at the close of the last century, another and more permanent industry was developing around Detroit. Automobile manufacturing and its associated industries changed that city into a great metropolis, containing within its district more than one third of the population of the state and producing the bulk of the two thirds of the world's automobiles made within the state.

During World War I, Michigan supplied 135,485 troops; in World War II, the state sent nearly 500,000 men and women into the armed services. Equally noteworthy was the contribution of its industries. The manufacturing skill of the automotive plants was utilized for arms production and many new plants were constructed, including the great bomber plant at Willow Run.

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MICHIGAN, Lake. One of the five Great Lakes, (q.v.), and much the largest body of fresh-water lying wholly within the United States. It extends 335 miles from north to south and throughout most of its length is 60 or more miles wide. Records kept since 1860 disclose an extreme surface variation from 578.3 to 583.4 feet above sea level, with a mean elevation of about 581 feet. At its northeasterly end the lake empties into Lake Huron by the broad Straits of Mackinac, several miles wide. It has a maximum depth of 870 feet in its northerly portion, lessening to about 200 feet opposite Chicago.

Throughout its southern 200 miles the shoreline is remarkably regular, with no natural harbors. The northern portion of the shoreline is considerably indented, and in this section there are numerous islands and many good harbors. By far the major indentation is Green Bay, over 100 miles long and up to 20 miles wide. The other major indentations are Grand Traverse and Little Traverse bays, on the eastern side of Lake Michigan. The principal island groups are the Fox, the Manitou, and the Beavers, and the chain of islands extending across the entrance of Green Bay. The largest single island is Big Beaver, 14 miles long and upwards of 3 miles broad. In the mid-19th century it was for several years the seat of the fantastic Mormon Kingdom of St. James, whose prophet, James J. Strang, claimed to be the divinely-appointed successor of Joseph Smith as head of the Church of Latter Day Saints.

The Lake Michigan drainage basin is but twice the area of the lake itself, and the numerous rivers that flow into it are necessarily comparitively short. The major rivers are the Fox and the Menominee on the western side of the lake and the Muskegon, Pere Marquette, Grand, and St. Joseph on the eastern side. Sand dunes border the lake for hundreds of miles, especially on its eastern and southern sides. A lake current flows southward on the western side and northward on the eastern, clogging the river mouths with sand and in numerous instances causing the rivers near their outlets to expand into more or less extensive lakes. The harbors throughout the southerly 200 miles of the lake are all artificial, created either by constructing breakwaters in the open lake or by opening and stabilizing the river mouths.

The white discoverer of Lake Michigan was Jean Nicolet in 1634, sent from Quebec by Samuel de Champlain (q.v.) in search of the Oriental kingdom of Marco Polo's narrative. Active French penetration of the upper lakes area, however, was delayed for a generation. Then by an amazing burst of commercial and geographical achievement the entire Great Lakes and Mississippi Valley areas were explored and added to France. Around Lake Michigan flourishing missionary and trading centers were established at such points as Chicago, Green Bay, St. Ignace, and Niles before the close of the 17th century. Until 1763 the country remained wholly French, and the influence of the French occupation is still felt. Although British rule supplanted the French in 1763 and American rule superseded the British in 1796, when the Jay Treaty of 1794 became effective, the region tributary to Lake Michigan remained inaccessible to American settlers until the second quarter of the 19th century. Then such developments as the construction of the Erie Canal and the coming of the steamboat to the Great Lakes and the western rivers produced a flood of settlement which quickly occupied southern Michigan and northern Indiana, and swept onward over northern Illinois and southern Wisconsin. Chicago, a tiny wilderness hamlet in 1830, was the metropolis of the West and one of the wonders of the world a generation later.

Although Lake Michigan is much smaller than Superior and slightly smaller than Huron,

its influence upon the development of the United States has been vastly greater than any of the other Great Lakes. All of them save Michigan lie from east to west upon the northern border of the country. Lake Michigan, 335 miles long, reaches from the relatively sterile pineland of the north to the heart of the richest agricultural area of America. In the period of settlement all overland travel between east and west diverged southward around it, while travelers by water found easy access on it to the heart of the continent. The development of Chicago as the metropolis of interior America and the foremost grain, cattle, and railroad center on earth was inevitable.

Until the close of the 19th century, fishing and the transportation of lumber and grain were important factors in the commerce of Lake Michigan, and during most of the period the volume of passenger travel on the lake was important. By 1850 all save the grain trade had shrunk to insignificant dimensions. In their stead an almost constant procession of huge freighters carries the iron ore of Lake Superior and the Upper Michigan Peninsula downward to the mills which line the southerly shore of Lake Michigan, and coal, grain and other staples in the opposite direction. A development in which Lake Michigan leads the world is the extensive employment of car ferries, by whose use the railroads have in effect leaped the lake from east to west.

With its wealth of forests and fisheries depleted, the northerly shore of Lake Michigan is but sparsely populated and possesses but slight industrial importance. The contrast, both of climate and of industrial development, with the populous and busy southern end of the lake is striking indeed. Nature has provided another marked contact between the eastern and western shores. The prevailing continental wind is from west to east and the vast reservoir of water in Lake Michigan is less susceptible to changes of temperature than is the surrounding land. Thus the lake air conditions the winds that blow over it, absorbing their extremes of summer heat and winter cold and giving the east coast freedom from freezing temperatures in late spring and early autumn. Along practically the entire 300-mile eastern shore, one of the nation's richest fruit belts has developed. Orchards of apples, peaches, plums, and cherries vie with vineyards and fields of berries to claim the attention of visitors and fatten the pocketbooks of those who till the soil. Because of its climatic attractions, too, the entire east coast from the Straits of Mackinac to the Indiana line has become a vast summer playground for the teeming millions of interior America.

The Ordinance of 1787, which created the first American government in the region lying between the Ohio and Mississippi rivers and the Great Lakes, fixed an east and west line through the southern extreme of Lake Michigan as the boundary between the three southern states of the old Northwest Territory (Ohio, Indiana, and Illinois), and the two northern ones (Michigan and Wisconsin). Although the proviso was subsequently violated in every instance, Lake Michigan figured prominently in determining the boundaries of the five states. Both the center of population and the industrial heart of the United States lie close to Lake Michigan's southern end. The wealth of human and material resources which center here contribute heavily toward making the United States the most powerful country in the world.

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MICHIGAN, University of, has had a continuous corporate existence since Aug. 26, 1817 when the "Catholepistemiad, or University, of Michigania" was created by act of the territorial legislature. The name was changed to University of Michigan in 1821. From 1817 to 1837 the institution was in Detroit, but only an elementary school and an academy were conducted under its auspices. When Michigan entered the Union, its first legislature, by an act of March 18, 1837, reorganized the university and created the Board of Regents which is still its governing body. Since 1850 the state constitution has contained provisions for the maintenance of the university, the complete control of its funds and affairs by the regents, and the election of the regents by the people at large. In 1837, by an act of the legislature, dated March 20, the university was located at Ann Arbor. A college building and four "professors' houses" were erected, and the first college class was admitted in 1841. Until 1852 the institution was managed by the regents and faculty, and remained a typical small college of its time. Henry Philip Tappan, who was its first president (1852–1863), however, conceiving that a university should offer complete facilities for study in all recognized fields, greatly strengthened it, paying particular attention to scientific studies. President Tappan was succeeded by Erastus Otis Haven (1863–1869) and James Burrill Angell (1871–1909). Dr. Angell, one of the great educational leaders of his time, added to the institution's prestige by a further expansion. The administration of his successor, Harry Burns Hutchins (1909–1920), was notable for the establishment of an effective nationwide alumni association. Marion LeRoy Burton's brief period (1920–1925) as president, brought a much-needed increase in state appropriations. After the acting presidency of Alfred Henry Lloyd and the administration of Clarence Cook Little (1925–1929), Alexander Grant Ruthven came to the chair in 1929. His administration proved to be another period of expansion in enrollment, which doubled, in the erection of buildings, especially those comprising the residence halls system, and in the value of endowment funds. The university consists of 14 schools and colleges, organized in the years named, although many had existed previously: literature, science and the arts, 1841; medical, 1849; law, 1859; dentistry, 1875; pharmacy, 1876; engineering, 1895; graduate school, 1912; architecture, 1913; education, 1921; business administration, 1924; forestry and conservation, 1927; music, 1929; nursing, 1940; public health, 1941. There are also many museums, and summer camps for special studies.

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The university lands, buildings, and equipment are valued at $86,000,000. Some of the finest buildings were provided by gift, notably the Law Quadrangle group, erected by the late William W. Cook, the Rackham Building which houses the Graduate School in Ann Arbor, and the Rackham Educational Memorial, the extension

center in Detroit, both given by the Horace H. Rackham and Mary A. Rackham Fund, and the Michigan Union and Michigan League, student social centers provided by alumni contributions.

MICHIGAN CITY, city, Indiana, LaPorte County, situated on the south shore of Lake Michigan at an altitude of 600 feet and 35 miles west of South Bend. Its transportation facilities include the Chesapeake and Ohio, the New York Central, the Chicago, Indianapolis and Louisville, the New York, Chicago and St. Louis, and the Chicago South Shore and South Bend (electric) railroads. A diversified industrial center, the city has foundries and railroad shops, and manufactures railway cars, industrial machinery, wire, furniture, building materials, clothing, sports equipment, and numerous other products. With its large harbor and yacht basin, Michigan City is a noted vacation resort. It is the site of the International Friendship Gardens, a permanent exposition of the flower gardens of the world consisting of 100 acres of rolling land where Father Marquette preached to the Potawatomi Indians in 1675. The city was settled in 1832 and incorporated in 1836. Government is by a mayor and council. Pop. (1950) 28,395.

MICHIGAN COLLEGE OF MINING AND TECHNOLOGY, Houghton, Mich., a coeducational technological institution founded in 1885 and opened the following year as the Michigan Mining School. It became the Michigan College of Mines in 1897, and its present name and scope date from 1927. The bachelor of science degree is given in engineering, and the master of science degree in chemistry, geology, geophysics, engineering physics, and physics, and in chemical, civil, geological, electrical, mechanical, metallurgical, and mining engineering. Since 1946 the college has maintained a branch at Sault Sainte Marie where the first two years of technical education are given. The college has a short-wave radio station, and uses field trips extensively in teaching. It provides a student loan fund and scholarship provisions, including tuition grants to foreign students. The yearly enrollment is approximately 1,700 students.

MICHIGAN STATE UNIVERSITY OF AGRICULTURE AND APPLIED SCIENCE, East Lansing, Mich., a coeducational land-grant university established as Michigan Agricultural College in 1855 and the first state institution in the United States to offer instruction in scientific and practical agriculture. It occupies 3,900 acres in campus and farms at East Lansing and has 4,625 acres in experimental station grounds at other points in the state. The school changed from a college to a university in 1955. In addition to a two-year basic college program, the university is divided into separate schools of agriculture, business and public service, engineering, medicine, graduate studies, and a division of extension work. Bachelor's degrees of arts and sciences are offered, and master's and doctorate degrees are conferred in most departments. The Michigan State University Press publishes text and trade books, and the university also has AM and FM radio stations and a television station for student training in these fields.

MICHILIMACKINAC, mĭsh-ĭ-lĭ-măk′ĭ-nô. See MACKINAC ISLAND.

MICHIPICOTEN, mĭsh-ĭ-pĭ-kō′t'n, a bay, island and river, Canada, situated in the western part of the Province of Ontario. Michipicoten Bay is an arm of Lake Superior, on the northeast shore, located 110 miles north of Sault Sainte Marie. Michipicoten Island, which is 17 miles long and varies in width from three to six miles, lies at the entrance to the bay. Michipicoten River has its source in lakes on the south side of the height of land dividing the waters of Hudson Bay and Lake Superior and flows 70 miles in a generally southwest direction into Michipicoten Bay.

MICHOACAN, mē-chô-ä-kän′, Mexico, a state of 23,202 square miles bounded on the north by the state of Guanajuato, on the northwest by Jalisco and Colima, on the east by Mexico, on the south by Guerrero, and on the west by the Pacific Ocean. Michoacán is mountainous except for a narrow coastal strip and some flat lands in the north and south. Its largest drainage streams are the Lerma River on the north boundary and the Río de las Balsas on the south border. The climate is cold in the mountains, temperate on the north plateau, and tropical in the southern valleys and on the coast. There is considerable volcanic activity; a new volcano, Paricutín, erupted near Uruapan in 1943. The principal inhabitants are Tarascan Indians and mestizos. In 1951 the United Nations and Mexico sponsored the first regional fundamental education center to train leaders for Latin America on the eastern shore of Lake Patzcuaro. Some sheep and cattle are raised but the economy is mainly agricultural. The leading products are sugar, rice, cereals, fruit, coffee, and tobacco. Valuable minerals are found here, and silver, lead, copper and iron are mined. The capital is Morelia (q.v.). Pop. (1950) 1,412,830.

MICHURINISM or **MICHURIN SCIENCE,** a set of biological doctrines named for Ivan Vladimirovich Michurin (1855–1935), a Russian nurseryman who also imported and hybridized plants. Michurin, who is credited with having developed numerous hardy varieties of fruit trees, was reputedly discovered by Nikolai Lenin and later was made into an authority by Joseph Stalin. In August 1948, the Communist authorities outlawed Mendelian genetics and put "Michurin science" in its place and thereby gave the doctrine an official status. The Soviet Michurinists thereupon assumed control of all agricultural and genetic research in the USSR.

Michurin's biological ideology is post-Darwinian but pre-Weismannian. It is almost identical with the Communist biological line set by Karl Marx and Friedrich Engels in the 1870's. Michurinists accept the theory of evolution and attempt to improve domestic plants and animals by artificial selection but they also accept the Lamarckian doctrine of the inheritance of acquired characters. Michurin himself added little to the biological theories of his time. He claimed to be able to cross-pollinate distant species by the technique of using a "mentor;" that is, one of the species to be hybridized would be grafted on the other until the two species—the stock and the scion—had learned to be compatible, whereupon the cross-pollination supposedly would take and a viable hybrid would be produced. Michurin's scientific and experimental procedures have

been questioned by Western geneticists, such as the practice he described in his *Selected Works,* p. 207, "In dealing with interspecific crosses definitely known to be difficult, I have often achieved success by adding a very small amount of the pollen of the maternal parent to the pollen of the male parent." This practice would explain (1) why Western geneticists could not repeat his species crosses, and (2) why his hybrids all came within the seedling range of the maternal species. Wherever biologists are free to reject Michurinism they have done so.

Michurin science has been elaborated in great detail since it displaced genetics in the U.S.S.R. Its chief doctrines may be summarized as follows: Important economic characteristics of plants are controlled by limiting factors which are not Mendelian genes. The worse limiting factor is always neutralized by the better one—the one which encourages the most appropriate course of development—so that consequently, in hybrids, the dominance or recessiveness of any particular character can be predicted because the best characters, those most suited to local conditions, are always dominant. Inbred lines deteriorate but they can be rejuvenated by hybridization. This is accomplished by a selective fertilization since the ovum is able to select the pollen grains from which the best adapted offspring will come. Heredity is defined as the capacity of the living body to react in a definite way to any given set of conditions. Hereditary characteristics thus are merely the environmental conditions that have been assimilated during the preceding generations. All organisms absorb nutrients from their environments and convert them into their own living substance. Their constitutions remain unaltered in an optimum environment, however, because an organism always absorbs the nutriments to which it is best adapted. By regulating the quality of the nutrients, the breeder may produce new and desirable types at will. Any segregation of types that may appear superficially to be Mendelian is caused by local difference in the nutrition supplied to the reproductive cells. Graft chimeras are regarded as true vegetative hybrids. Michurin and his followers have rejected Mendelian heredity and, consequently, all modern genetics.

Consult Michurin, Ivan, V., *Selected Works* (Moscow 1949); Zirkle, Conway, "The Theoretical Basis of Michurinian Genetics," *Journal of Heredity,* vol. 40: pp. 277–278 (Washington 1949).

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MICKIEWICZ, mêts-kyĕ'vêch, **Adam Bernard,** Polish poet: b. Nowogrodek, Lithuania, Dec. 24, 1798; d. Constantinople, Nov. 26, 1855. He studied at the University of Wilno and then attracted national attention with his first volume of poetry in 1822. Because of his association with a group of young Polish patriots who protested Russian control of their country, he was exiled to Russia in 1824. After five years he was allowed to leave and eventually traveled to Paris where he became professor of Slavonic languages and literature at the Collège de France in 1840, but his espousal of the mystical and political doctrines of André Towianski (1799–1878) caused his dismissal from the college in 1844. In 1848 he attempted unsuccessfully to enlist Polish regiments in the Italian struggle against Austria. He died while trying to raise Polish armies in Turkey. A lifelong patriot who glorified the romantic traditions of Poland in his poetry, Mickiewicz was the greatest Polish poet of his age. *Pan Tadeusz* (q.v., 1834), a humorous epic of Polish country life in the early 19th century, is considered his masterpiece, and his other noteworthy works include *Grazyna* (1823), *Crimean Sonnets* (1826), *Conrad Wallenrod* (1828), and *The Books of the Polish Nation and of the Polish Pilgrimage* (1832).

MICMACS, mĭk'măks, a tribe of Algonquian Indians found in Newfoundland and the Maritime provinces of Canada. Historically they were friendly to the French settlers and hostile to the British. Their population of about 3,500 is surprisingly much the same as their estimated number during the 17th century. The Micmacs hunt and fish for a living, and are one of the few Indian tribes to remain virtually intact after prolonged contact with the white race.

MICROANALYSIS. See CHEMICAL ANALYSIS.

MICROBE, mī'krōb, a microscopic organism; applied particularly to bacteria, and more especially to the forms that cause disease. See also BACTERIA AND BACTERIOLOGY; PROTOZOA.

MICROBIOLOGY, mī-krô-bī-ŏl-ô-jĭ, the science dealing with the structure, classification, physiology, and distribution of microorganisms, and with their technical and medical significance. The term microorganism is applied to the unicellular and structurally closely related simple representatives of the plant and animal kingdoms. With few exceptions, the unicellular organisms are invisible to the naked eye and generally have dimensions between a fraction of a micron and 200 microns (1 micron = 1/25,400 inch).

Principal Types of Microorganisms.—In its broadest sense, microbiology deals with the biology of the Protozoa, the Algae, the Fungi, the Bacteria, the *Rickettsiae,* and the viruses.

Protozoa.—These are unicellular organisms generally placed in the animal kingdom, although some of the photosynthetic species are, with equal justification, often considered to be plants (green Algae). All Protozoa have distinct nuclei and generally reproduce by cell division. Many exhibit a sexual process known as conjugation, which is analogous to the sexual phenomena in higher plants and animals. The nutrition of the Protozoa is varied: some are holophytic and lead a plant-like existence; others are holozoic and prey on other microorganisms; a few are parasitic.

Algae.—The simple forms of Algae, which are microscopic, unicellular and simply organized, filamentous and colonial, are found mainly among the green Algae (Chlorophyceae), the yellow Algae (Chrysophyceae), and the blue-green Algae (Cyanophyceae). In general, the Algae have a photosynthetic mode of nutrition and produce cell material and oxygen from carbon dioxide and water. The energy used in this process is derived from sunlight, which is absorbed by the green plant pigments known as chlorophylls. Most Algae have a distinct nucleus and show sexual behavior as well as cell division. Unlike other Algae, the blue-green Algae do not have chloroplasts and are not known to have a sexual cycle. Their nucleus is not distinct, although nuclear bodies have been shown to be pres-

ent. If they are motile, the blue-green Algae have a creeping movement and never swim by whip-like processes known as flagella, which occur in other Algae and some Protozoa. In addition to chlorophyll, they contain a blue pigment, phycocyanine, which gives them their characteristic color.

Fungi.—The true Fungi, which, like the Algae, are generally considered to be primitive plants, differ from the Algae in being non-photosynthetic and in not depositing cellulose in their cell walls. This group includes the yeasts, the molds, the rusts, the mushrooms, and related organisms. True Fungi possess distinct nuclei and, with some exceptions, a sexual reproductive mechanism. The yeasts are unicellular Fungi and generally reproduce by budding or fission, while the molds are filamentous (mycelial) organisms, which often show a certain degree of differentiation of the various portions of the plant body (mycelium) into special sexual or asexual reproductive structures. Being incapable of photosynthesis, the Fungi are saprophytic or parasitic in their nutrition.

Bacteria.—The Bacteria, or Schizomycetes, which are usually classified as a group of Fungi, differ from most of the true Fungi in being smaller and simpler in structure. No sexual reproduction comparable to that found in the true Fungi has been proved for Bacteria. Although nucleus-like bodies have been demonstrated in many Bacteria, their nature and behavior have not been entirely established, perhaps mainly because of their small size. While most Bacteria are saprophytic or parasitic, like the true Fungi, some or photosynthetic. Bacterial photosyntheses, however, differ from green plant photosynthesis in that oxygen is never produced and in that the bacterial chlorophylls, which are diffused in the cells, differ slightly both in chemical structure and in absorption spectrum from green plant chlorophylls. Bacteria are unicellular or mycelial in structure and may be either rigid or flexible. Many possess a swimming motility, generally achieved by flagella, while some show a creeping motility similar to that of the blue-green Algae. In general, the group known as Bacteria appears to be a somewhat heterogeneous and poorly defined collection of organisms, some of which may be more closely related to the blue-green Algae than to Fungi. Because of the small size, the lack of distinct characters, the absence of sexuality, and the variability of Bacteria, their classification is difficult and admittedly unsound.

Rickettsiae.—These are small, bacterium-like organisms, which are found as parasites in arthropods and occasionally in warm-blooded animals. They are obligately parasitic and, while they can be grown in living tissues, they do not generally yield to cultivation in lifeless, artificial media.

Viruses.—The filterable viruses are the smallest known entities possessing certain characteristics of living organisms. They pass through bacteriological filters which retain Bacteria and *Rickettsiae*. The viruses are obligately parasitic in the tissues of plants or animals and cannot be grown in lifeless artificial media. While the larger viruses may well be thought of as organisms, some of the smaller ones can be crystallized and appear to be nucleoprotein molecules or aggregates.

Microbiological Methods.—The success of experimental laboratory work and of the medical and large-scale industrial applications of microbiology is based mainly on the techniques of sterilization, aseptic manipulation, and propagation of pure cultures.

Sterilization.—This is the complete destruction of all germs in an environment or in a medium wherein microorganisms are cultivated. This is usually accomplished by prolonged exposure to dry heat (160° to 180° C. for 90 to 150 minutes) or to steam under pressure (15 to 20 pounds pressure from 15 to 60 minutes).

Aseptic Technique.—This implies the manipulation of sterile media and pure cultures without their contamination with foreign germs, which are present everywhere in soil and water, on the human body, and on dust particles in the air. Protection against dust is commonly effected by the use of sterile cotton plugs, which act as air filters, and by the use of a gas flame, with which dust particles are burned before they can enter sterilized receptacles.

Pure Cultures.—These are populations of cells derived from the multiplication of a single cell of a microorganism and, therefore, the progeny of one individual. They are usually obtained by the isolation of individual cells on a sterile, nutrient, solid medium, on which their progenies accumulate as segregated masses, known as colonies.

Physiology and Nutrition of Microorganisms.—Because of their availability and their enormous rates of growth and metabolism, the microorganisms have served as excellent material for studies of nutrition and physiology. Some of the greatest contributions to the understanding of the physiology and biochemistry of higher plants and animals have come from experiments on yeasts, unicellular Algae, and Bacteria. The Fungi, and particularly the Bacteria, which occur in a great variety of natural habitats, exhibit a remarkable multiplicity of nutritional requirements and physiological processes. The autotrophic organisms are those which can grow in entirely inorganic environments, synthesizing their cell material from carbon dioxide and inorganic salts, such as nitrates, sulphates, phosphates, etc. The photoautotrophs use the radiant energy of sunlight as a source of energy for their life processes. Thus, the Algae carry out the type of photosynthesis characteristic of all green plants, while the green and the purple sulphur Bacteria make their organic compounds by the reduction of carbon dioxide with hydrogen sulphide or sulphur. The chemoautotrophic or chemosynthetic organisms are also capable of growing in environments containing only inorganic compounds, but do not possess chlorophylls and are incapable of photosynthesis. They derive their energy from energy-yielding oxidation-reduction reactions involving inorganic compounds. The colorless sulphur Bacteria use oxygen to oxidize sulphides to sulphur, which they store in the cells and which they subsequently oxidize to sulphates. Some nitrifying Bacteria obtain their energy from the aerobic oxidation of ammonia to nitrites, while others oxidize nitrites to nitrates. The hydrogen Bacteria can oxidize molecular hydrogen to water, while the iron bacteria, which are found in iron springs, oxidize ferrous iron salts to ferric hydroxide, which they deposit outside the cell body.

The heterotrophic organisms use organic compounds in their nutrition and are, therefore, ultimately dependent on the autotrophs for their livelihood. They obtain organic compounds either

as saprophytes, by decomposing dead organisms or the waste products of living ones, or as parasites or symbionts living in or with other living organisms. Certain Bacteria are photoheterotrophic, using organic compounds in their nutrition, but obtaining their energy from sunlight. All the Fungi and most of the Bacteria, on the other hand, are chemoheterotrophic. They depend on organic nutrients as a source of carbon for making protoplasm and obtain their energy from oxidation-reduction reactions involving organic compounds. Some chemoheterotrophs can grow with a single organic compound, while others need more than one. Many Protozoa, Fungi, and Bacteria require minute amounts of special organic compounds, known as nutrilites, for growth. These compounds are in many cases identical with the vitamins needed by higher animals.

Aerobic or respiratory organisms obtain their energy by oxidizing organic compounds with molecular oxygen. While complete oxidation leads to the production of carbon dioxide, incomplete oxidations may lead to partially oxidized products. The vinegar Bacteria, for instance, transform alcohol into acetic acid. While many organisms require air, many others can use anaerobic oxidations as a source of energy. The obligate anaerobes are restricted to this type of metabolism and are inhibited or even killed by contact with air. Anaerobic oxidations involve oxidizing agents other than oxygen. Thus, some Bacteria oxidize organic compounds with nitrates, which they reduce to nitrites, nitrogen gas, or ammonia. Others use sulphates as oxidizing agents and produce sulphides. Still others can oxidize organic compounds with carbon dioxide, which they reduce to methane, or marsh gas. Fermentations are oxidation-reduction reactions involving only organic compounds or portions of organic compounds. The products of fermentation vary with different organisms and include such compounds as ethyl and butyl alcohol; formic, acetic, propionic, butyric, and caproic acids; lactic acid; acetone; glycerine; carbon dioxide; hydrogen gas; etc.

Significance of Microorganisms and Practical Applications of Microbiology.—The universal distribution and the varied physiological activities of microorganisms make them extremely important in the economy of nature. It is estimated that about 90 per cent of the decomposition of organic compounds, which is necessary for the continuation of plant and animal life, is carried out by microbes. In soil and in water microorganisms are responsible for the transformations of carbon and nitrogen compounds, through which the fertility of the soil and, indirectly, the composition of the earth's atmosphere are maintained. (See Bacteria and Bacteriology.)

The variety of technological uses to which microorganisms are put is enormous. In brewing and baking, the alcohol and carbon dioxide produced in fermentation by yeasts are utilized. Bacterial fermentations are used industrially to produce organic acids and solvents. In food manufacture, microorganisms are used for the production of vinegar, the preservation of olives, sauerkraut, and pickles, for the souring of cream in making butter, for the ripening of cheese, and for the curing of tea and tobacco. The control of undesirable microorganisms is the principal aim of canning, pasteurization, and other methods of preservation of food.

Since Protozoa, Fungi, Bacteria, *Rickettsiae,* and viruses are the causes of almost all infectious diseases of plants and animals, the control of these parasitic microorganisms is one of the main aspects of both preventive and therapeutic medicine. The sciences of pathology, immunology, and epidemiology are concerned with the medical aspects of the microbes in their relation to the hosts which they invade.

Certain microorganisms produce antibiotic substances which are destructive of or inhibitory to other microbes. Some of these substances have great therapeutic value in the treatment of disease and are produced on a large commercial scale. Of the many antibiotics which have been described, the most important are the penicillins, which are produced by Fungi, and the bacterial antibiotics, streptomycin and tyrothricin. See also Bacteria and Bacteriology; Fungi; Protozoa; Yeast.

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MICROCEPHALUS, mī-krō-sef'à-lŭs, in *pathology,* the condition of having an abnormally small head, further marked by a peculiarly shaped cranium. The forehead is small and receding and the vertex somewhat pointed. The condition results in mental deficiency, amounting in some cases to idiocy.

MICROCLINE, mī'krō-klīn, a feldspar identical in composition with orthoclase, but crystallizing in the triclinic system. Thin sections examined in polarized light frequently show a grating-like structure, due to double twinning. The color varies from white to yellow and, occasionally, red or green.

MICROCONODON, mī-krō-kŏn'ō-dŏn, a fossil animal of the Upper Trias in North America, doubtfully placed among the Protodonta, or most primitive of Mammalia, and of interest chiefly in reference to the structure of its teeth as indicating the subsequently developed mammalian type.

Consult Osborn, *Evolution of Mammalian Molar Teeth* (New York 1907).

MICROCOSM, MACROCOSM, măk'rō-kŏz'm. Among the ancients a belief prevailed that the world or cosmos was animated, or had a soul. This theory led to the notion that the parts and members of organic beings must have their counterparts in the members of the cosmos. The natural philosophers of the 16th century took up this theory in a somewhat modified shape, and considered the world as a human organism on the large scale, and man as a world, or cosmos, in miniature; hence they called man a microcosm (Greek, "little world") and the universe itself the macrocosm ("great world"). Heylin gave the title *Microcosmus* to a work on cosmography in 1621.

MICROLESTES. See PLAGIAULACIDAE.

MICROMETER, mī-krŏm′ĕ-tĕr, the name given to various instruments for the measurement of minute angles and distances and used by astronomers, engineers and mechanics. As used by astronomers the device is commonly called the double image micrometer and is an eyepiece containing two halves of a lens, each half being movable by a screw in a direction parallel to the common diameter. In making an observation of the diameter of a heavenly body, the half lenses are moved so that the image formed on one half lens coincides with the image on the other. In engineering the micrometer scale is attached to the transit. In mechanics the micrometer takes the form of a caliper or gage with a micrometric screw which registers measurements as fine as .0001 of an inch.

MICRON, mī′krŏn (Gr *mikros,* small), a unit of length equal to the millionth part of a meter, or the 25,400th part of an inch. The Greek letter μ is used as its symbol. Thus 47 μ is read "47 microns."

MICRONESIA, mī-krō-nē′zhĭ-ă (Gr. *mikros,* small; *nēsos,* island), designation of one of the three great divisions of the Pacific Islands (see OCEANIA), located north and west, respectively, of Melanesia and Polynesia (qq.v.). These groups of small islands are situated between the equator and latitude 20° N.; and from west to east between longitude 130° and 180° E. The designation "little islands" aptly describes their physical appearance, for they are generally small and generally low, and Micronesia contains a larger proportion of islands of the atoll type than any other area on the globe of comparable extent.

In general, the islands lie outside the hurricane belt, yet at rare intervals they are visited by destructive gales of this type. Precipitation is generally low and the supply of water is markedly deficient, in some islands the only potable water being that which is obtained by filtration through the beach sand into wells dug above high water mark. However, despite the infrequency of rain, all of the islands may be regarded as fertile and abundantly productive, and the excessive temperature is pleasantly moderated by the prevalence of ocean breezes. Production includes bananas, breadfruit, coconut, taro, sweet potatoes, and yams. The major groups of islands comprising Micronesia are the Caroline Islands, Marianas (Ladrone) Islands, Marshall Islands, and the Gilbert Islands, the last being politically part of the (British) Gilbert and Ellice Islands colony. The Carolines and Marianas were acquired by Spain, who later sold them to Germany (with the exception of Guam, in the latter group, which was ceded to the United States). Germany annexed the Marshalls, only to lose all three groups after World War I, when they became a Japanese mandate; in turn, the United States captured them in World War II and continued to hold them in trust for the United Nations.

Nauru and Ocean are two detached islands of Micronesia lying almost on the equator, both of considerable economic importance because of rich deposits of phosphates. Nauru is a mandate of the British Empire administered by Australia, and Ocean is the capital of the Gilbert and Ellice Islands colony. Micronesians of the Gilbert Islands were settled in Gardner, Sydney, and Hull, three of the uninhabited eight atolls constituting the Phoenix Islands (geographically within Polynesia), when that group was incorporated in the colony in 1937.

Micronesians originally came from southeastern Asia, in the course of their migration being affected by the racial and cultural influences of the lands through which they passed. Thus they acquired affinities of blood and speech with Indonesians, Filipinos, and Papuans, and bear many resemblances to the Polynesians and Melanesians (qq.v.). As a general type, the Micronesians are long headed, copper colored, slender, short in stature, and straight haired. While a great many distinct dialects are in use, they have generally a common grammatical structure with an elaborate verb system. The local forms of dress and equipment, the semidivine status of the chiefs, and the veneration of stone pillars (sometimes stone circled) are reminiscent of a megalithic domination.

MICROPHONE, mī′krō-fōn, a device which converts sound energy into electrical energy. Microphones may be classified according to their principle of operation into the following categories: carbon-button; condenser; crystal; dynamic or moving-coil; and the velocity or ribbon type.

The carbon-button microphone has as its principle of operation the change of an electrical resistance with sound pressure. The variable resistance element is a cylindrical "button" containing minute carbon particles. One end of this button is mounted against a diaphragm, which vibrates in accordance with the sound waves striking it. This motion causes the density, and hence the aggregate resistance of the carbon particles in the button, to change. A source of direct current is connected across the button, so that when sound strikes the microphone the current flowing in the circuit will be varied accordingly.

The carbon-button type is a relatively sensitive microphone. On the other hand, its quality of reproduction of sound is relatively poor. It also possesses a characteristic background hiss due to random motion of the carbon granules. For these reasons, the carbon-button microphone is used where transfer of information with minimum amplifying equipment, but not necessarily high-quality reproduction, is desired.

A condenser microphone depends for its operation upon the change of electrical capacitance with sound pressure. The diaphragm acts as one plate of a variable condenser. This condenser is connected in series with a high-resistance and direct-current source. When the diaphragm vibrates in accordance with sound striking it, the change in capacitance causes an alternating component of current to flow.

This type of microphone is characterized by a very small output, about one hundredth that of the carbon-button type. For this reason an amplifier stage is often built into the microphone stand. It does, however, have good reproduction fidelity and stability. Hence it is often used for sound measurements.

The crystal microphone utilizes the piezoelectric effect of Rochelle salt crystals to convert mechanical stress produced by sound waves into electrical energy. The voltage thus generated is

taken off from a pair of electrodes between which the crystal is mounted. The crystal microphone requires no external source of voltage or current.

This type of microphone has relatively low output, but good fidelity. The crystal element is temperature-sensitive, the sensitivity dropping rapidly at temperatures above 90°F.

The dynamic or moving-coil microphone, as the name implies, generates a current in the coil as it moves back and forth in a magnetic field. The coil is attached to a diaphragm which the sound waves cause to vibrate. The magnetic field is usually produced by a permanent magnet. Like the crystal microphone, this type requires no external source of power. A small permanent-magnet loud-speaker can be used as a dynamic microphone, although the reproduction quality is not as good as that obtained with a properly designed microphone.

The velocity or ribbon microphone is a special form of the moving-coil microphone, in which the coil consists of a thin metallic ribbon suspended between the poles of a magnet. The ribbon is acted upon directly by the sound waves, so that no additional diaphragm is used.

This type possesses a pronounced directional response property; that is, it responds to sounds coming only from certain directions. This directivity can be taken advantage of to minimize undesired noises and room characteristics. It has very good reproduction fidelity.

E. S. Lincoln.

MICROPHOTOGRAPH. A minute photograph of a large object. Sometimes it is incorrectly employed as the equivalent of photomicrograph (q.v.).

MICROSCOPE, mī′krō-scōp, an optical instrument by means of which images of objects are so magnified that details invisible to the naked eye are clearly discerned. The basic principle making this possible lies in supplementing the lens system of the human eye by the use of external positive (that is, magnifying) lenses. (See also Lens.)

The normal human eye is able to change the focal length of its lens system from infinity to an average minimum of 10 inches. The apparent size of an object being determined by the angle which it subtends to the eye, whatever that angle is at a distance of 10 inches represents unity of magnification. Should the object be moved to five inches from the eye it would automatically be magnified two times but appear blurred. By interposing a lens of five-inches focal length between it and the eye, the image can be made sharp and twice as large as at 10 inches. At one inch from the eye the angle subtended would be substantially 10 times that at 10 inches and here again it can be put in perfect focus with a one-inch lens. Therefore any single positive lens having a focus of less than 10 inches will enlarge an object, the amount of magnification being equal to 10 divided by the focal length of the lens. The image in this case is called a *virtual* image. Lenses employed in this way are simple microscopes, commonly known as magnifying glasses. Fig. 1 shows diagrammatically the path of the light rays in the case of a simple magnifying lens.

A one-inch lens will also project a *real* image of an illuminated object on a screen. With the screen located on the side of the lens having the longer of the conjugate foci, when the latter are in the ratio of 10 to 1 the image will be 10 times the size of the object. This principle is made use of in the compound microscope, which essentially represents a two-stage magnification. For this there must be a double set of lenses. The first, the objective, projects a *real* image into the microscope tube where, if a ground glass screen were interposed, it could be observed. However, it is not necessary for an actual screen to be present; the image exists in space as an *aerial* image, but is nevertheless *real.*

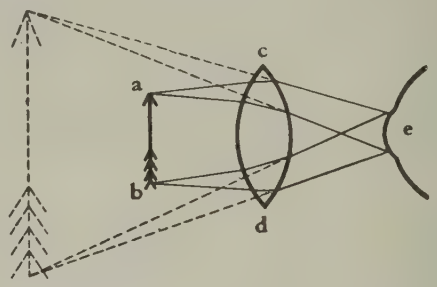


Fig. 1. In this diagram, *e* is the eye, looking at an object *a—b* through a simple double-convex lens *c—d*. Limiting rays from the extremity of the object are bent by the lens to enter the eye, which sees them as though coming from the enlarged dotted image located in space.

Then the second magnifying lens system, the eyepiece (or ocular), picks up this image, projecting it into the eye as a *virtual* image The path of the rays in this compound system is shown in Fig. 2, in which *a—b* represents the object and *c—d* its real image as formed by the objective *g—h*. The eyepiece, consisting of two planoconvex lenses, *i—l* (the field lens) and *o—p* (the eye lens), spaced apart with a limiting diaphragm located in the plane *c—d*, serves as a lens to produce a virtual image in the eye. Rays from it cross above the eye lens at the Ramsden circle

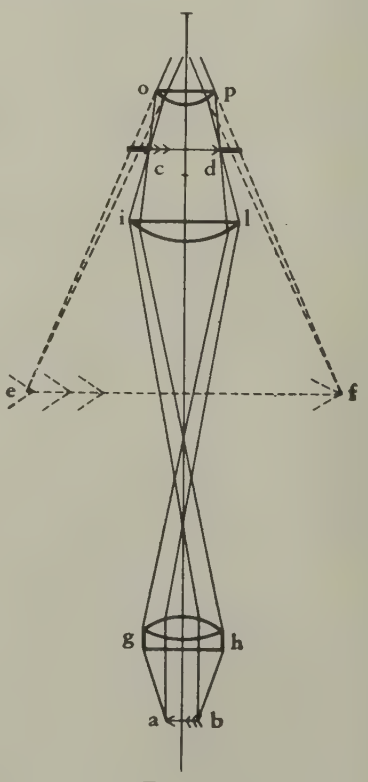


Fig. 2.

and can project a real image on a screen. The inverted virtual eye image is seen as though it existed in space at *e—f*.

It will be evident that the total magnification of a compound microscope equals the magnification of the objective times that of the eyepiece. Actually a third factor enters the equation, the distance from the optical center of the objective to its projected image where it is picked up by the eyepiece. The normal 10-inch (250 millimeter) distance of best vision is the standard against which the magnification of the optical components must be compared. As pointed out, a one-inch lens on this basis gives a magnification of 10 times, a ½-inch lens 20 times, and so on. But this is true only when its image is formed at a distance of 10 inches. Microscopes were formerly designed with a 10-inch tube length, but this results in an unwieldy instrument; hence a mechanical tube length of 160 millimeters has been adopted as standard by the majority of manufacturers. Thus the formula for final magnification with a 16-mm. objective and 25-mm. ocular is:

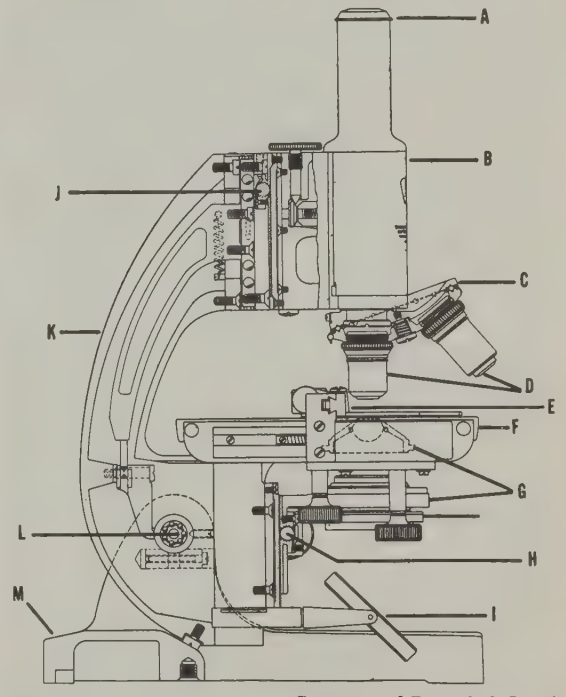
$$\frac{250}{16}\,(\text{objective}) \times \frac{160}{250}\,(\text{tube length}) \times \frac{250}{25}\,(\text{ocular}) = 100\text{x}$$

Modern objectives are designated in millimeters, supplemented by their magnification computed for 160-mm. tube length. They range from 50 mm. to 1.5 mm. The commonly employed lenses are 10x (16 mm.), 40x (4 mm.), and 90x (—2 mm.). Oculars are marked with magnification only, 5x, 10x, and so on.

So far it has been assumed that objectives are simple lenses. Actually this cannot be so, since lenses with spherical surfaces possess inherent defects which render their performance entirely unsatisfactory in that they do not form perfect images. Chief of these defects are spherical and chromatic aberrations. The former results from the fact that the peripheral portion of a lens magnifies more than the central portion. Chromatic aberration is due to a variation in lenses in their refractive index for different wave lengths of light. Short waves (blue) are refracted more than long ones (red), hence a lens possesses a different focal length for each color of the spectrum. Fortunately, different kinds of glass possess not only different refractive indices but different degrees of dispersion; hence, by properly combining positive and negative lenses made from high index (flint) and low index (crown) glass of varying degrees of dispersion, it is possible to eliminate both types of aberration to a great degree, and also to deal with other defects to which glass lenses are subject. Such corrected lenses are called achromatic and are employed for all types of optical instruments. Low-power microscope objectives have but two glass elements, but as the power goes up more complex combinations are required. There may be as many as ten or more elements in the highest type of oil immersion objectives. For the most critical work a still more highly corrected objective, known as apochromatic, is available. These are extremely high-priced, hence not ordinarily supplied as regular equipment.

While magnification is an essential requirement in objectives, the degree of resolution obtained at any given magnification depends on another characteristic of lenses. It is known as numerical aperture (N.A.), a value derived from the angular aperture of a lens and the refractive index of the medium through which light reaches the objective. The formula is: N.A. $= n \times$ sine U; n being the refractive index, which in the case of air equals 1. U is one half the angular aperture. The sine of U cannot exceed 1.00 with lenses in air, hence the N.A. must be less than 1.00, but by designing high-power lenses so oil with an index of 1.515 can be used between the object and the lens, the N.A. can be as high as 1.40. To obtain the utmost an objective is capable of producing, it is essential that an object be illuminated from below with a condensing lens having an N.A. equal to that of the objective. By means of an iris diaphragm it can be adjusted to fit any objective.

Stand.—The essential parts of a microscope (Fig. 3) apart from the optics are—the base,



Courtesy of Bausch & Lomb

FIG. 3. LABORATORY MICROSCOPE. (A) Eyepiece. (B) Body tube. (C) Revolving nosepiece. (D) Objectives. (E) Mechanical stage. (F) Stage. (G) Variable focus condenser. (H) Rack and pinion substage. (I) Mirror. (J) Coarse focusing mechanism (knob not shown). (K) Arm. (L) Fine focusing mechanism (knob not shown). (M) Base.

supporting the entire instrument; the stage, upon which the object (usually mounted on a glass slide) is supported; the tube carrying the objective and ocular; the arm, or handle support, on which the tube is mounted; and coarse and fine focusing means for raising and lowering the tube. Under the stage are located the substage, carrying the condenser, and the mirror for directing the light into the lens system. A usual accessory is the nosepiece, a turret for mounting several objectives for quick interchange. More elaborate instruments are equipped with binocular eyepieces, a great convenience for reducing eye strain during long priods of use. Finally, a mechanical stage for accurate control of the object being examined is an important accessory. All but inexpensive models are provided with an inclination joint allowing the tube to be inclined or used in a horizontal position when required.

Numerous applications of the microscope in science and industry involve the use of various modifications in design to adapt it to specific uses. The simpler models intended for schools and student use omit all but the bare essentials. Biological and medical instruments come next, ranging from medium-priced models to the highest refinements of research types. For chemical and petrographic purposes very special equipment is required—a graduated revolving stage; polarizer and analyzer for polarized light; a Bertrand lens which can be inserted into the tube above the analyzer for viewing interference figures; and various other optical accessories which can be inserted in a slot in the tube as required. Microscopes for metallurgical use require a vertical illuminator located above the objective for projecting light down on the specimen, since all metals must be studied with top illumination. Another practical microscope for low-power work is the Greenough binocular, employing paired objectives and paired eyepieces, with Porro prisms for erecting the image, which is always inverted in other microscopes. Other types of microscopes for special purposes include the ultramicroscope for viewing colloidal particles in a light beam at right angles to the optic axis, and ultraviolet microscopes which require quartz optics and illumination with monochromatic light in the ultraviolet range.

Recent developments along microscopical lines include phase microscopes, which are equipped with special condensers and objectives for producing contrast in living and unstained objects having refractive indices close to that of the substance in which they are mounted; and the radical departure from glass optics in the electron microscope. This instrument substitutes electromagnetic focusing of high-frequency cathode rays for glass lenses and visible light. With it, magnifications from 10,000 to 100,000 diameters, with perfect resolution, are possible. The image is either photographed or picked up on a fluorescent screen.

History.—The origin of simple magnifying glasses is shrouded in antiquity. References to them occur in the literature of nearly 2,000 years ago, and lenses of glass and quartz have been found in the ruins of Nineveh, Pompeii, and other localities. It was not until about the year 1600 A.D. that the compound microscope was born. In all probability the first ones were made by two Hollanders (father and son), Hans and Zacharias Janssen. Almost simultaneously others, Cornelis Drebbel (1572–1633), Franciscus Fontana (fl. c.1646) and Galileo Galilei produced similar instruments. No work of note was done with these early models and it was not until about a half a century later that Anton van Leeuwenhoek in the Netherlands and Robert Hooke in England began to do constructive work with instruments of their own design. That of the former was not strictly a compound microscope since he did all his work with very powerful minute spherical lenses.

Other names associated with the development of the microscope between the years 1660 and 1720 were Eustachio Divini (fl. 1648–1670) and Filippo Buonanni (1638–1725). It is interesting to note, in the light of recent developments in microscope objective construction that Sir Isaac Newton suggested in 1672 the use of a concave spherical reflector in combination with an eyepiece to eliminate chromatic and spherical aberrations. Johann Nathanael Lieberkühn's (1711–1756) invention of the solar microscope about 1740–1750, using the sun as a source of illumination, enabled him to project enlarged images in a darkened room. With the advent of more powerful light sources this form of microscope became obsolete. Since all these early microscopes were equipped with uncorrected lenses, they were limited in both magnification and performance.

It was not until after 1776, when Leonhard Euler (1707–1783) discovered the way to make achromatic lenses, that the microscope began to take its proper place as a research instrument. The names of Joseph von Fraunhofer (1787–1826), Augustin Jean Fresnel (1788–1827), Sir William Herschel (1738–1822), Giovanni Battista Amici (1786?–1863), Joseph Jackson Lister (1786–1869), Charles Luis Chevalier (1804–1850), and others, are associated with subsequent developments of the microscope. In 1840 Amici introduced the first immersion objective, marking a great advance in high-power work. In 1872 Ernst Abbe (1840–1905) produced his two-lens condenser and a new series of homogeneous immersion objectives. His work on the theoretical optics of the microscope, culminating in the production of apochromatic objectives, marks the greatest single contribution ever made to the microscope.

In the United States important contributions to objective design were made by Robert B. Tolles (1825?–1883), William Wales (fl. 1875–1885), Charles Albert Spencer (1813–1881), and others. Much of the credit for mechanical innovations goes to the optical firms of Zeiss, Leitz, Reichert, Hartnack, Koriska, and others on the continent; Watson, Baker, Beck, and Powell & Lealand in England; and Zentmayer, Gundlach, Spencer, and Bausch & Lomb in the United States. Several of these firms no longer exist, but played their part when the microscope was still young.

More recent developments include the electron microscope, phase microscopy, and objectives utilizing the principle first suggested by Sir Isaac Newton, which has been mentioned above. See also MICROSCOPY.

Consult Allen, Roy Morris, *The Microscope* (New York 1940); Gage, Simon Henry, *The Microscope,* 17th ed. (Ithaca, N. Y., 1941).

ROY MORRIS ALLEN.

MICROSCOPIUM, mī-krō-skō′pĭ-ŭm, in astronomy, one of the 14 constellations which Nicolas Louis de Lacaille (1713–1762) added to the heavens in connection with his work at the Cape of Good Hope. It is south of Capricornus and is a very inconspicuous constellation, its brightest star being of only 5.1 magnitude.

MICROSCOPY, mī-krŏs′kō-pĭ; mī′krō-skō-pĭ, the practical application of the microscope in the various fields in which it is employed. In the broadest sense, it includes a knowledge of the instrument itself in theory and practice; familiarity with the various techniques of preparing objects for study under the microscope in its numerous applications; and the interpretation of what is seen under the microscope, the specimens having been suitably prepared. Probably no other scientific instrument can rank with the microscope in its practical value to mankind. Without it we would know nothing about vital

human processes and structures, the nature of reproduction, blood and tissues, the nature and causes of disease, bacteria and viruses, the minute forms of plant and animal life, or the structure of metals and rocks; in fact every phase of modern life and progress owes a debt to the microscope. The fields wherein it is an absolute essential include biology, histology, hematology, clinical pathology, bacteriology, parisitology, metallography, mineralogy, petrology, crystallography, chemistry, foods, and forensic problems.

General Techniques.—Because the microscope is involved only in the study of minute objects, it is essential that all material to be examined under it be suitably prepared for the purpose. The exception to this is the case of examination by means of the low-power Greenough binocular microscope which provides erect stereoscopic images of relatively large objects. This type of instrument is of great value in examining rocks and minerals, metal and paint surfaces, fabrics, coins, postage stamps, printed matter, writings, signatures, and the like. For other microscopical work the examination is done largely by means of transmitted light. With most materials this involves either the making of thin sections or reducing to small-particle size in various ways. The materials can then be mounted in a suitable mounting medium on glass slides.

Glass slides are usually three inches long and one inch wide and about 1.5 millimeters thick, although other sizes are employed for specific purposes. Since objectives are corrected for use with a cover glass (.18 millimeter thick) between them and the object, a cover glass must always be used for best results when working with dry lenses. Oil immersion lenses do not require cover glasses since the oil can be a substitute. Only slides intended for permanent record and future study require detailed consideration.

Living tissues, plant and animal, involve an elaborate technique to prepare them for mounting. The fresh, still living, material must first be killed rapidly and fixed before post-mortem changes can occur. Various chemicals are employed for this purpose, the most common being 10 per cent formalin, acting for several hours. This is followed by washing in water, slow dehydration through several changes of alcohol, replacing the latter with xylol or a similar solvent, and the final embedding in paraffin just above its melting point. When the paraffin has completely infiltrated the tissue, the latter is cast within a block of solid paraffin. It is now ready to be mounted on the microtome (q.v.) and sectioned, usually about 5 to 10 microns thick. As sections are cut, the paraffin causes them to alhere together in proper sequence forming a long ribbon. Sections from this ribbon are mounted on glass slides, the paraffin is dissolved out, leaving the sections adhering to the slide. They are then suitably stained, washed, dehydrated, cleared with xylol, and mounted in balsam. Such a slide constitutes a permanent object for study under the microscope and future reference. This process is employed for pathological tissues (cancer and other diseases), normal histological tissues, both plant and animal, and all soft objects requiring support during sectioning. Other modified methods are in use, such as embedding in celloidin when harder tissues are involved.

In some cases it is desirable to examine tissues separated into individual cell components. These are treated with a solution to soften the intercellular substances, then teased out with needles. The cells can then be stained and mounted. Tissues containing water must be dehydrated using the procedure previously described. This applies to all objects which would be damaged if allowed to dry. Such include objects like infusoria, parasitic worms, fecal matter containing eggs, minute insect larvae which can be mounted whole, and others of similar nature.

Some materials can be dried directly on a slide as a thin smear. Among these are blood, bacteria, sputum, yeast cells, and minute plant and animal life occuring in stagnant water. When dry these are fixed to the slide by heat or alcohol, stained, and mounted in balsam.

Staining.—Staining of plant and animal tissues is necessary since unstained objects are usually transparent and have a refractive index close to that of the mounting media used. Also, since different tissues and cell contents possess affinities for different stains it is possible to differentiate them with two or more colors in the same section. The stains commonly used include aniline colors, acid, basic, and neutral; vegetable and animal dyes; and metallic impregnation with gold or silver. Staining methods are often quite complex, but when carefully done yield beautiful results.

Clinical Microscopy.—In no other field are the varied microscopical techniques employed to the extent required by the study of disease. Examination of pathological tissues, blood, intestinal parasites, urine, feces, bacteria, insect carriers of disease and the manner of their transmission, with many other problems call for the utmost in manipulative technique. One procedure, limited almost exclusively to this field is the examination of neoplastic tissues while a patient is still on the operating table, to determine the nature of the growth and the degree of malignancy. Since time does not permit the employment of standard embedding and staining processes, tissues must be sectioned by freezing. Special carbon dioxide freezing devices attached to the microtome will harden a tissue for sectioning within a few minutes. Then with a quick stain, a diagnosis can be made at once.

Petrology.—The study of rocks and minerals by means of thin transparent sections is a specialized type of microscopy not only in that the work must be done with microscopes designed for the purpose, but also because the technique of preparing material for examination is different. Sections cannot be cut with a microtome; they must be ground to the proper thickness, usually about 30 microns. Briefly the procedure involves slicing the material in a diamond-charged metal saw to a thickness of one to two millimeters; grinding one side smooth and flat on a glass or metal plate charged with carborundum and water; then cementing it to a slide with hard balsam or other cement. The section is then ground down to the desired thickness, removed from the slide and remounted on a fresh one, and covered with a cover glass. If the material is soft and friable, it must be left on the slide on which it has been ground since it would disintegrate if removed.

Special knowledge is required in the study of rocks and minerals, including the nature and use of polarized light and the optical characteristics

of minerals. The technique of preparing petrographic slides, however, is of value in some biological work, e.g., bone, teeth, calcareous secretions, and the like.

Metallography.—The study of metals is another phase of microscopy requiring a special technique. In this case examination is done on suitably prepared flat surfaces which must be illuminated from above. The surface to be studied must be flat and represent non-distorted metal. To produce this condition, grinding and polishing must be done in stages on carborundum papers of increasing fineness, the scratches from one grade being removed by the next finer until a surface is obtained which can be polished on wet cloth wheels charged with polishing powder that gives a mirror finish free of scratches. Then this surface is etched with a suitable acid adapted to the metal or alloy to be examined.

Microscopes designed for metallographic work do not require substage equipment, mirror, or condenser, but must have a vertical illuminator located above the objective. Light is projected into this illuminator from above and deflected downward by a mirror through the objective, which thus serves as a condenser, onto the metal surface. This illuminated surface is studied and interpreted by means of the differential etching of the various constituents present. Since no cover glass is used in the study of metals, special objectives corrected for use without them must be used. These objectives are also designed with shorter mountings to minimize glare.

Photomicrography.—The key fact in taking photographs through a microscope is that a compound microscope as a whole functions as a single magnifying lens, in that it produces a virtual image in the eye and a real image on the screen. With the screen located 10 inches from the eyepoint the magnification is identical to that seen by the eye, at 20 inches it will be twice as great, and so on. A slight change in the focus is necessary when changing from eye focus to projection.

Photomicrography, therefore, requires only the addition of a camera, without lens (the microscope becoming the lens), and a powerful light source. For best results these should be so mounted with respect to each other, after proper alignment, that they can not easily be disturbed. While a fixed focus camera can be used, one with an adjustable long bellows is preferable since the magnification is then variable with a given combination of lenses. Also the camera should allow the image to be seen and focused on a ground glass screen. The microscope can be either in its vertical position with the camera above it, or turned to the horizontal position with the camera also horizontal. The latter is more desirable for several reasons—it eliminates the mirror which must be used in the vertical position, it allows the use of a mounting board on which the complete apparatus can be placed, and it makes easy the proper alignment of lamp, microscope, and camera. Easy means for moving the camera out of the way for eye examination is essential; also some type of optical bench located between the light and microscope, on which accessories such as shutter, filter holder, and polarizer can be placed when needed. A collimating lens in front of the lamp for focusing the light into the microscope is an important accessory.

For many objects the use of light filters is required. The practical minimum of these would be red, green, blue, light yellow, and orange. They are used for reducing or intensifying contrast as desired, depending on the colors in the object. Also the use of panchromatic plates or films is necessary when red is a dominant color in the object. For best results one should have a practical knowledge of the optical principles of the microscope and of photographic processes.

Probably the greatest problem involved is the exposure time, since this depends on so many factors: (1) the intensity of the light; (2) the speed of the film used; (3) the magnification on the screen; (4) the speed factor of the filter necessary; (5) the numerical aperture of the objective; (6) the amount the condenser diaphragm is closed beyond that point where its aperture equals that of the objective; and (7) the nature of the object being photographed. The best procedure is to determine by repeated trial the correct exposure under one set of definite conditions; then the effect of variables can be computed for other combinations. Exposure time varies as the square of the magnification; inversely as the square of the numerical aperture of the objective (see MICROSCOPE); directly as the filter factors (data supplied by the manufacturer). But only experience will guide as to the density of the object, the relative intensity of the image on the ground glass screen serving as a measure.

Although the objective alone will project an image, it should never be used without an ocular (eyepiece) since it produces a perfect image only at the computed optical tube length. With an ocular, the projection distance is not a serious factor. Photomicrographs can be taken either in black and white or color film or by any standard color process.

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ROY MORRIS ALLEN.

MICROTOME, mī'krō-tōm, an instrument designed for cutting thin sections of plant and animal tissues for study under the microscope by means of transmitted light. It may be small and of simple design or very large with extremely complex mechanisms, but the principle is the same in all. The three essential parts are: a means for supporting rigidly the tissue material to be cut; a knife honed to razor sharpness, also rigidly held in the proper position for making the cut, and movable across the tissue in the plane of the cut; and means for advancing the position of the knife with respect to the tissue a definite, predetermined, and uniform amount for each cut.

Since the microscope, especially when high magnifications are involved, possesses a very minute depth of focus, and also because some materials are relatively opaque, it is essential that a microtome be able to cut sections within the range of useful thickness. The more elaborate instruments are usually susceptible of ad-

justment to cut any desired thickness between 1 and 60 microns (a micron is approximately 1/25,000 of an inch). The usual thickness employed for histological and pathological tissues is from 5 to 10 microns. Advances in the use of the electron microscope for studying sections has required refinements in the design of microtomes for this purpose so as to make it cut as thin as 1/10 of a micron (1/250,000 of an inch).

Microtomes may be grouped into three types —simple hand models, sliding microtomes, and rotary microtomes. In the sliding types the object being cut is usually stationary, the knife moving horizontally over it on sliding tracks. Rotary microtomes have a vertical stationary knife with the object moving up and down across it. In both types the object is advanced after each cut to give the desired thickness. For the technique of preparing specimens for sectioning and mounting see MICROSCOPY.

ROY MORRIS ALLEN.

MIDAS, mī'dăs, in Greek myth, a king of Phrygia, proverbial for his golden touch and for his ass's ears. The gift of the golden touch came from Bacchus, whose follower, Silenus, Midas rescued and treated kindly; in return Bacchus offered him any wish he would name and Midas asked that all that he touched should be turned into gold. When he found that food and drink became gold at the touch of his lips, Midas besought Bacchus to take back the gift; some stories say he was sent to bathe in the river Pactolus, which ever after was full of gold-bearing sand. His ass's ears were given Midas by Apollo to punish the king for declaring Pan's pipe more musical than Apollo's lyre. Hence "ears of Midas" is a phrase used of ignorant critics. Midas' barber discovered the king's secret deformity and whispered it into a hole in the ground, where reeds grew up whispering the story in the wind.

MIDAS, a genus of marmosets (q.v.).

MIDDELBURG, mĭd"l-bûrg, commune, the Netherlands, capital of the Province of Zealand, on the island of Walcheren, 4½ miles northeast of Flushing. Middelburg was a medieval Hanse town, and one of the leading mercantile cities of the United Provinces, sending many ships to the East and West Indies, and the Levant. Its former commercial importance, however, has declined, being now confined chiefly to a coasting and domestic trade. Pop. (1947) 20,605.

MIDDLE AGES, The, a period of history supposed to extend from the fall of the Roman Empire in the 5th century to about the year 1550, covering from 10 to 11 centuries. The Middle Ages embrace that period of history in which the feudal system was established and developed, down to the most prominent events which necessarily led to its overthrow, though its consequences and influences are still very observable in the states of Europe. The first centuries of the Middle Ages are often termed the Dark Ages (q.v.). Still, the destruction of Roman institutions by the irruption of barbarous tribes is often unduly lamented, and the beneficial consequences attending it overlooked. True it is that many of the acquisitions which had cost mankind ages of toil and labor were lost in the general wreck, and only regained by the efforts of many successive generations; the flowers of civilization were trampled underfoot by barbarous warriors; the civil development of society suffered a most severe shock; those nations to which Roman civilization had extended previous to the great invasion of the Teutonic tribes were thrown back in a great measure to their primeval barbarism, and the unruly passion for individual independence greatly retarded the development of public and private law, and in some countries has entirely prevented a regular civil constitution. So also the most remarkable institution of that time, its characteristic production—chivalry—exhibited all the peculiarities of the corporations. War was the profession of the nobles. No one of their order who was not a knight could bear a lance or command cavalry. The weak side of the Middle Ages is the scientific. Physical science was still in a very crude state, and the lack of the proper apparatus necessary for its accurate pursuit was a serious handicap. Considering, however, the inefficient means then at hand, the knowledge attained, though of course rude, inaccurate and often mere guessing, was greater than is popularly supposed. The efforts of Charlemagne in the 8th century to encourage science and instruct the people laid the foundations for a more thorough and systematic training, which culminated in the great schools of scholasticism of the 12th and 13th centuries. The process was slow and often retarded by the unsettled social and political conditions that prevailed through this period. The 14th and 15th centuries witnessed a rapid and brilliant development finding its apogee in the Renaissance movement. See HISTORY, MEDIAEVAL.

MIDDLE EAST, the region situated mainly in southwest Asia and northern Africa, predominantly Moslem in religion, which may be broadly described as forming the bridge between the continents of Europe, Asia, and Africa. For the purposes of this series of articles, the term Middle East includes the following political units:

(1) *In Europe:* Greece (with Crete) and Turkey in Europe.

(2) *In southwest Asia* (bordered by the Soviet Union, China at Kashmir, and India): Turkey in Asia; the Mediterranean island of Cyprus; Syria; Lebanon; Israel; Jordan (comprising former Transjordan and non-Israeli Palestine); the countries of the Arabian Peninsula—namely Saudi Arabia, Yemen, Aden and Aden Protectorate, Masqat (Muscat) and Oman, Trucial Oman, Qatar (Katar), Kuwait, and the adjacent Bahrain Islands; Iraq, Iran (Persia); Afghanistan; and western Pakistan.

(3) *In Africa:* Morocco, Algeria, Tunisia, Libya, Egypt, and the Sudan.

From a strategic point of view, the Ethiopian Plateau and the lands generally east of it to the Red Sea, the Gulf of Aden, and the Indian Ocean —namely Ethiopia, Eritrea, British and French Somaliland, and Somaliland (former Italian Somaliland)—could be included in the Middle East, but are here excluded because of their many divergencies from the rest of the region.

From a religious point of view, the Middle East thus comprises, primarily, the predominantly Moslem countries of southwest Asia and of Africa; but it also includes the Christian-Moslem state of Lebanon and the Jewish state of Israel, both of which are geographically inseparable from the rest of the region, as well as

the nearby island of Cyprus, which is predominately Christian. Greece, a Christian state, is a part of the Middle East, both in view of the widespread Hellenistic civilization of the pre-Moslem period and the role played by Greece in the maritime affairs of the eastern Mediterranean.

The term Middle East as here used replaces other terms for parts of the same region. All of what is generally considered as comprising the "Near East" is included, except the Balkan states north of Greece, which were included in the "Near East" by some authorities before World War I. Also included is the "Levant," a general term for the eastern Mediterranean region from western Greece to western Egypt, meaning, as does "Anatolia," the land where the sun rises.

Also consult *The Middle East: a Political and Economic Survey*, Royal Institute of International Affairs (London 1950).

Under the following headings will be found an authoritative treatment of the Middle East, its geostrategic and economic importance, its historical, political, social, and cultural aspects:

1. Delimitation of the Middle East
2. Statistical Highlights
3. Geostrategic Uniqueness
4. Center of Creation, Radiation, and Mediation
5. Hebrew Civilization
6. Influence of Hellenism on the Middle East
7. Rome and Western Civilization
8. Oriental Christianity
9. Byzantium and Eastern Christianity
10. Birthplace of Islamic Civilization
11. The Arab Caliphate: Its Rise and Decline
12. Rise of the Turkish Empire
13. European Imperialism
14. Russian Messianism and the Middle East
15. Nationalism
16. Social and Economic Problems
17. Petroleum
18. The United States and the Soviet Union in the Middle East
19. The Importance of the Mediterranean
20. The Law of the Near and Middle East
21. The Arts: Reaction Against Hellenism
22. American Archaeology in the Near and Middle East

1. DELIMITATION OF THE MIDDLE EAST. The terms "Near East" and "Middle East" have had different meanings at various times and places. The old and for centuries the prevailing term had been that of "Near East," taken from the geographical viewpoint of the western European countries, particularly those bordering on the Atlantic and the western Mediterranean, such as Great Britain, Portugal, Spain, Holland, France, and the Italian city states, dealing commercially and politically with the Near East. This term was also accepted by the three great landpowers driving toward the Near East and the Mediterranean from the northeast and northwest: Russia, Austria, and Germany.

All of this Near East was included in the Ottoman Empire in the 16th century during the height of its power—an area as large as the United States of America of today, spreading into the three continents of south Europe, west Asia, and north Africa, and connecting the Atlantic and Indian oceans, and through the latter, the Pacific Ocean. In today's terms that empire embraced in Europe: parts of Austria and Hungary and all of the five Balkan states; in Asia: all of the seven Arab states, plus Israel, the British protectorates of the Arabian Peninsula, parts of Persia (Iran), and six Soviet Russian states; in Africa: all the countries of that continent's Mediterranean littoral, including Egypt, Libya, Tunisia, Algeria, and Morocco; in the Mediterranean Sea: all the strategic islands, except Malta, as

THE MIDDLE EAST

The delimitations of the Middle East area as defined in this article are shown on the map above. The southeastern corner of the Mediterranean Sea is shown in greater detail in inset A; the Persian Gulf area, in inset B.

Top: Cairo, Egypt, from the Citadel. Sultan Hassan Mosque is in the foreground. *Bottom:* View of Istanbul, Turkey. The Galata Bridge crosses the Golden Horn into the modern section.

Top, Courtesy American President Lines; bottom, © Gendreau

MIDDLE EAST

Top: Street scene in Teheran, Iran. The Elburz Mountains are in the distance.

Center: Ashar, Iraq. The Madat Al-Ashar Canal with its canoes. The Maquam Mosque is almost at the water's edge.

Bottom: Jerusalem, Palestine. Arabs smoking their water pipes.

(1 and 2) © Gendreau; (3) © Ewing Galloway

well as the strategic waterways leading from the Mediterranean to the Atlantic and the Indian oceans.

The disintegration of the Ottoman Empire, ending in final dissolution following World War I, covered a period of about a century and a half. During that time, all issues arising between the empire and the competing European powers were called questions of the Near East (see EASTERN QUESTION). More than a score of national states grew out of this gradual dissolution of the Ottoman Empire.

During the historic evolution of the Balkan states toward their nationhood, the Balkan Peninsula (q.v.) was taken out of the Near East delimitation and referred to as "South East Europe." At the same time, Europe used the term "Middle East" for the area between the Ottoman Near East and the Far East, comprising such non-Mediterranean countries as Persia (Iran), Afghanistan, and India.

In the United States, also, the two terms have been used in different ways. E. A. Speiser's book on *The United States and the Near East* (1947) designates as "Near East" only the area of the Arab League, Palestine, and Israel, without even Turkey. For the American Oriental Society, Iran together with Iraq constitutes the Middle East. The U.S. State Department's Division of Research for the Near East and Africa covers Africa (except Algeria and the Union of South Africa), Greece, Turkey, the Arab lands, Iran, Afghanistan, Pakistan, India, Burma, and Ceylon; while a special section deals with the immediate neighbors of the USSR—Greece, Turkey, and Iran. The *Middle East Journal* in Washington declares in its editorial foreword (1946) that "its attention will be centered on the heart of the area: Turkey, Iran, Iraq, Syria, Lebanon, Palestine, Transjordan, the Arab Peninsula and Egypt, but not without due reference to closely related peripheral areas, such as the Mediterranean approaches—North and East Africa; in addition, Transcaucasia, Afghanistan, India, and Turkestan." The Middle East Supply Center of joint American, British, and at times Soviet Russian cooperation from 1941 to 1946 included in Asia: Syria, Lebanon, Palestine, Transjordan, Iraq, Saudi Arabia, the Arab sheikhdoms, Aden, Iran, and Turkey; in Africa: Egypt, the Sudan and Ethiopia, Eritrea and Somaliland, Tripolitania and Cyrenaica; and in the Mediterranean: Cyprus and Malta; but it excluded Turkey because of the accident of its neutrality.

A subcommittee of the United Nations has also dealt with the question as to what countries comprise the Middle East (in 1948 on May 24 and 25 and on June 1), and has arrived at the following delimitation: Greece, Turkey, Iran, and Afghanistan, the seven states of the Arab League, and Ethiopia. For this region, a United Nations Commission was established to permit its economic development. On June 14, 1948, Pakistan applied for membership and was admitted. At the same time, neighboring Soviet Russia's claim to membership was rejected.

The American use of the term "Middle East," borrowed from the British, appears to have practically superseded the older European term "Near East," and British Prime Minister Attlee stated in the House of Commons in 1950: "It has become the accepted practice to use the term 'Middle East' to cover the Arab world and certain neighboring countries. This practice seems to me convenient and I see no reason to change it." However, the most proper term for the whole area in question would be "Near and Middle East," which has been accepted by Columbia University for its Near and Middle East Institute. This organization commenced with a minimum program covering Greece, Turkey, Iran, Afghanistan, the Arab countries (including the North African coast of the Mediterranean), and Israel. In view of the geographic and religious affinity of the Near and Middle East to the Moslems in India, the state of Pakistan was included.

The seeming differences in the use of the terms "Near" and "Middle" East will be understood if one approaches the issue from various aspects of geography, strategy and communications, politics and economics. From all these angles, the Near and Middle East offers a unique situation in ancient as well as in modern times, with varying emphasis on one or any part of the whole Near and Middle East area.

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2. STATISTICAL HIGHLIGHTS. Immediately to the south of the Soviet power bloc is a band of small but important nations whose common bond is that of resistance to the Soviet expansion southward. No other unifying principle connects these diverse states, as is proved by the statistical analyses which follow, and tensions among neighboring members of this regional grouping are strong. In these lands were located all the great early civilizations—Egypt, Sumer, Babylonia, and the Indus Valley—and many of their successors—Phoenicia, Greece, Assyria, and Persia—as well as such outlying peoples as the Hittites, the Mitannians, and the Hebrews. Nearly all human inventions were originated by Near Eastern peoples, including statistics itself, but their descendants have neglected this study. Consequently, the following figures vary widely in precision and must be considered as approximations, with conclusions drawn therefrom remaining necessarily somewhat tentative.

Government.—Politically the Near and Middle East area includes several nations which have imitated, more or less successfully, the institutions of Western democracy. Nominal republics include Turkey, Syria, Lebanon, Israel, and Pakistan; constitutional monarchies are Greece, Egypt, Iraq, and Iran. An older form of monarchy, with the ruler limited by custom and religious law, is found in Afghanistan, Jordan, Saudi Arabia, and the Yemen; while sheikhs under British protection rule in Aden Protectorate, Masqat and Oman, Trucial Oman, Qatar, Bahrain, and Kuwait. Aden and Cyprus are British colonies; Jerusalem is theoretically under United Nations administration. And the small neutral zones northeast of Saudi Arabia are under the undivided joint rule of that nation and Iraq or Kuwait.

The westward extension of this region, excluded from the following statistics unless specifically mentioned, includes a condominium in the Anglo-Egyptian Sudan, a United Nations trusteeship in Libya, within which are a Senusi tribal state under British guidance in Cyrenaica and a French regime in the Fezzan oases, a French protectorate in Tunisia, a government-

general of France in Algeria, and a sultanate in Morocco divided into a French protectorate, two Spanish zones, five Spanish-owned cities, and the international zone of Tangier.

Religion.—The political diversity is matched by the religious. Though the area is normally considered Moslem, other religions are well represented. Greece is 98 per cent Christian, Cyprus 82 per cent, and Lebanon 54 per cent, while significant Christian minorities are located in Syria and the North African countries. Jews comprise 93 per cent of the inhabitants of Israel and a majority in Jerusalem, and are scattered throughout the East, where they were accepted without prejudice until resentment against Zionism aroused hostility. A 10 per cent Hindu admixture complicates Pakistan's situation, but these Hindus are concentrated in Bengal outside the area presently in review. Finally, the southern Sudan is inhabited by animistic Negroes, who constitute 20 per cent of the total population.

Within the Moslem community similar divergence is found. Shi'ites dominate Iran (93 per cent) and the Yemen, and are more or less evenly matched with orthodox Sunnites in Iraq (57 per cent) and the Persian Gulf sheikhdoms and in the Moslem part of Lebanon. Saudi Arabia is controlled by the puritanical Wahhabis. Syria is an intricate mixture of Sunnites, Shi'ites, Nusayri and Druse (Druze) pseudo-Moslems, Yezidis, Maronite and other Christians, and a tiny remnant of Samaritans. Pakistan's minorities include Brahmins, Parsis (Parsees), Sikhs, Jains, and Isma'ili followers of the Aga Khan, whose origins go back to the Assassins of crusading times.

Although most of the territory historically under Moslem rule, except Spain and the Balkans, is included in this region, four of the five major Islamic powers of the 20th century are excluded: 69 million Moslems in the Republic of Indonesia lead Pakistan's 66 million for world priority, while India's 34 million, China's 23 million, and over 20 million in the USSR all exceed the highest figures west of Pakistan, that is, Turkey's 19 million, Egypt's 18 million, and Iran's 16 million. Thus it is clear that numerically the center of Islam is located far to the east of its origins in Mecca, although pilgrimage thither is still obligatory in theory if seldom feasible in practice. Mecca and Medina are still sacred to Moslems and absolutely forbidden to non-Moslems. There were approximately 360 million Moslems in 1950, 1 out of every 7 persons in the world, but, as they are said to have the world's highest birth rate, this proportion may be expected to rise steadily. (See also Moslem Sects.)

Population.—Total population of the Near and Middle East from Greece and Egypt to Afghanistan and western Pakistan may be estimated at 140,000,000, of whom about 124,000,000, or 89 per cent, are Moslems, with perhaps 12,000,000 Christians, a majority of whom are Greek Orthodox resident in Greece, 2,000,000 Hindus, and 1,000,000 Jews. The largest city in the region is Cairo, whose 2,100,000 is more than double that of its nearest rival, Alexandria (925,000). Next come Istanbul (860,000), Teheran (700,000), Lahore (672,000), Athens (487,000), Baghdad (450,000), Karachi (360,000), and Aleppo (320,000). Cities with populations between 200,000 and 300,000 are Ankara, Beirut, Damascus, Isfahan, Izmir (Smyrna), Mecca, Piraeus, Salonika (Thessalonike), and Tabriz.

The total area under consideration is a little less than 3,000,000 square miles, giving an average density of 47 persons per square mile, very unevenly distributed. The most heavily populated area is the Nile delta, while almost vacant areas include all of Egypt outside the Nile and Suez Canal strips, most of interior Arabia and western Iraq, two large deserts in Iran, and parts of Anatolia, Afghanistan, and Baluchistan. Though most of these areas can never support large numbers of people, the fertility of Iran, Iraq, and Anatolia has been greatly diminished by poor agricultural techniques and destruction of irrigation networks. Efforts at diversified, intensive scientific agriculture in Israel may be copied elsewhere if successful.

Inclusion of North Africa from Morocco to Cyrenaica would add about 1,750,000 square miles and nearly 23,000,000 inhabitants, of whom all but 2,000,000 are Moslems. This would bring the total area to 4,700,000 square miles; total population to 163,000,000, with 145,000,000 Moslems and 14,000,000 Christians; and reduce density per square mile to 35. North African cities of over 200,000 are Casablanca (550,000), Tunis (365–000), Algiers (360,000), Oran, Marrakech, and Fez.

Language.—The ethnic stocks are thoroughly mixed throughout the area, and can be approximated only roughly by the more easily analyzed linguistic groupings. Arabic is spoken throughout the Arabian Peninsula and in Iraq, Syria, Lebanon, Jordan, Egypt, and much of North Africa, where Berber and French also are in common use. Hebrew and Yiddish dialects are heard in Palestine, Turkish in Turkey, Greek in Greece and Cyprus, Persian in Iran, Pushtu (Pashto) and Persian in Afghanistan, and Urdu with many rivals in Pakistan. Armenians, who have largely discarded their language except in Soviet Armenia and Iran, but who retain their ancient form of Christianity, are found throughout Anatolia; Greece and Turkey forcibly exchanged respective minorities in the 1920's. Turbulent Kurdish tribes occupy the highlands north of Mosul, and their periodic revolts alternately threaten Turkey, Syria, Iraq, and Iran as they resist cultural subjugation. Half of the estimated 3,000,000 Kurds live in Turkey, 700,000 in Iran, 500,000 in Iraq, and 200,000 in Syria.

Environment.—Physically the Near and Middle East is less diverse than in its human geography. It is dry and hot in summer, dry and mild in winter except around the Mediterranean and Black seas, where wet mild weather prevails. Both ends are high: the Atlas Mountains in Morocco, the Pamirs and Hindu Kush in eastern Afghanistan, spurs of the Himalayas in northern Pakistan. Highlands cover eastern Anatolia and western Iran, rising to 18,600 feet at Demavend and 16,873 at Ararat. The whole region is seriously subject to earthquakes, though the only active volcano is located in the Cyclades. Vegetation is notably sparse, but animal raising—sheep, goats, camels—is general. The occurrence of oil and the absence of land transportation are discussed in the separate section on economic survey.

Education.—The cultural centers are Cairo, Beirut, Athens, Istanbul, Baghdad, Teheran, and Lahore. American colleges and universities at Athens, Beirut, Istanbul, and Cairo have joined European and Near Eastern institutions in educating the most promising young people, but gen-

eral literacy remains low, though dependable statistics are rare. Lebanon, with nearly three fourths of its children of elementary school age attending educational institutions, is far in advance of its Moslem neighbors, among whom Egypt and Jordan with less than 50 per cent at school still are the leaders. Turkey's literacy has risen sharply since the introduction of the Latin alphabet in 1928, but the difficult Arab script delays universal literacy among speakers of Arabic, Persian, and Urdu. The British in India and Egypt and the French in North Africa, and to some extent in Syria and Lebanon during their mandate, tried to spread educational opportunities, with only moderate success. Greece, Lebanon, and Israel rank high among their neighbors in such other cultural activities as journalism, book publishing, and archaeological research.

Summary.—These statistics convey a definite impression that the Near and Middle East, with North Africa, is an underdeveloped area which has not yet been sufficiently integrated into the political and economic structure of the modern world. Although it contains one twelfth of the world's land area, and only one fifteenth of its population, the uselessness of much of that land for cultivation has hampered economic progress. Restoration of fertility to the arable land, irrigation, reforestation, and final defeat of this region's perennial enemies—drought, famine, and pestilence—must be considered goals as important and as urgent as military support and educational advancement.

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3. GEOSTRATEGIC UNIQUENESS.

In all the varieties and changes of the fates of empires, states, and peoples of the Middle East, for its whole as well as for its parts, there has been one unchanging and unvarying factor—that determining force which Napoleon in his twofold capacity as statesman and strategist called "the mother of politics"—geography. In fact, he himself was defeated in his reach for world domination by the geography of the Middle East.

History is also geography in motion. The geographical factor in Middle Eastern history has great significance, since no other region is so strategically located as the middle land, where three continents meet and merge, along the middle sea, the Mediterranean, which connects or separates three oceans.

The geographical and geostrategic heritage of the Middle East has been shared by every nation of that area, from the early epoch when the Trojan War was fought for control of the Dardanelles and the first "Suez Canal" was built by the pharaohs, down to our century. Irrespective of whether the governing power was united in a single imperium, as under the Ottoman Turks and earlier empires, or divided among many sovereignties, this heritage of the whole middle land and middle sea complex has been jealously guarded by the Middle East people against attacks from the East and the West. Now a new front for the United States of America has been created along the northern frontier of the middle land on three continents, and the sea between the three oceans has become a lifeline for America as well as for Great Britain.

This three-continental and three-oceanic status epitomizes the geostrategic uniqueness of the rectangle between the Adriatic Sea and the Indus River, and between the Black Sea and the Indian Ocean. The three coastlines include three peninsulas (Greco-Balkan, Turkish, and Arabian) involving three straits which connect three adjacent seas—the Adriatic, the Black, and the Red —with the Mediterranean Sea and also open or lock the exit to three oceans. In addition, there is the important factor of the strategic islands at the approaches to the straits as well as all over the Mediterranean. On the three continents are the three rivers which have fomented interneighborly and international issues—the Danube, the Nile, and the Mesopotamian Tigris-Euphrates—flowing into the Black Sea, the Mediterranean, and the Persian Gulf.

These geographical facts, as old as recorded history, have created all the geostrategic issues connected with interregional, intercontinental, and interoceanic communications, and with the control of isles and ports, straits and bases, whether by military, naval, or air power.

Two would-be world conquerors expressed the same geostrategic concept of the Middle East in identical terms, Peter the Great and Napoleon, when they proclaimed that whoever controls Constantinople (the Middle East) can rule the world. Hitler's failure in World War II to achieve control in the Mediterranean has not discouraged the Kremlin's 200-year-old Russian ambition for a similar penetration via Istanbul into the middle sea.

To such expanding geostrategy, Gen. Dwight D. Eisenhower in 1947 gave the American viewpoint that if the Mediterranean should be closed to the United States, the latter would be closer to war. Some seven years before this statement was made, the United States government had indicated that the independence of the Middle East nations was necessary to American security. The world has so shrunk that what was once the center of the Old World, by 1940 had become in Franklin D. Roosevelt's words, "the New World center of gravity"; for the Mediterranean, as a link between the Atlantic and the Pacific, had become for the United States almost as indispensable as the Panama Canal and Caribbean Sea. To quote Gen. Eisenhower in 1951, "there is no more strategically important area in the world than the Middle East."

The same geostrategic question through all history (in ancient times, from east to west and vice versa; in modern times, from north to south) has been: Will the Middle East be used as a steppingstone by an aggressive power seeking world domination, or as bulwark against threatening aggression? The British geostrategist, Sir Halford Mackinder, who termed the Middle East "the heart land of the Eur-Asian-African world island," summarizes the importance of this bridge or barrier as follows: "If the World-Island be inevitably the principal seat of humanity on this Globe, and if Arabia, as the passage-land from Europe to the Indies and from the Northern to the Southern Heartland, be central in the World-Island, then the hill citadel of Jerusalem has a strategical position with reference to world-realities not differing essentially from its ideal position in the perspective of the Middle Ages, or its strategical position between ancient Babylon and Egypt." *

* Mackinder, Sir Halford, *Democratic Ideals and Reality*, p. 89 (Holt Company, New York, 1942).

On the hill in Ankara the stones tell the geostrategic story of the Middle East from the era of the ancient Hittites (c. 1550 B.C.), to the *Monumentum Ancyranum,* the famous record left by Emperor Augustus to his Roman subjects around Ankara in 14 A.D. The account is there —of Egypt, Assyria, Babylon, Persia, Rome, and those more recent empires, Byzantium and the Ottoman Empire.

In the narrow gorge amid the snow-covered Taurus Mountains, Greek stele and Roman milestone stand side by side. These too tell of conquest and of empire. Xenophon and Alexander the Great, the general and the geostrategist, traversed the pass. Mark Antony, Caesar's friend, and Julian the Apostate, Roman emperor, later led their legions through it. Frederick Barbarossa, the crusading Hohenstaufen emperor, crossed mountains at this spot close to the treacherous Calycadnus River wherein he was destined to drown.

Farther to the south, in Lebanon, one sees side by side the monuments of the great strategists of their times, erected by themselves—an Egyptian pharaoh, an Assyrian king, a Roman emperor, and the French Napoleon.

Consider the two principal geostrategic lines of the Middle East: the Dardanelles and the Suez Canal. During the Gallipoli campaign (1915) the writer, at the time on a German mission to Turkey, standing with Mustafa Kemal (later Kemal Atatürk) on the site of Homeric Troy, from Achilles' grave and Agamemnon's battlefield observed the enemy British battleship *Agamemnon* and the gallant Anzacs, who had been dispatched in accordance with Winston Churchill's brilliantly conceived but badly executed geostrategic plan. The thoughts expressed by Kemal on that occasion concerning the vital importance of the Dardanelles had nothing of novelty in them. Conceivably, like thoughts had passed through the minds of Agamemnon and Achilles. Such has been the significance of this narrow strait from the prehistoric times of Troy to the Dardanelles Conference at Montreux in 1936, and to the Soviet demands of 1950.

Franco-British-Russian rivalry in the Middle East over a period of two centuries saw the emergence of French and British policies favoring Turkish protection of this international seaway under international agreements and guarantees. Since 1945 American policy has conformed with this western European policy. Turkey has defended her control of this waterway ever since 1356. She had to fight no less than 10 wars in a single century. She fought two wars against land armies marching from Egypt in the south—those of Napoleon in 1799, and Mehemet Ali in 1833, who drew as close to the Dardanelles as Brusa. Five wars against Russia were fought in 1806, 1828, 1853, 1877, and 1914. Russia pressed down from the north into the Balkans and once succeeded in reaching San Stefano (1878), just as her protégés, the Balkan states, would reach the Chatalja line of Constantinople in 1912. Turkey fought two wars against seapowers driving in from the Mediterranean: Italy in 1911 and the British-French Navy in World War I. Four times Turkey was allied with and protected by Britain and France against the menace of land attack from the Balkans; twice she was allied with Russia against a land attack from Egypt. Whenever a third party appeared, such as imperial Germany or Hitlerite Germany, Britain, France and Russia took joint action regarding the Dardanelles, just as in the late 1940's the United States and Britain assisted Turkey diplomatically and economically against Soviet Russia.

The other international waterway of the Middle East, the modern Suez Canal completed in 1869, has a history of 4,000 years. To accommodate the waterborne traffic between the Mediterranean and the Red Sea the pharaohs dug a canal between the Nile and the Suez Gulf. This "Canal of the Pharaohs" in later ages was renamed the "Canal of Darius" (Darius' stele is still there), then the "River of Trajan," and later, "Canal of the Prince of the Faithful" in honor of Mohammed. When the Middle East land and sea routes were blocked by the three-continental Ottoman Empire, the Portuguese and Spanish geostrategists searched for an independent sea route to the Far East; in so doing they discovered America.

At first the fight over the Middle East was concentrated on the control of the waterways. Later it shifted to competition for overland routes and railways, since great rivers and great highways are always bad neighbors. The Constantinople-Baghdad Railway was needed to link distant parts of the Ottoman Empire to the capital for administrative as well as strategic reasons. But since it could not be planned as a domestic investment, it grew into an international issue of first magnitude because of the immediate strategic interest of rival imperialist powers. For a railway represents not merely a land route or a financial and economic activity, such as the irrigation of land or the cultivation of wheat or cotton, but a line of political influence, an indicated direction of political expansion, a possible road of invasion to colonies and to strategic positions. On the chart of Ottoman Turkey's railways can be read the temperature of Europe's power struggle and diplomatic rivalry. Some of the lines invaded Ottoman Turkey's distant provinces from the periphery of the Mediterranean and tended to weaken the bonds of those provinces with Constantinople. Others, starting from Constantinople, strengthened the Ottoman government with economic and strategic outposts. But one line served to bring into head-on collision two great imperialist powers with interests on opposite sides. This was the Constantinople-Baghdad Railway, misnamed the Berlin-Baghdad Railway. That very misnomer indicates its strategic significance in the opinion of one of the two empires concerned.

The Baghdad Railway (q.v.) is an interesting case in point. It had been a project of the Deutsche Bank as early as 1888, when the concession for the Anatolian Railroad, Constantinople-Konya, was obtained from the Ottoman government. This Anatolian Railroad reached Ankara in 1892 and Konya in 1896. But its continuation to Baghdad, although agreed upon in 1899, had only reached Ereğli by 1908. Then it was conceived alternately as a German or a European (German-French-British) plan to develop the Near East. This economic project increasingly became a bone of political contention between the European powers regarding Near Eastern geostrategic potentialities. The Russians fought it because it served to strengthen the Turks, their "hereditary enemy." England alternately fought for and against it. France's attitude also varied with the Triple Entente's policy. The international character of this economic undertaking,

actually a sort of international highway, can be attested by (1) the German-French financial treaty concerning the Baghdad Railway in 1899; (2) the British government's agreement in 1902 to participate financially in the project; (3) Bernhard von Bülow's belief in 1899 that Russia had dropped her previous opposition to construction of the Baghdad Railway, as at long last Britain did in 1913–1914, a quarter century after its start.

In all epochs of history, when landpowers have disputed with seapowers the possession of territories, chief access to which was by water, the nations gaining command of the strategic sea routes have prevailed over powers holding only strategic land routes. Those nations able to transport overseas at will to the theater of operations the requisite personnel and matériel have invariably triumphed. As examples of this general rule one may cite the victory of the seaborne Greeks at Troy, the defeat of Persia by Greece in the naval battle of Salamis, Rome's victory over Carthage, and that of England and her continental allies over Napoleonic France, mainly achieved through Britain's command of sea routes. In our own day the general rule has continued valid. Examples include: the maintenance by the Allies of the sea routes to Salonika and Alexandria in both world wars; during World War II, the victory in the North African campaign, assured by Allied seapower; also the effect on the war of the ability of the United States, through Allied possession of the sea routes, to ship American war matériel across the Indian Ocean and the Middle East "Bridge of Victory" through Iran to Stalingrad.

The fact that William II and Francis Joseph in World War I, and Hitler and Mussolini in World War II, were deprived of the use of the great world sea routes at the outset of those conflicts, that they were landlocked on the European continent, ensured their ultimate downfall. Seapower again proved the decisive factor, as had happened in the case of those other conquerors —Xerxes, Hannibal, and Napoleon—who made vast conquests of Mediterranean peninsulas only to suffer final defeat by enemies who attained naval supremacy in the Mediterranean Sea.

From ancient times the pattern of seapower versus landpower has repeated itself countless times through history in the Middle East. Just as the Greeks and the Persians had fought the issue, so later Spaniards, Portuguese, Genoans, and Venetians contested it with the Ottomans. England, France, and Russia followed the same pattern in their diplomatic and warlike dealings in the 19th century.

The oil age has turned the Middle East into that intercontinental and interoceanic center of air communications without which no round-the-world and all-weather air route is possible. Thus the recent addition of airpower to the old issue of land and sea communications has only heightened the geostrategic uniqueness of the Middle East as a new center now studded with airbases, American and British, around the Mediterranean from the Atlantic to the Indian Ocean. From these bases it is possible to fly over most of the three-continental expansion—a position which has the particular aspect of immediate closeness to the Russian neighbor and his oil potentials.

"Whoever controls the still untapped oilfields of the Middle East will have power to make peace or war." Thus spoke King Ibn Saud to President Franklin D. Roosevelt, when they met in 1945 during World War II on an American warship in the Suez Canal less than two months before the president's death. American oil geologists have characterized the Middle East as the "center and the heart of the international oil production"; "the world's greatest reserves of oil, vast beyond imagination, with unparalleled abundance"; the "potential biggest development of natural resources ever undertaken by American investments" including the vast network of pipelines from Arab lands to the Mediterranean. Ibn Saud's statement to Roosevelt is but a restatement of Clemenceau's characterization of oil as "the powerful last word in matters of peace and war."

In 1951 the United States had an oil monopoly in Saudi Arabia, as had Britain in Iran (a monopoly attenuated by the Iranian government's expropriation of the Anglo-Iranian Oil Company's holdings in March-April 1951), while in other parts of the Middle East, particularly Iraq, the United States and Britain owned common shares with French and Dutch investments. According to official joint statements of the strategic, political, and economic authorities of the United States government, Middle Eastern oil is indispensable for the United States Navy in the Mediterranean Sea and the Indian and Pacific oceans, as well as for European recovery under the Marshall plan. Oil is still the most strategic raw material on which alone navies, armies, and air forces can move, even in the atomic age. The atom bomb has not reduced the requirement of liquid fuel; it only has placed a higher premium on airborne transport as against ships. Since the bomb cannot fly, it must be taken to its objective by plane or by missile needing oil.

Thus the geostrategic uniqueness of the Middle East is based on the twin pillars, one of which represents the old center of world communications, and the other, the newly developed natural power—oil, vital for peace or war.

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4. CENTER OF CREATION, RADIATION, AND MEDIATION. The Middle East forms that part of the world where the most dramatic and decisive episodes in the history of mankind were enacted. There, in prehistoric times, took place the discovery and working of metals, presumably in the Transcaucasian Mountains or on the southern shores of the Black Sea; in Afghanistan and adjacent countries, the cultivation of plants, along with the domestication of animals; and it would seem that from the disks of the sun and moon, the

wheel descended to earth in the forms of the potter's wheel, the cartwheel, and the cylinder. The way having been paved by such achievements, there arose on the soil of the Middle East that almost inextricable mass of states and civilizations among which murderous rivalries seem to have stimulated, rather than impaired, the creation of great cultural values. There is in our Western civilization much which stems directly from the Middle East, and hardly anything which cannot be traced ultimately to the Middle East.

Nowhere have heaven, earth, and the nether world been so well balanced, so neatly separated, yet so intimately connected as in the magic-based civilizations of ancient Egypt and those of Mesopotamia, particularly Babylon. All civilizations of the Middle East seem to have been created by down-to-earth people to whom life meant everything, the life of the nation no less than that of the individual. In defiance of transiency, they erected monumental buildings (pyramids, temple towers, palaces) and used their art, sculpture, relief, and painting for the main purpose of transmitting to posterity portrayed personalities and scenes of their life in war and peace. From the same powerful motive came the invention of the script, which may have occurred in more than one place, perhaps in Sumer and in Egypt. Starting with the pictographic, it developed into syllabic script and—only in the Middle East—reached its climax in the invention of the alphabetic script which, by its convenience and adaptability, foreshadowed the intellectual achievements of Western civilization. (See also ALPHABET.) The art of writing spread not only to the West; India also received it from the Middle East, one form deriving from the Phoenician, the other from the Aramaic script.

Nowhere else, on the other hand, did the deep anxiety ingrained in life, the fear of the ephemeral, the horror of death and destruction, become so predominantly elements of life itself. Mytho-magic journeys to the nether world and heaven in quest of immortality and resurrection were pictured in grandiose epics (such as those of Gilgamesh, q.v., and Etana), preparing the way for the savior-religions. Nowhere else was the world of heavenly powers and gods so concretely visible, without, however, suffering the anthropomorphism of the Greeks; nowhere were designs and influences traced and controlled with so keen an awareness as in the astral religions of the Middle East. Identification of the deities with sidereal bodies not only carries an immediate certainty of their existence, but also awakens a passionate interest in the stars. Hence, scientific astronomical observation and calculation became connected with astrological interpretation. The Mesopotamian duodecimal system lives on within our own decimal system, in the division of the zodiac, in the reckoning of the year and the hour. The dependence of terrestrial events on sidereal constellations (the "influences" flowing from the stars to earth) is not only the most impressive of the magic links binding the three worlds together, but also testifies to a sense of order and harmony, an idea of law and its formulation.

This world conception was overcome by the one God of the Hebrews when, in the times of the prophets, the idea of God was freed from the limited view of a tribal and national god and from the mytho-magic elements inherent in it. With Christianity and Islam deriving from Judaism, the Middle East monopolized monotheistic religion, whereas Europe proved unproductive in the realm of higher religion. This is evident from the secular character of Greek culture and of Western civilization as a whole. Thus with the triumph of monotheism on the one hand and the rise of a secular culture on the other, an epoch ended.

Greece rests upon the civilizations of Egypt and Asia, including the intermediary but highly independent civilization of the Aegean Islands with Crete as its center. Early Greek art bears the mark of its Aegean paragon, and before adopting their alphabetic script from the Phoenicians, the Greeks seem to have used script of Cretan origin. However, there never was a more creative assimilation and transformation of foreign influence, or a more momentous creation than the culture that rose on the Greek peninsula. The forms of our Western thought and the means of philosophic and scientific expression stem from Greece, as do the spheres of our cultural life and the objects of our interest. If Christianity constitutes the only significant exception, still the dogma and the theology of the church are the work of Greek thought. As to the modern period, the formation of the mind and the orientation of our interest are obviously more deeply determined by Greece than by Christianity. Greece assigned to philosophy the place hitherto occupied by religion, and Greek philosophy from its beginning was closely connected with the quest for scientific knowledge. From this relationship, the scientific effort of the West—though its roots were in Egypt and Mesopotamia—derived its nature, becoming a dispassionate and disinterested movement of the mind inspired and guided only by the desire for knowledge constituting an aim in itself. The same spirit prevailed in Greek historiography. True, the pertinent parts of the Old Testament are remarkable pieces of historiography, reliable and colorful, but they are sacred history and confined to the story of the chosen people. Herodotus, on the other hand, transcended the national limits and, embracing the peoples of the then known world, wrote about their history and cultural conditions, intent on a critical evaluation of his sources.

The variety of forms of government in Greece had a significant forerunner, distributed however among different peoples. The close connection between rulership on earth and the divine powers was apparent in the priest-kings of old and the kings who claimed to be the sons or representatives of the god; but the few examples of divine kingship, where the king claimed a divine nature and required worship, came into being in all probability with the successors of Alexander and belonged to the Roman emperor cult. The true theocracy of the Jews was of a different character. Were they judges, prophets, or kings at the head of the political community, it was God Himself who ruled through the laws He had given, the revelation of His will being announced by the high priest and involving His constant concern with the fate of the nation. A secular form of republican government was represented by the Phoenician city-states such as Sidon and Tyrus (Tyre) where, as in the Republic of Venice, the highest officials were selected by and from a commercial oligarchy. So far as autocratic rule in the Middle East is concerned, it must be emphasized that in Sumer and Babylon—

in sharp contradistinction to Egypt—the kings in early times limited their arbitrary power by the establishment of a body of laws which was more than simply the codification of traditional customs, the best known being that of Hammurabi. (In past years many scholars placed the time of Hammurabi before 2000 B.C. Now, according to the "low" chronology, some authorities place the time between 1728 and 1686 B.C.) It was this idea of a statutory law, together with the political form of the city-state, which constituted the parallel of, and bridge to, Greece—with this distinction however: that unlike their predecessors, the Greeks considered laws not as commandments of their god, but as inherent in nature or as the free invention of man. The instability of their forms of government, particularly in Athens, anticipating almost everything that emerged in Western political history, and their incapacity to overcome particularism undoubtedly fostered their exemplary investigation into political theory and philosophy. The result of all this was the *polis,* the city-state, where free citizens deliberated their own affairs, a unique creation bearing inestimable consequences. On the other hand, the formation of empires fell to others. The Babylonians, Assyrians, and Egyptians extended their realm far beyond their national territories and amalgamated major parts of the Middle East. But only in a loose and inaccurate sense can these large dominions be called empires. No constructive idea, no organization held them together; they were founded on the power relation of the conqueror and the conquered people—people always at the victor's mercy. The Persians were the first to create a world empire worthy of that name. Unlike their predecessors, the Achaemenian kings imposed on the conquered neither their religion nor their language; they did not interfere with any expression of the cultural life of the nations. Although strict centralization was the underlying idea of their administration, the Greek subject cities of Asia Minor were permitted to preserve their local autonomy and, as a general rule, the sovereign's authority was limited to taxation and levy. Thus, while it is true that the idea of the autonomous individual personality, its freedom and rights, originated in Greece, the recognition of the national personality as a cultural entity must be credited to the Persians. The religious background gives this empire conception its full meaning and importance. The Achaemenian king of kings carries out the mission entrusted him by the great god Ahura Mazda (Ormazd), namely, to rally all men under his command to fight the powers of evil and make the earth a good place in which to live.

Alexander's world empire was the only one to contain, during its short life span, all the lands of the Middle East. What the concrete shape of his dream of coalescing West and East into one body would have been, is not known. His premature death, his world-shaking exploits condensed into so brief a period, his comet-like rise and disappearance, the worship paid him as to a god-like being, made him, more than any hero in history, a figure in whom the borderline between reality and imagination was effaced, and whose memory was glorified by legends and epics in the countries of the West and Middle East. What Alexander has meant as an inspiration and paragon to conquerors and world builders, can hardly be estimated.

The interpenetration of Greece and the eastern countries of the Middle East following Alexander's conquest is the only example of the meeting of Western and Eastern civilization on equal terms. Had the Persians conquered Greece, their indifference to foreign cultures would have rendered creative contact more difficult. The aggressive curiosity of the Greeks, on the other hand, and their ready appreciation of Persia made Hellenism a unique phenomenon, almost immeasurable in its effect on East and West. Greek philosophy with Neo-Platonism as the leading force, the religious philosophy of Judaism, the mystery cults of Greece—all competed in the successor states of Alexander and in the Roman Empire with those of Egypt and Asia, until final victory fell to Christianity—itself a religion sharing with the mystery religions the belief in the initiate's spiritual participation through mystic rites in the death of the god and his resurrection. In Gnosticism (q.v.), less a system and doctrine than a great spiritual movement, the old Zoroastrian dualism of Good and Evil revived and inundated the world, increasing in strength when the Persian sage Mani (Manes or Manichaeus, 216?–?276 A.D.) fused elements of practically all the forms of faith and religious philosophy into a mythology and metaphysics of salvation—a process ending in the immediate knowledge (gnosis) of God. Several and not the least important of the heretical sects, usually known by the common name Cathari, which during the 11th, 12th, and 13th centuries spread to northern Italy and southern France, betray their Manichaean origin. On the other hand, Gnosticism penetrated deep into central Asia, where, as in India, the influence of Hellenistic art was considerable, though not always beneficial. (See section *Oriental Christianity.*)

Such an expansion and interpenetration of ideas and creeds would have been impossible, had outer conditions not been favorable. There existed, particularly between the successor states of Alexander, facilities of communication and exchange which continued into the Roman Empire, with the exclusion of Persia which had regained her independence under a native dynasty. A standard Greek dialect (*koine*), commonly understood, made trade relations easier, comparable to, but more widely spread than the lingua franca of later times. To the old sea routes frequented by Egyptians, Cretans, and Phoenicians was added a new one from the Red Sea to China. The land routes through Persia to India and the silk route from the Phoenician seaports through central Asia to China gained in importance. Thoroughly planned cities constructed after the Greek model sprang up on Asiatic soil with municipal autonomy; with their market places, theaters, and gymnasiums they became centers of international life. The administrative system in the successor states, drawing on the powerful centralism of the Sassanian Empire, as well as on the liberal and democratic ideas of the Greek city-states, was elastic and efficient enough to serve as a model to the Byzantine and Arab empires, and to extend some of its influence to the Western World. Government thus assumed the function of fostering scientific research, and centers for the study of science and the liberal arts arose around such places as the famous library and the museum of Alexandria. The names of Hero (Heron), excelling in mathematics and mechanics and in the invention of automata; of Hipparchus, the

founder of mathematical astronomy; of Archimedes, Euclid, and many others, are well known. Medical research and sanitation became the preoccupation of government; in the Egypt of the Ptolemies, medical assistance was a public service. Nor was activity in the field of arts less prolific and influential than in the scientific, though it was less creative. Several new forms of literature, particularly the novel, must be credited to that era.

Whatever the date considered to mark the crisis or end of the Hellenistic period—the Roman or the Arab conquest—the period had from 600 to 900 years of vigorous, tenacious, and creative life. Hellenism represents the greatest syncretistic civilization the world has seen, ebullient with potentialities due to the variety of its components and the possibilities of their entering into multifarious combinations. However, it was inherent in its very nature that, just as it originated from disparate civilizations, so it had to engender or, at least, lead up to new civilizations. Indeed, Hellenism became the soil from which Byzantine and Islamic civilizations sprang. The originality of the Byzantine Empire—immediate heir of Hellenism and its faithful treasurer—lay in the fact that state and culture were impregnated with Eastern Christianity. This fact gave Byzantium the atmosphere of a theocratic state. Its almighty bureaucracy regulated prices, organized public works for the unemployed, watched over public hygiene, and established orphan asylums. Contrary to the contemporaneous West where education was practically limited to the clerical class, Byzantium had institutions of higher learning from which women were not excluded. While the pursuit of science was never its foremost concern, the ideal of universal education, later proclaimed by the Renaissance, was recognized in Byzantium, and personified in the great figure of Michael Constantine Psellus (1018–1078), statesman, jurist, philosopher, historian, and poet. In art the highest achievement was expressed in the churches with circular domes over rectangular naves, churches which, with their luminous mosaics, gave the pattern to church construction in Italy, from Venice to Sicily. The Byzantines alone created a real military science, and the Arabs learned from them how to improve their armaments.

The connection between Hellenism and Byzantium appears as a natural relation between cognates. On the other hand, the part Hellenism played in Islamic civilization proves once again its universality and resilience. The impetus toward the formation of a new civilization came from the Arabs who, as they so often had done before, broke from their peninsula in the 7th century, their energy this time increased by the conviction of being the protagonists of the true faith. Islamic religion submitted less to Greek and Hellenistic thinking than did Christianity, but just as Christianity conferred its character on medieval civilization, so Islam created the atmosphere in which the Islamic civilization originated and continued to live. Islamic civilization is the result of the combined effort of Arabs, Persians, Byzantine Christians, Jews, Egyptians, and Berbers—all of whom adopted Arabic, if only as their second language, while the creed of Mohammed spread among them. If the rapidity of the Arab conquest is due to Arab vigor and fanaticism, the triumphant expansion of Islamic civilization must be explained to a large extent by the fact that almost everywhere its way was prepared by the common Hellenistic ground. While Islamic civilization cannot compete in originality with the Egyptian and Babylonian civilizations, and still less with the Greek, it realized the highest achievements in almost every sphere over a period of about 900 years—taking the 8th century as its beginning and the Safawid (Safavid) period in Persia and the almost contemporaneous efflorescence of the Ottoman Empire, particularly under Suleiman the Magnificent (1520–1566), as its last great manifestations. Its cultural radiation can hardly be overestimated. Islamic religion, political domination, and civilization, extending beyond its Middle Eastern homelands, embraced at times southern Europe and the Balkan Peninsula, North Africa and wide regions south of the Sahara, central Asia and the India of the Mogul emperors, made important ramifications in China and Indonesia, and testified during the periods of its efflorescence to a universality, dignity, and abundance of values which make it the equal of any other civilization. There was, for example, a refined material and cultural life in the 10th century at the courts and in the cities of Baghdad, Cairo, Palermo, and Córdoba, at a time when the bulk of Europe was still a backward and in many ways a barbarian continent. It needed a man of the stature of Frederick II (1194–1250), who entertained at his court Italian, Greek, Mohammedan, and Jewish scholars, to overcome the prevailing prejudices and limitations.

With few exceptions, Moslem (Muslim) rulers and people practiced religious tolerance—and this not only in the first centuries of Islam—whereas in Europe a blind and cruel intolerance determined the attitude toward people of other faiths. Crusaders, having been fed with fantastic stories about the situation of the Christians under Moslem rule, could not conceal their boundless amazement when they saw Moslems, Christians, and Jews living together harmoniously in prosperous communities. As late as the time of the Crusades, Christians were named to high state offices. This general line of policy and attitude continued under the Ottoman Empire. It was only in Spain that the immediate contact of Christian and Mohammedan kingdoms produced on the part of the Christians a true appreciation of Islamic civilization. There, on Spanish soil, a happy and fruitful interpenetration of Islamic and Christian cultures took place for centuries. Hispano-Moorish architecture and crafts resulted from this cooperation, and the products of Andalusia—jewelry, arms, enameled glassware, tapestries, paper, and other things—were well known in all Mediterranean countries. As to the creations of the mind, the work of ibn-Arabi (1165–1240) influenced Dante's composition of the *Divina Commedia*. The origin of the troubadours can be traced to Moslem Spain, and it is not unlikely that the system of European chivalry goes back to Arab models. The Arabs everywhere translated Greek works in close collaboration with Arabized Persians, Christians, and Jews, both Christians and Jews being steeped in Arab civilization and writing in the Arabic language. Thus Moslem philosophers, mathematicians, physicists, astronomers, physicians, and others translated pertinent Greek books and based their own works on them. Many Greek texts, the originals of which are lost, exist only in the

Arabic translations, and their retranslation into European languages (like that of the original Arabic works, for example, on astronomy and alchemy) contributed considerably to that stream of thought which converged with the Renaissance movement. Whereas the Arabs were content with cultivating and continuing the Greek tradition, the Europeans recreated and assimilated in an original way the classic heritage, thereby establishing the Humanism of the Renaissance and the foundations of modern science. Yet our debt to the Arabs remains. This is particularly true with regard to their autonomous creations such as the work of ibn-Khaldoun (1332–1406), a Berber and native of Tunis, the first to conceive a philosophy of history. The name of al-Biruni (973–1048), astronomer, and author of a book on India based on a thorough knowledge of Indian religion, literature, and customs, also that of ibn-Batuta (1304–1378), likewise of Berber origin, one of the greatest travelers of all times, who left such fascinating reports on his travels—both stand for that spirit of adventure and curiosity, so admirably presented in *The Arabian Nights,* which made the Moslem merchant, traveler, and explorer, scientist and geographer pillars of world civilization.

As to material culture, Islamic countries, when they did not invent and create, became mediators between India and the Far East on the one hand, and Europe on the other. Just as the Arabs passed the "Arabic" numerals they had received from India to Europe, so they gave paper and its fabrication to the Christian West where the first paper mills sprang up in southern France. The compass, as well as paper, a Chinese invention, was known to the Arabs before it came to Europe. Though explosives and guns had been invented and used in the Far East long before, the Turks were the first to use artillery on a large scale during the siege of Constantinople in 1453. As to domestic animals, cultural plants and other products of the soil, styles and articles of dress, the West's indebtedness to the Middle East is too well known to be mentioned herein. See also separate section, *The Arts.*

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5. HEBREW CIVILIZATION. When Israel appeared on the historical scene, the Near East had behind it a long and significant record of civilized life. While the prehistory of Israel during the first centuries of the 2d millennium B.C. is shrouded in darkness, it appears that the Biblical narratives connecting the patriarchal age of Abraham, Isaac, and Jacob with both Ur of Chaldea and Egypt reflect some historical events. Within the more or less perpetual migration of ancient peoples speaking Semitic languages, from the Fertile Crescent to the Nile Valley, there also sporadically appeared groups called Habiru (probably identical with Hebrews). These migrants furnished not only the first permanent Hebrew settlers of ancient Palestine but also certain tribes which found their way into Egypt, later to return to the land of Canaan under the leadership of Moses. Israel's sojourn in Egypt partly coincided with the reign of a mixed Asiatic people, the Hyksos; the latter ruled over the Nile Valley for some 160 years (c.1730–1570 B.C.). The presence of a Semitic group in the northwestern district of Goshen, in and around the city of Tanis (Avaris or Zoan), has been confirmed by numerous excavations. Even Hebrew names of localities have been identified in that district. The date of the Exodus, which was so momentous to Israel, but of minor significance to Egypt, is still controversial. While some scholars date it, more in accordance with tradition, in the mid-15th century B.C., the majority still favor 1290 B.C. (Albright) or 1220 B.C. as the most likely date.

These beginnings, in many ways peculiar to the Hebrew people, affected all their subsequent destinies. Already at this point we notice the Hebrews' absorption of a variety of cultures. The Jewish people never forgot that they had originated in Mesopotamia, had spent many generations in an Egyptian ghetto, had lived for "forty" years as a migratory tribe among Bedouins in the desert, and finally had settled within the mature civilization of Canaan which in the days of Moses and Joshua already had behind it more than a millennium of civilized life. Confronted by such a rapidly changing situation and quickly integrating the lessons of all these civilizations, Moses and his successors had to transcend in their legislation and general outlook on life the exigencies of the moment, or the boundaries of any particular region, and to think in more permanent and worldwide terms. Therefore it is not surprising that, responding to such a challenge, these early Israelites groped for the new religious formula of monotheism, a faith which would correspond to their own experiences and needs and encompass the entire civilized world known to them.

Another remarkable development permanently affecting Hebrew thinking was the people's undying remembrance of its foreign origins. Much more strongly than even the Greeks after them, the Jews always referred to the great events which had taken place beyond the confines of their own country. Forever after, they considered their Exodus from Egypt and the revelation on Sinai, both located outside their national territory, as the most significant events in their own history, indeed in the history of the universe. Prophets and lawgivers never allowed them to forget that it was a Diaspora which had created their state because of grace divine and that, hence, they might lose that state if they departed from the ways of the Lord. Curiously, the same extraordinary phenomenon of a Diaspora creating a nation, in contrast to mother countries colonizing new areas, repeated itself twice in Jewish history: namely, the return in 538 B.C. after the Babylonian Exile, and again in 1948 A.D.

Connected with this evolution was also the rise of a new type of polity unparalleled in the ancient world. Beginning with a loose confederation of independent tribes, some ruled by judges during emergency periods, the people long preserved its unity only through common allegiance to its Mosaic faith and its amphictyonic sanctuary at Shiloh. Even when, under foreign pressure, several tribes united for purposes of defense under such a commander as Gideon and later all northern tribes jointly elected their first king, Saul (c.1020–1004 B.C.), their cooperation with the southern tribes, led by Judah, was based on ethnic and religious, rather than political solidarity. Only during the short span of the reigns of David (c.1004–965 B.C.) and Solomon (c.965–926 B.C.) did ancient Israel possess a united

monarchy. It soon broke asunder into Northern Israel which lasted until the fall of its capital Samaria in 721 B.C., and Judah, which endured until the fall of Jerusalem (serving as its capital since King David) in 586 B.C.

It was of greatest importance that, except under Solomon, the Israelitic monarchy never exercised the absolute power, nor was it invested with the divine qualities characteristic of other Oriental kings. Israel's monarchs always remained under the law. The administration of justice was, to a large extent, in the hands of priests and lay judges accepted by the population of the numerous townships independently of the royal will. Time and again the political, economic, and religious disorders in the country brought forth serious censures of kings and their counselors by prophetic spokesmen of the people, who had no other claim to leadership except their call to prophecy. Just as Elijah successfully combated about 855 B.C. the syncretistic Baal worship of King Ahab and his Phoenician wife, Jezebel, so did Amos, the first of the writing prophets, make social justice the keynote of his memorable harangues. After the return from Exile in 538, the Second Commonwealth had no kings at all for nearly four centuries. Even later, the weakness of its governmental structure was so marked that the historian, Flavius Josephus, had to coin a new term for it. By calling it a "theocracy," he meant not so much the rule of priests, scribes, or any other ecclesiastical organs, as the direct sovereignty of God under whom even Israel's kings had been mere mortals. In this way was injected into human history a new approach to political and social relations which has permanently affected all of Western civilization; for it was formulated by a succession of extraordinary prophetic leaders (Hosea, the two Isaiahs, Jeremiah, Ezekiel, and others), psalmists, and teachers of wisdom, and it was invested with deep religious sanctions which ultimately proved victorious through the spread of Judaism, Christianity, and Islam.

Still another result of these extraordinary developments was the rise of a peculiar type of democracy. It was not principally an electoral democracy, although public assemblies on both the local and national levels were often held. When King Josiah wished to introduce his Deuteronomic reformation on the basis of a newly found scroll (621 B.C.), he convoked "all the men of Judah and all the inhabitants of Jerusalem with him, and the priests, and the prophets, and all the people both small and great" (II Kings 23:2-3; cf. Ezra 3:1, etc.). This democracy was based principally upon the recognition of the dignity of man, with every Israelite sharing on an equal basis in the covenant with the Lord. Josiah's contemporary, the prophet Jeremiah, found particularly incisive words to instill in his people the doctrine of individual responsibility and individual worth. At the same time it was a democracy based on communal self-government of the numerous smaller and larger towns throughout the country and the organic cooperation of the citizenry at large with local elders, judges, and priests. The latter retained a great religious and educational function even after the official desecration of the local shrines by the Deuteronomic reformers. Schooled through long centuries of such extensive municipal self-government, the Jewish people continued to live an autonomous communal life even after the loss of its national sovereignty. Thus arose, through a long process of trial and error, the Jewish Diaspora community, centered about another revolutionary innovation, the egalitarian synagogue without sacrifices or priests, which assumed growing importance in the history of the entire Mediterranean world.

A Jewish dispersion had apparently existed in Palestine and elsewhere even before the fall of Samaria. Just as there were numerous Canaanites in the territories occupied by Israel—the process of amalgamation continued at least to the days of Solomon—so did the latter learn permanently to share their small country with such neighbors as the Philistines, Edomites, Moabites, and Ammonites. In fact, because the Philistines living on the Mediterranean coast first came to the attention of the Greeks, the whole country has ever since been known to the West as Palestine. Geographically placed between such expansive empires as Egypt and Assyria-Babylonia, the country was easily drawn into the vortex of international power politics. Our records become more explicit from the time of King Ahab's participation in an alliance of Syro-Palestinian kings which stopped the first Assyrian expansion at the Battle of Karkar (Qarqar, 853 B.C.). Each invader doubtless carried off many Israelitic prisoners who, for a time, probably continued to profess their ancestral faith during exile. Moreover, if we are to believe stray Egyptian papyri, some Hebrews had remained in the Nile Valley long after the majority's Exodus. There also were Jewish bazaars in Damascus in the days of Ahab. In short, there perhaps never was a time when all Jews lived in Palestine.

After the fall of Samaria, a large portion of the northern Ten Tribes was deported into distant lands. Although the majority of these exiles was sooner or later assimilated by their neighbors (the subsequent legends concerning these Lost Ten Tribes made of them ancestors of many nations from the British and Japanese to the American Indians), a minority doubtless persisted until they were joined by the new deportees from Judea after the fall of Jerusalem. From that time on, it appears, Diaspora Jewry always exceeded in number the Jews of Palestine, with the sole exception perhaps of the brief period of the Maccabean regime (c.140–63 B.C.). The entire history of the Second Commonwealth was, indeed, dominated by this interrelation between the Palestinian center and the ever more far-flung dispersion.

Dispersed Jewry's insistence on the preservation of its ethnic-religious identity amidst various nations was often misunderstood and, because of its extraordinary nature, created much ill-will. Haman's exclamation reported in the Book of Esther (3:8) became a keynote of ancient, as well as medieval and modern, anti-Semitism. "There is a certain people," this Persian courtier is quoted as saying to King Ahasuerus, "scattered abroad and dispersed among the peoples in all the provinces of thy kingdom; and their laws are diverse from those of every people." Less pertinent was Haman's accusation, "Neither keep they the king's laws." On the whole, the Jewish community readily abided by the laws of the various countries in which it lived. At times, in fact, it became identified with the powers in control and suffered together with the latter from any attack on the established order. The Jewish

soldiers, for example, established by the Persian rulers in a military colony in Elephantine, Upper Egypt, to defend the frontier against raids from Ethiopia, were attacked by their Egyptian neighbors as abettors of the foreign regime of Persia.

These hostile, as well as friendly, Judeo-Gentile relations were intensified after the historic conquest of the Near East by Alexander the Great (4th century B.C.). The first contacts between Judaism and Hellenism were amicable, Aristotle himself reputedly being greatly impressed by the wisdom of a Jewish interlocutor. In time, however, the growth of the Jewish dispersion, the perseverance of Jews in their ethnic-religious separatism, contrasting with the growing uniformity of mores in the rest of the Graeco-Roman world, and the numerous conversions of Gentiles to Judaism resulted in the rise of what is frequently called "classical anti-Semitism." Leading writers like Seneca and Tacitus often spoke of Judaism in terms reminiscent of vulgar Jew-baiters. In many cities, particularly Alexandria, Jews were embroiled in centuries-long controversies with their Hellenistic neighbors.

Governments whether Persian, Hellenistic, or Roman as a rule protected the Jewish minority against such local onslaughts. These multinational empires found in dispersed Jewry, at least for a time, a factor cementing the imperial unity against disruptive local forces. From Cyrus and Darius, through Alexander, Ptolemy I, and Antiochus III, to Caesar and Augustus, the imperial rulers extended to Jews a variety of privileges, not only preserving a measure of their economic and civil equality but also giving them considerable autonomy in cultivating the "mores of their forefathers." For example, a remarkable decree, dated 419 B.C., has been found among the Elephantine papyri. Here Darius II enjoined the Jewish soldiers, as he doubtless ordered the other Jewish communities throughout the empire, to observe the Passover in accordance with the Biblical law. Despite frequent Roman misunderstandings of Jewish "idleness" during a weekly day of rest, Augustus allowed Jewish parties and witnesses to refuse to appear at court on the Jewish Sabbath. He also ordered that the Jewish poor in the imperial capital be given on Friday a double measure of grain as well as money in lieu of the oil ritually forbidden them.

At times, however, forces of uniformity tried to break down Jewish separatism. In extreme cases, this led to outbursts of religious intolerance. When Antiochus IV (Antiochus Epiphanes) tried to force Palestinian Jewry to adopt Greek paganism, he provoked thereby an open rebellion led by the priestly family of Maccabeans. The Maccabean revolt (165–161 or, more broadly, 175–135 B.C.) has become memorable in human history not only because it re-established for a time a fully sovereign Jewish state, but also because it introduced for the first time the idea of religious martyrdom. The Maccabean martyrs of the Fourth Book of Maccabees, although wholly legendary, became as significant in the destinies of mankind as did the political and military leaders of the successful revolt. The newly developed sectarian movements of Pharisees, Sadducees, Essenes, New Covenanters, and others, superimposed upon the long-simmering Samaritan schism, searched for ever-new solutions to the perplexities of existence, without in any way budging from the principles of historical-ethical monotheism.

Another answer was given by Jewish apologists in the dispersion. Themselves imbued with the ideals of Greek civilization, speaking and thinking in the Greek rather than Hebrew idiom, they nevertheless staunchly adhered to their faith. They had to justify it, however, both before the world at large and before their own coreligionists who had grown away from the naïve religion of their forefathers. For example, although the Bible was less anthropomorphic than Homer, enlightened Greek opinion resented its ascribing corporeal qualities to God. The Greek translation of the Bible, therefore, the Septuagint, prepared for use in the Jewish synagogues as well as for purposes of the Jewish religious mission, modified some of these Biblical passages so as to remove human passions from the Deity. A large number of historians, poets, and philosophers (Demetrius, Eupolemus, Artapanus, Philo the Elder, and others) tried to trace the origin of all wisdom to the work of Moses.

Hellenistic Jewish literature, largely centered in Egypt, produced in Philo Judaeus of Alexandria (died before 50 A.D.) a philosopher of considerable distinction. Combining the Platonic style with Jewish tradition, Philo wrote a number of allegorical commentaries on the Bible in which he attempted to synthesize Judaism with Greek culture. This synthesis, and even more, its allegorical method, deeply influenced the subsequent generations of religious thinkers among Neo-Platonists, Jews, Christians, and Moslems. In the historian Flavius Josephus (died c.100 A.D.), the combination of Jewish and Greek historiography produced a monumental record of the historic evolution of the Jewish people as well as of its final tragedy, the war against Rome (66–70 A.D.). This clash between Judaism and the Great Western power, ending in the burning of the Temple in Jerusalem (70 A.D.), was followed by the debacles of Diaspora Jewry's revolt against Trajan (115–117 A.D.), Palestine's Bar Cocheba (Kokba) revolt (132–135 A.D.), and the complete political eclipse of the Jewish state. But the ethnic-religious history of the Jewish people continued in both the East and West. In view of its ever-shrinking minority in Palestine, Diaspora Jewry now assumed definite leadership. It perpetuated the Jewish way of life by continuing the work of the Pharisees and creating the monumental literature of the Talmud. See also JEWISH HISTORY AND SOCIETY.

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6. INFLUENCE OF HELLENISM ON THE MIDDLE EAST. Hellenism is the term used to denote the civilization of the Greeks. In his book *Alexander the Great,** Charles A. Robinson writes. "The true legacy of Greece consists not of art and literature, beautiful as they are, but of a mental attitude, the insistence on the primacy of reason. Neither ancient Rome nor the Middle Ages nor Asia (ancient or modern) has made the mind the controlling factor in human affairs, but ancient Greece did, and as the originator of what we call the modern spirit she is part of us."

From their earliest appearance on the Mediterranean scene, the Greeks were distinguished from the races around them by their consciousness of their own intellectual superiority. The Greek language, which was the symbol of the common Hellenism of communities frequently politically hostile to one another, also expressed the common way of life and thought which made them superior to the barbaroi—the non-Hellenes whose utterances sounded to the Hellenes like "bar bar" and whose acceptance of despotism was incomprehensible; for a basic concept of Hellenism was that of *Eleutheria,* loosely translated "freedom" but transcending the modern meaning of the word. Unlike the barbarian who considered slavery as part of the order of nature, the Hellene, whether he lived under a king, an oligarchy, or a democracy, was essentially and irrepressibly *eleutheros:* free in his thought and imagination, free in his will to assert himself, truculently free in his determination to argue, free to legislate the restriction of his freedom and then to revolt against his own legislation.

Modern Fascists have made the grave mistake of pointing to Sparta as the prototype of their police state. Nothing could be further from the truth. Sparta was a Hellenic kingdom all of whose able-bodied citizens were kept in permanent military training. Her exiguous citizen-population and her precarious geographical position made disciplinarian leadership and training necessary, and the Spartans made a virtue of necessity. In their case the Hellenic *Eleutheria* manifested itself clearly: first they had *two* kings, lest a single king aspire to absolute rule; second, a board of ephors elected by, and responsible to the citizens, controlled the kings, levied taxes, and exercised the functions of government. Here is no Fascist state or dictatorship; it is Hellenic *Eleutheria* adapting itself with sensible rigor to the exigencies of survival, for above all else the Hellenes were realists.

By the 7th century B.C., the Greeks were firmly established on the mainland of Greece, the Peloponnesus, and the Aegean Islands and were expanding their power by founding cities along the Black Sea and the coast of Asia Minor. The sea was the principal medium through which the Hellene operated; the Aegean has always been a sea that unites, not one that divides. On either shore were the Hellenic cities which were his maritime and commercial bases—the mother-city in Greece maintaining a close association with her daughter in Asia, who reproduced her civic pattern. The *polis* (city-state) was perhaps the most representative expression of Hellenic civilization in progression. It was based at least as much upon the realism of commerce as on less earthy ideals, so that when Aristotle declares that man is a political animal he does not mean what his mistranslators assume, but simply that man is an animal suited to life in the *polis.* By the end of the 6th century B.C., Hellenic commercial power, by reason of its lusty organic growth and the indispensable services it rendered to the agricultural populations of the Asiatic hinterland, had asserted itself in Thrace, on the Black Sea, in Ionia, and down the coast of Asia Minor to Naucratis on the Nile delta, the earliest Greek maritime settlement in Egypt. Greek influence penetrated into the courts and councils of Asiatic potentates who frequently employed cultured Greeks as administrators. The highly individualistic nature of the Greeks, and the incessant disputes both internal and external among the Hellenic cities in Greece and in Asia Minor, lulled the great Oriental despots of the interior into a false sense of security to which the formidable military power of Persia lent credibility. But Hellenic civilization on the upsurge had a dynamic vitality; only political disunion kept it from expanding more rapidly than it did. When, at the end of the 6th century B.C., Athens emerged as a full democratic state in which all citizens had equal rights in government, she automatically took the imperial lead. Herodotus writes: "It is proved by many instances that equality is a good thing. While the Athenians were under undemocratic rulers they were no better in war than any of their neighbors; yet once they were rid of despots, they were by far the best of all. While they were oppressed they willed to be cowards, but when they were freed each one was zealous to achieve for himself" (abbreviated).

As soon as Hellenism, through the coordinated power of the Athenian Empire on the one hand and of Sparta on the other, began to show signs of a greater expansion it was opposed simultaneously by the Asiatic Medes and Persians to the east and by the Semitic Carthaginians to the west who rose up to choke this new civilization. If the Persians had not been beaten by the Athenians at Salamis in 480 B.C., and if Carthaginian Hamilcar the Elder had not been slain in the same year at Himera in Sicily by Gelon of Syracuse, Greece would have been snuffed out by Asia and there would have been no Western civilization as we know it today.

After the disastrous Peloponnesian War which sapped the vitality of Athens, it seemed as though the destructive quarrels of the Greek city-states would dissipate the expansive energies of Hellenism. It took a semibarbarian foreigner imbued with the Hellenic ideal to accomplish by force what the Greeks were unable to accomplish by agreement. Alexander the Great of Macedon (356–323 B.C.), extending to wider horizons his father's dream of ruling over a unified Hellas, had the creative imagination to realize of what achievement Hellenism under his leadership was capable. In 334 B.C. he launched his amazing

* Robinson, C. A., Jr., *Alexander the Great,* p. 20 (E. P. Dutton and Company, Inc., New York 1947).

enterprise, sweeping across Asia with his conquering armies, and in less than eight years passing through the gates of India. In that short period he succeeded in fusing his variegated empire into a flexible political organization composed of every element in the *oecumene*—the whole inhabited world. He established world government under the direction of one leader, with the city-state, self-governing but no longer independent, as the indispensable, vitalizing political and economic cell, upon which the life of the empire depended. Alexander's immediate and principal objective as he advanced was to create a vast network of Hellenic cities, highways, and commerce. He might deem it wise to reinstate Oriental satraps and kings, but his own power rested on the chain of Greek city-states which he planted as economic and cultural outposts no less than as garrisons all over Asia and Egypt. These enduring cells of Hellenism maintained a permanent influence on the Middle East. In the Greek cities which he captured or founded, Alexander invariably installed democratic regimes on the Athenian pattern. Here we have the roots, never to be shaken, of the free municipal system handed down by Alexander's successors to Rome, and by Rome to Byzantium. The oecumenical concept in government combined with the local freedom of the *polis* resulted in a powerful structure which survived the disruption of the Diadochi (Alexander's successors) and without which Roman dominion in Asia would have been impossible. The continued prosperity of the Greek cities was essential to the social and economic stability of the Roman Empire.

One of the effects of Alexander's achievement was the breaking down of language barriers. Aeolic, Doric, Ionic, and Attic Greek might continue to be fostered by local traditionalists, and the Asiatic languages remained natural to the non-Greek members of the empire, but the practical language of affairs from Athens to the Ganges was the *koine dialektos,* the universal dialect, in which some four centuries later the New Testament was written by Christ's disciples although their Master taught in Aramaic. However, the Oriental mind was refractory to Hellenic positivism as it is today to Western ideas. Thus, at the farthest limits of Alexander's empire, the traces of Hellenism are faintest. Barely 200 years after the Macedonian conquest of India, the last Greek prince there was overthrown. However, scholars wish to detect an Hellenic strain in Oriental art originating allegedly in the vigorous Greek civilization which flourished in Bactria about 250 B.C. (See section *The Arts: Reaction Against Hellenism.*) On the other hand, it is probable that throughout the Roman and Byzantine periods enterprising Greek merchants maintained trading relations with India, as they do today. In Afghanistan an Alexandrine memory survives unrecognized by those who sustain it: a warrior tribe claims descent from a hero of myth named "Aksander." In Afghanistan, Kandahar and Herat, and in Russia, Merv and modern Leninabad, were founded by Alexander under other names, but otherwise the mystic Orient engulfed Hellenic clarity. In Egypt, Alexander built the great port of Alexandria in order to take Mediterranean trade away from Phoenician Tyre. This it did, and under the Ptolemies became the most powerful Hellenic center of commerce in the world. For centuries it rivaled Athens in the field of culture. Ptolemy I founded the great library containing 700,000 volumes, a museum, and institutions for the study of mathematics, philosophy, geography, medicine, and astronomy. In the Christian era it became a great center of ecclesiastical learning and is still the see of a Greek Orthodox patriarch. Alexandria through the centuries has maintained its Hellenic character and today a populous and thriving Greek community of bankers, brokers, cotton merchants, and businessmen contribute greatly to its prosperity.

Under Rome the Greek *polis* in the Middle East prospered, and Greek influence was correspondingly high throughout the area. When Byzantium succeeded Rome in the East, the Greek Byzantine emperors continued to accord full municipal freedom to the cities of the now Greek empire. The Greek language was official as well as predominant, and the imperial navy protected Greek commerce throughout the Mediterranean. A highly efficient civil service which was the backbone of the empire gave it the *harmonia* (coordination) of which Alexander had dreamed. For more than 1,100 years, with few lapses, Byzantium secured peace, trade, and full personal *Eleutheria* within the *polis* for its citizens in the Middle East at a time when western Europe wallowed in the darkness of the Middle Ages and followed confused patterns of animalism masquerading under the heraldic cloak of chivalry. That the court of Byzantium was sometimes the center of sinister intrigue had little bearing upon Hellenic life as it affected the ordinary citizen who at no period of Mediterranean history attained a greater degree of happiness.

When the Byzantine Empire fell to the Turks in 1453 A.D., the latter, after the first flush of ferocity had subsided, in great part adopted the Byzantine administrative system. They allowed wide municipal freedom to the cities within the Ottoman Empire, and the cities were Greek. The Turks were farmers destined to be served, as their fellow Orientals before them, by the commercial aptitudes of the Greeks. The *polis* still maintained its antique pattern under the crescent of the sultans. It held its meetings in the marketplace and elected its officers. The sea continued to be the source of Hellenic life and activity as it has been since the time of Odysseus, and Greek merchants acquired wealth and power. Of these many were entrusted with positions of the highest authority at the Sublime Porte. Under the rule of the Ottoman Turks the influence of Hellenism, though forced into devious channels, continued to flow throughout the Middle East.

Today Hellenism, centered in a free and united Hellas, is an element of progress in the Middle East, and in the Western World.

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7. ROME AND WESTERN CHRISTIANITY. The history of the relations between the Middle East and Rome is at the same time the history of the development of a civilization unequaled in its universality. This civilization embodies the great synthesis of all basic discoveries in the realm of the human spirit as well as in the relationship between individuals and between nations. This achievement is generally

described as the great Mediterranean culture, which dates approximately from the traditional foundation of Rome (753 B.C.) to the downfall of the Western Roman Empire (476 A.D.). The principles of all basic spiritual and religious human values and of all social and political systems—the entire foundation and heritage of Western civilization—emerge in the course of this development both in their chronology and in their content. Since we can understand this development correctly only in our own historical perspective, that of our Western tradition, it is but natural that all these political and social trends center around Rome as their focus. In this context—looking back toward the ancient cultures and nations and then looking forward to our own history—we perceive the history of the relations between the Middle East and Rome to be at the same time the history of our own tradition. The relation between the Middle East and Rome discloses a twofold significance in world history: in its political and in its cultural aspects.

Rome's political history evolved in constant tension between Rome and the Middle East. Through its political genius Rome succeeded in making use of this tension to sublimate its historical causes, its temporary expressions, and its often dangerous consequences in two syntheses: in the concept of the Roman state and in the universality of the Roman Empire. Thereby Rome proved herself able to stave off the predominantly negative traits of these tensions, primarily expressed in the collectivism and despotism of the Oriental monarchy and in the nationalist separatism of Hellenistic imperialism—an onerous heritage, which, as translated into the Byzantine monarchy and into Eastern Christianity, was left to the Eastern Roman Empire alone to bear.

Even at Rome's cradle the Middle East was present as a godfather, for Rome's early history is primarily a creation of the Etruscans, the first bands of whom probably emigrated from Asia Minor into Tuscany between the 10th and 8th century B.C. By the mid-8th century B.C. the Etruscans seized the town of Rome, the center of a religio-political confederacy of Italic folk called Latins from the name (Latium) of the district, and there they re-created the traditional forms of the Oriental monarchy. After more than two centuries of domination by force, the Etruscan monarchy was expelled and the Roman Republic was founded in 509 B.C. This is the first manifestation of the political genius of Latium. So radically did the early Romans destroy all notions and institutions of Oriental kingly despotism that throughout all their subsequent history not even the word and the concept of "kingdom" could venture to make its appearance as a designation of a political system. And after the republic had evolved into the empire (27 B.C.), not even the most orientally minded among the Roman imperial sovereigns, Diocletian (r. 284–305 A.D.), could dare to call himself "king." They assumed such titles as *princeps* (chief), *imperator* (commander), Caesar, Augustus, but not *rex* (king). With this feat of the expulsion of the kings began the tradition of republican Rome; for all time to come it signaled Rome's fundamental decision against any future attempts to assimilate the political collectivism and despotism of the Oriental monarchy and its successor, Hellenistic imperialism. Thus the groundwork was laid for Rome's most original contribution to the political history of all nations: the autonomous and free development of the *res publica* (commonwealth) as a political and social way of life, based on a strict separation of the spheres of *res sacrae* (religious affairs) and *res profanae* (worldly affairs), and on an equally clear distinction between the realms of *res publicae* (public property) and *res privatae* (private property). Thereby the community was safeguarded against all dangers of totalitarianism until the principle of Caesarism transformed the principate (27 B.C.–284 A.D.) into the dominate (284–476 A.D.) or an Oriental despotism. Thus already the first encounter between Rome and the Middle East in the arena of political institutions was decided in favor of the Romans' civic freedom and of the Latin autonomy.

The second great encounter between Rome and the Middle East was caused by Rome's efforts to secure her frontiers and the freedom of her islands and sea lanes. Rome entered the contest among the Mediterranean peoples in defense of her political and economic power and security. Rome's attention was first attracted by the western approaches to the Middle East, the empire of the Phoenician-Punic Carthaginians, who in that era also dominated northwest Africa, Corsica, Sardinia, Spain, and Sicily. After Rome's expansion in Italy had begun, she dispatched her first naval expedition to expel the Etruscans from Corsica (353 B.C.) and concluded two treaties with Carthage for the protection of her exposed coastal areas (348 and 306 B.C.). Then, looking toward the East, Rome was forced to fight Pyrrhus (q.v.) of Epirus, whose Italian invasion was repelled finally by the Battle of Beneventum (275 B.C.). Already in this action the Mediterranean area revealed its geopolitical importance and its role in power politics. Already Rome had grasped the principle which proved to be the basic foundation and final argument of Mediterranean and Middle Eastern policies on into the 20th century, as expressed in the geostrategy and power politics of commanding the sea lanes and coastal areas of the Mediterranean: the principle of pacifying the Middle East and of precluding all attacks waged from the Mediterranean area. This was the precondition for liberty and peace on the European continent and its coastal areas. As a measure of protection against the menace to her flanks of Greek Epirus and African Carthage, Rome entered into a treaty with Ptolemy II of Egypt in 273 B.C. Nine years later she challenged the Carthaginian power in the First Punic War and fought for the possession of Sicily (264–241 B.C.). The cession of Sicily to Rome (241 B.C.) was followed by the Roman seizure of Sardinia and Corsica (238 B.C.). A war of revenge begun by Carthage under Hannibal (q.v.) was won by Rome (Second Punic War, 218–201 B.C.), who acquired Spain and reduced Carthage to a vassal state.

The third fateful encounter between Rome and the Middle East was induced by the imperialism of Macedonia and the aggressive urge of the Hellenistic successors—kings of Alexander's short-lived empire. In the East, Rome first liberated Greece from Macedonian despotism in a war against Philip V (200–197 B.C.). After this Rome fought with Antiochus III of Syria and added Asia Minor to her sphere of political influence (189 B.C.). This was followed by the defeat of the Aetolians (189 B.C.), the subjection of the Galatians (188 B.C.), and the division of the Macedonian possessions into four minor states (167 B.C.) under patronage of Rome, who re-

united these into a province at the end of the Fourth Macedonian War (149–146 B.C.). When Carthage formed an alliance with Syria against Rome, the Romans resorted to drastic measures to counter once and for all the combined threat from the West and the East. In the Third Punic War (149–146 B.C.), Rome destroyed Carthage and proclaimed Africa a Roman province. Revolt in Greece led to Rome's dissolution of the Achaean League and the destruction of Corinth (146 B.C.). Greece was put under the supervision of the governor of Macedonia until at last it attained provincial status. After inheriting Pergamum by will of its last king (133 B.C.), Rome annexed most of Asia Minor as a province (129 B.C.). Cyrenaica also entered the Roman provincial system by a similar legacy (96 B.C.). Sulla's first war against Mithridates VI Eupator of Pontus (88–84 B.C.) was followed by the second under Murena (83–81 B.C.) and the third under Lucullus (74–64 B.C.). When Mithridates had finally been defeated, Pompey founded the twin provinces of Bithynia-Pontus and added to the Roman dominion Syria (64 B.C.) and Palestine (63 B.C.). Caesar brought Egypt (already a Roman vassal since 168 B.C.) under closer control (47 B.C.). Antony in his turn moved into Alexandria, where, however, his reign as an Oriental king and his romance with Cleopatra soon found a bitter ending through the victories of Octavian off Actium (31 B.C.) and at Alexandria (30 B.C.). This third encounter of republican Rome with the Middle East culminated in the proclamation of Egypt as a Roman province (30 B.C.). By then all politically important countries of the Middle East had become Roman provinces.

After Augustus (Octavian's new surname) had become Rome's first emperor (27 B.C.) and had instituted his constitutional reforms (27 B.C.–14 A.D.), republican Rome was definitely transformed into the hierarchical *oecumene* (inhabited world) of the Roman Empire. The new order which settled the administration of the provinces gave the Middle Eastern provinces a large measure of autonomy and administrative independence, but at the same time unified them under a governor general of the East (3 A.D.). With few exceptions Augustus accepted the frontiers of the eastern provinces as determined by Pompey and, in a peaceful settlement with Parthia (1 A.D.), drew the eastern border lines of the Middle East along the Euphrates River, a settlement which essentially lasted throughout the entire history of the Roman Empire. Neither the temporary eastern conquests of Trajan (98–117 A.D.), under whose reign the empire achieved its widest expansion by addition of Armenia, Mesopotamia, and Assyria, nor the vicissitudes of the succession of good and bad incumbents of the imperial throne could mar the blessings of peace and the increasing economic prosperity in the eastern provinces. Although the Roman Empire continued to be based on a slave economy, there is no better illustration of the reality of the ample political and cultural liberties among the peoples, states, provinces, and cities of the empire and of the blessings which they conveyed than the opinion of the Emperor Claudius I (41–54 A.D), as quoted by Tacitus (*Annales* 11:24): ". . . that Athens and Sparta were less successful as imperial powers than Rome, because they treated conquered peoples as aliens and refused to incorporate them as members of the state." The political wisdom and liberality which Rome exercised in her treatment of the nations inside the empire was crowned by Emperor Caracalla's (211–217 A.D.) gift of full Roman citizenship to all freeborn inhabitants of the empire. There is no doubt that the groundwork for the political and economic catastrophes which followed and thereby caused the final loss of the Middle East was laid by the steady trend toward absolutism in the political administration of the Middle East and in its economic exploitation, particularly of Egypt, beginning with the 3d century A.D. However, there is little doubt that the epoch of the empire's greatest glory and of its peoples' peace and prosperity (27 B.C.–193 A.D.) is a magnificent achievement due to the genuine forces and traditions of Roman *humanitas* and *universalitas,* of Roman craftsmanship in politics and in the education of nations. The autocratic reforms (293 A.D.) of Diocletian prove how, under the influence of Oriental despotism, political wisdom deteriorated and how the true traditions of *humanitas, libertas,* and *universalitas* were abandoned in favor of Eastern servility and collectivism. It is evident that this was the beginning of the end of the historical mission of ancient Rome among the nations of the world, an end which was decided even before the fall of the Western Empire in 476 became a political fact, at the moment when Constantine the Great (r. 306–337 A.D.) left the world metropolis to refound Byzantium as Constantinople (now Istanbul), the "New Rome" (dedicated 330 A.D.).

Outwardly this ends the actual history of the political relations of Rome with the Middle East, since the history of the Byzantine Empire then begins. However, the "Rome without an Empire or Caesars" remained unimpaired and continued to fulfill its historical world mission both of transmitting to posterity its own grand traditions and of blending these with the creative traditions of the Middle East. This was a twofold task, and the effort of accomplishing it kept Rome securely in her position of leadership in the spiritual and intellectual developments at the cultural centers of the Middle East. To give even a sketch of these historical trends, we should have to discuss the history of the Christian theological schools and their councils in the Middle East, as well as describe the imperial history and codifications of Roman law, in which the law schools of the East, particularly that in Beirut, played the leading role.

The basic manifestations and decisive historical consequences of the cultural interrelations between Rome and the Middle East could materialize only by the help of the spiritual universalism of Hellenism and the political universalism of the Roman Empire. Most important of all, Hellenism had created the *koine,* the Greek universal language, as the instrument of mutual understanding by means of the written and the spoken word. The second momentous feature was the political universality of the Roman Empire which safeguarded the freedom of movement within a politically unified space and afforded the technical preconditions for such movement. Rome supplemented the spiritual *oecumene* of Hellenism with the necessary political *oecumene.* In this combination the first visible synthesis of the Greek and the Roman elements was achieved by the medium of the Middle East.

Three basic consequences arose from the cultural encounter of Rome with the Middle East and from the influence of Greek culture on both.

These cultural consequences far surpass in importance the organizational and civilizing influences already mentioned; they were: (1) the personalistic principle of the Hellenistic philosophy of the Stoa and the survival of this principle in the personalistic concepts of man and law in Roman Stoicism and in Roman jurisprudence; (2) the origin and expansion of Christianity as a historic development of religious Hellenism; (3) the emergence of a specifically Roman form of Christianity with its theological-philosophic foundations in the religious personalism of Latin patristic. Because this threefold creative encounter between Rome and the Middle East was destined to become the very basis of Western Christianity and of all Western civilization, we must delve somewhat deeper into these interconnections.

The Stoa may be said to be the least Greek and the most Oriental among all the philosophical systems of Hellenism. All great representatives of the Stoa (with the exception of Panaetius of Rhodes) were non-Greeks. Zeno, the founder, was a Semite immigrant in Athens, and the same is true of his successors up to the time of Posidonius the Syrian. The best modern experts characterize this system as "un-Hellenic" (Pohlenz) and "devoid of even a trace of the Attic spirit" (Wilamowitz-Möllendorff; see *Bibliography*). This characterization also gives us the key to a better understanding of Stoic personalism and its natural-law universalism; for never could a Greek unaided have formed either the idea of justifying the personal autonomy (the "being-unto-himself") of the concrete human being or the notion of universal humanity. To be sure, it was in Hellas that the abstract idea of man was discovered and developed by Plato and Aristotle into all fine points of philosophic individualism. But the ego of the physical human being seemed to the Greeks unworthy of philosophical interest, and the same applied to the concrete "I—thou" relationship and its extension to the notion of universal humanity. It is therefore one of the most glorious expressions of the creative spirit of "Oriental" Semitism that, by way of the Stoics from Zeno to Posidonius, it introduced the idea of the human person, of the natural order, and of human liberty into the abstract notion of man as conceived by the philosophic idealism and intellectualism of the Greeks. Where did these Semites find that idea of concrete personalism and of mankind-embracing universalism? In the entire Orient there was, as we know, one nation only which had founded its individual notion of man on the concept of man being created in God's image and of all men being brothers. This nation was the Jewish. (See section on *Hebrew Civilization.*) We therefore are led to believe that the philosophic personalism of the Stoa and its personalistic doctrine of natural law is a legitimate development of the religious personalism of the Jews together with a Hellenistic continuation of Greek philosophy. This view is all the more to be credited, since recent research has shown that the "Semitic linguistic climate" of the Stoa (Pohlenz), and also the numerous linguistic creations of Zeno, stem from Aramaic and Hebrew verbal roots which can be found in exactly the same "quasi-Semitic forms" (Kilb) in one other place only, in the Septuagint translation done by Alexandrian Jews. These facts also explain why the Stoa never could find acclaim either on the part of Greek Hellenism or of Greek Christianity, and never succeeded in founding a tradition or a school. On the other hand, it becomes more understandable that the Roman spirit—which was always primarily directed toward the concrete character of man and the natural and practicable order of law—found its adequate personalistic philosophy of life and the law precisely in Stoicism. Thus, by way of the religious personalism of the Jews, the Middle East has made its contribution toward the foundations of the Roman theories of the state and the law and the Roman idea of man (Cicero, Seneca, Marcus Aurelius). This in turn proved of decisive importance for the development of the theology and anthropology of Roman Christianity.

Taken merely from the historical point of view, it may be stated that Christianity as a universal doctrine of salvation, and in its development to the status of a world church, was possible only within the spiritual *cosmos* of Hellenism and within the hierarchically organized political *oecumene* of the Roman Empire. We have conclusive proof in the tragic personal fate of Jesus and his original Jerusalemitic community of the insuperable obstacles that would have prevented Christianity from developing and expanding in a world of religious and nationalistic separatisms. We find added proof in the literary documents of early Christianity, which show of what surpassing importance was the Greek universal language (the *koine*): first for preforming Christianity in the Septuagint of the Old Testament; later for transmitting the Gospel by the spoken word, for formulating it in writing, for making these Scriptures definitive and for canonizing them; and finally for propagandizing the ideas and doctrines of the Gospel. The same applies to the missionary broadcasting of the Christian message and the founding of the early Christian communities, which would have been impossible without the spatial universality and easy traffic conditions within the Roman Empire. How, for instance, could Paul have inaugurated his world mission, much less have accomplished it, lacking these facilities and the language of the *koine*? The achievements of Peter and Paul give us the clearest insight into these necessary preconditions. The deeds of the two apostles reveal to us the sum total of the spiritual and organizational possibilities realized inside an empire, the only scene on which the original experience at Jerusalem could come to be a world church, a church for all the world. The road of Peter and of the early Jewish-Christian community begins in Jerusalem and reaches its goal in Rome. The road of Paul also has its origin in Jerusalem and, after making the circuit of the Eastern *oecumene* as far as Philippi to organize the original Gentile-Christian communities, it also finds the end of its mission in Rome. Thus, the Epistles of Paul and the Acts of the Apostles are a veritable catalogue of the various possibilities—in ideas, personalities, routes, and localities—offered by Roman universalism and exploited to the full in the process of transforming the early Jewish-Christian community and the early heathen-Christian community into the one and only world church for Jews and Gentiles, where "there is no difference between the Jew and the Greek: for the same Lord [is] over all. . ." (Romans 10:12); "Through mighty signs and wonders . . . so that from Jerusalem, and round about unto Illyricum, I have fully preached the gospel of Christ" (Romans 15:19). As a historical personality Paul is the true type

of the universal citizen of the Roman Empire, "the traveller and the Roman citizen" (Ramsay); as a theologian he personifies the type of the universal apostle of the Christian *oecumene*. "Paul created for the religion of Jesus the form that enabled it to conquer the world" (Lietzmann). In the Roman citizen Paul's realization of his freedom of movement we recognize the spatial width of the Christian *oecumene,* which had its poles in Jerusalem and in Rome. In the Christian Paul's theological concept of man we see preformed the creative synthesis of the religious personalism of the Old Testament with the natural-law personalism of the Stoa to culminate in the Christian vision of the concrete human being, a synthesis on which later the anthropology of Latin Christianity was to build so successfully. It is finally in Rome that, united in their lives and actions, the original apostolic mission of the shepherd Peter and the apostolic world mission of the teacher Paul achieved their ultimate fulfillment in the religious and organizational oneness of the witness and confession of the church itself. In this historical uniqueness of Rome—at the same time the capital of the Christian *oecumene* and of the Roman Empire—we find the deepest confirmation of the creative role played by the Middle East from the origin to the height of the Roman Empire's true universalism.

The same ideas and historical forces which we have found characterizing the creative encounter between pagan Rome and the Middle East also influenced deeply the development of Latin Christianity. First, the entire tradition of Latin patristic has its origin in the Middle East and in Rome herself. Of the four great Latin patristic authors who developed and determined the theology and the anthropology of Western Christianity and thereby laid the foundation of Western culture, three stem from Punic Carthage: Tertullian (160?–?230), Cyprian (c.200–258), Augustine (354–430); the fourth, Ambrose (340?–397), was born in Trier of Roman parents. All four are characterized by the typically Roman vital approach which centers on the living person and the actual world and is combined with a strong affection for a natural legal turn of mind and a practicable legal order. This matter-of-fact separation of all natural affairs from their supranatural subtilization is expressed in Latin theology by the stress laid on distinguishing worldly matters and human frailties from the supranatural and divine order; and it is also expressed in the legal and political thinking of Rome, which strictly divorces *res sacrae* from *res profanae*. Under these conditions the Roman concept of the church could grow in complete independence from the political and administrative powers, and this saved it from the fatal Oriental heritage of the ocracy with its emperor-divinity and its Caesaropapist state church. The stress laid by Western theology and anthropology on personalism—again in conformity with the secular traditions of Rome—implies the unconditional opposition against every trace of Oriental and Hellenistic mysticism and collectivism. Instead, Western (in contrast to Eastern) Christian anthropology and social philosophy are securely based on the religious personalism of the Old Testament and the natural-law personalism of the Stoa. In their philosophical, anthropological, and natural-law theories applied to the concrete person and the concrete state, Tertullian and Cyprian, as also Ambrose and Augustine, are just as much grounded in the natural-law personalism of the Stoa, primarily of Cicero, as they are grounded in their theological anthropology and Christology on Paulinian personalism. It is especially characteristic that the anthropology and sociology of Latin patristic, besides being fully based on the theological personalism of Paul, which Paul on his part derived from the religious personalism of the Jews and from the natural-law personalism of the Stoa, placed even greater stress on these pre-Christian personalistic elements and traditions of Paulinism and developed them still further. Thus Ambrose especially, in his work on *Duties* (which for more than a millennium became the principal source for Western pastoral theology), accepts Cicero's concept of the Stoic doctrine of duty almost literally and thus exalts the religious personalism of the Old Testament to the function of a general basic concept, when he replaces Cicero's quotations and arguments derived from Graeco-Roman authors by others taken from the Old Testament. Finally Augustine, developing his doctrine from those of his most important teachers, Cicero and Ambrose, completes the great synthesis—of the Stoic doctrine of natural law and anthropology, the religious personalism of the Old Testament, and the theological personalism of Paul—a synthesis which, formulated in the fundamental Augustinian concepts of sociology and anthropology, became the common possession of Western civilization. In their origin and their development over the ages, Western theology and anthropology are personalistic and "Roman." On the other hand, they are deeply indebted to the best creative traditions of the Middle East which have become so important to us through the religious personalism of the Old Testament. Therefore, Western man and Western civilization can subscribe with even greater justification than the East to the old and wise adage: *ex oriente lux* (out of the East, the Light.).

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EDGAR ALEXANDER.

8. ORIENTAL CHRISTIANITY. A fundamental difference has always existed between the history, the doctrines, and the eccles-

iastical organization of Oriental Christianity in the Middle East on the one hand, and Eastern Christianity of the Byzantine faith and tradition on the other hand. In common parlance the terms "Eastern Church" and "Eastern Christianity" are often used uncritically to embrace all Christian churches of the East and then to distinguish these from the historical complex of Western Christianity. However, the distinctive character of the dogmas and ecclesiastical history of Oriental Christianity sets it apart as a meaningful, historical unit against both Western and Eastern Christianity. We therefore must draw a clear line between the dogmatic unity of "Orthodox Christianity" with its one "Eastern Church" and "Oriental Christianity," which comprises the several "Churches of the East." This is all the more necessary, because in the Middle East of the mid-20th century the influence of the churches both of the West (whether Catholic or Protestant) and of Eastern Orthodoxy within the totality of Oriental Christianity is restricted to a small number of adherents. The two most important churches of Oriental Christianity are the Nestorians in Iraq and Syria, with about 67,000 members, and the Coptic in Egypt, and the Monophysites in Ethiopia, Syria, Iraq, Armenia (USSR), and Asia Minor, with about 7,800,000 members. Only about 390,000 persons belong to the Orthodox patriarchates of the Eastern Church (Alexandria, Antioch, Jerusalem), and only about 870,000 are members of the Uniat churches, which, though in communion with the Roman Catholic Church, are not organized as one body and follow non-Latin rites, such as the Alexandrian, Antiochian, Armenian, Byzantine, and Chaldean. To sum up: there were (1950) in the Middle East about 7,867,000 Oriental Christians, 390,000 Orthodox Christians, and 870,000 Uniat Christians. To this total should be added the numerically very small following of Protestant churches (primarily in the American and British missions), who, however, achieve a social and cultural importance quite out of proportion to their numbers.

The history of Oriental Christianity shows clearly how bleak would have been the historic fate of early Christianity if it had not come under the influence of Hellenism and Latinity. Early Christianity might well have been halted in its theological and dogmatic development on the primitive autarchical level so characteristic of Oriental Christianity but for the traditions created by Paul, the Apostle to the Gentiles. It was he who initiated the selective synthesis of the religion of Jesus with Greek culture, while at the same time "though being a Hellenist himself, he saved Christianity from being submerged by Hellenism" (Schmidt; see *Bibliography*). Likewise, but for the traditions and the original apostolic office of Peter, who established Rome as the doctrinal and organizational center for the nascent ecumenical church, the early church might have become exhausted in that same multiplicity of primitive native churches so characteristic of the structure of the Oriental churches. (It is well to remember that it was Rome which endowed all early Christian communities with the first catechetic formulation of the creed, with the canon of the New Testament, and with the diocesan constitution.) Viewed in historical perspective, this means that without Hellenistic and Roman universalism the young Christian faith would never have been able to develop the world-encompassing universalism of the *orbis Christianus* (Christian world). Only in this perspective can Oriental Christianity be understood: first in its specific meaning as an expression of the culture of the Middle East, and second in its general function in world history. To be sure, Oriental Christianity takes its legitimate position within the *orbis Christianus,* without, however, expressing and living out the reality of Christian catholicity and universalism. This explains the utter passivity of the role played by this brand of native Oriental Christianity in developing the young church, first when the schools of theologians were formed and the ecumenical councils were held, and later when it became itself an object of church policies (in the struggles between Byzantium, Rome, Persia, and Islam).

The history of Oriental Christianity may be divided into four great epochs: (1) the expansion of Christianity in the Middle East to the First Council of Nicaea (325); (2) the development of the state church and of Greek patristic and their dogmatic condensation (through the councils) to the Council of Chalcedon (451); (3) the rise of the several Oriental churches and their struggle against the Byzantine state church to the victory of the Arabs (647); (4) Oriental Christianity and its separate churches (647 to the present).

Expansion.—The history of the expansion of Christianity in the Middle East also records the general process of Christianity's outgrowing the confines of its provincial Palestinian origin and transforming the early Jerusalemitic community into the early Christian *oecumene* (inhabited world) of the Roman Empire. Disregarding Armenia for the moment, we can state that this process occurred almost exclusively in the Hellenized cities and provinces of the Roman Orient, a fact which was of decisive importance for the autonomous development of Oriental Christianity. It appears that Christian teaching and doctrine exerted their influence only within the Hellenistic urban civilization and in those provinces which had come under strong Hellenistic influence. This particularly applies to Asia Minor, which had become Christianized very early because "at least in the Imperial era it was an entirely Greek country of Greek culture" (Holl). The opposite is true of non-Hellenized Jerusalem and Palestine, which accordingly played a negligible role in the early Christian history of the Orient. When the Romans dispersed the Jews (70 and 135 A.D.), the original Jewish-Christian community all but disappeared in the recesses of history, until the Council of Chalcedon accorded it the merely formal rank of a patriarchate to honor its venerable tradition. There were no Christians in Nazareth, Capernaum, Tiberias, and Gaza up to the reconquest of Palestine by Constantine. On the other hand, the numerous Greek cities of Asia Minor and the Hellenized coastal towns of Syria, above all Alexandria and the Nile Valley with the Thebaid, were very early centers of Christian life and doctrine. "Christianity was a city religion, and the larger the city, the greater the number of Christians" (Harnack).

Because of this completely Hellenistic character of the early Greek "city religion," which used the Greek language exclusively, it exerted its influence only on the Hellenistic upper strata of society and never established a vitalizing contact with the tongues and ways of life of the ancient native cultures and the everyday existence of the masses of the indigenous peoples. "No

Greek ever thought of learning a foreign dialect for the sake of Christianity, in order to transmit the Bible to a strange nation. At official occasions the Church always speaks Greek. In the sermons, at the Synods, in literature, on the monuments, this is the only language used. Around 400 A.D., Asia Minor could be said to be just as much Christianized as Hellenized" (Holl). What is true of Asia Minor is even more true of the other provinces and peoples of what was then the Orient. Wherever Hellenism had expanded, there Christianity could penetrate; and conversely, where Hellenism had done little preparation, the success of Christianity was scanty. In other words, in the Oriental provinces of the Roman Empire the majority of the population led a life without Hellenism and, in the religious sphere, also without Christianity. There even was a part of the Hellenized upper strata of society which turned its back on Christianity altogether, adhering exclusively to the pagan syncretism of the Hellenistic mystery cults and losing itself in Gnosticism. Another part endeavored to find an original synthesis in its heritage of Oriental native culture, Hellenism, and Christianity. These attempts evoked all those questionable formations of Oriental-Hellenistic-Christian syncretism expressed in the staggering number and variety of the Oriental-Christian heresies of the epoch, among which Gnosticism and Manichaeism represent only two of the most influential.

Thus, this failure of the early Christian "city religion" of the Romanized Orient to develop into a genuine, vital Christian-Oriental peoples' religion is the main reason for the permanent primitivity of Oriental Christianity. The second consequence was that Oriental Christianity became the never-failing source of all the heresies and popular "tribal" interpretations of the basic doctrines of the Christian religion, to combat and to correct which the ecumenical councils and synods had to devote the main part of their labors. The third consequence was that, instead of Christianity conquering the Orient, the Orient on the contrary became the sole shaping force within this "Christianity" in the Middle East. In the overall view of world history, we see in this failure the chief ethnological and psychological reason for the decisive defeat of the Christianity of the Orient at the hands of the Arabs.

Development.—The era of the Christianization by force of the Oriental provinces begins with the attempt to enforce the canons of the First Council of Nicaea (325) two generations before Theodosius the Great formally declared Christianity to be the state religion (380). What even the most successful Christian communities and ecclesiastical provinces of the Middle East had failed to achieve before the latter date by their free efforts was now forcibly imposed by decree. All organized power of the Byzantine autocracy was applied to administer Christianity to the peoples of the Orient, from the top downward. In this action, the last potentialities of an organic transformation of Oriental Christianity into a genuine, popular religion were lost.

There were two decisive consequences. First, the ruthlessness with which the authority of the Caesaro-papist state-church was applied in the interests of the power politics of Byzantine imperialism so greatly enhanced the nationalistic separatism of the Oriental peoples that the hatred for the political oppressors was soon also directed against official Christianity. Consequently these peoples were always prepared to form alliances with any non-Christian power for the sake of liberating themselves from the religious domination by a church alien to the country and its people. The exodus of Nestorius to Persia and the surrender of Egypt to the Arabs (642) by the Coptic patriarch, Cyrus of Alexandria, were two fateful examples of this sentiment. Second, these power politics of state and church made it impossible for all the labors of the Greek church fathers of the Orient and also the work of educational and dogmatic criticism and construction rendered by the councils to be utilized for a positive development of Oriental Christianity.

From the point of view of the Oriental Christian churches, the first four general councils of the church (325, 381, 431, 451) were destructive of their ecclesiastical autonomy and theological individuality; the net effect of the councils' decisions was to inhibit any indigenous exegesis of the Christian religon. Thus the First Council of Constantinople (381; see CONSTANTINOPLE, COUNCILS OF) had deprived the patriarch of Alexandria of the special honors and the ceremonial rights of his episcopal see founded by Mark the Evangelist. This action was advanced another stage when in 451 the Council of Chalcedon (see CHALCEDON) usurped for Constantinople ("New Rome") all jurisdiction over the Oriental churches and the other patriarchates of Antioch and Jerusalem because of the Caesaro-papist lust for power by the patriarch of Constantinople. Somewhat earlier the First Council of Nicaea (325; see NICAEA, COUNCILS OF) had proscribed the doctrine of Arius, which had gained a popular following in the Orient; the Council of Ephesus (431; see EPHESUS, COUNCIL OF), banned the doctrine of Nestorius; and the Council of Chalcedon condemned the Monophysite doctrine of Dioscurus of Alexandria. The outcome of Ephesus was that the Nestorian Church was definitely founded and took refuge in Persia. The decision of Chalcedon resulted in the final organization of Monophysitism in the Coptic Church of Egypt. In both instances the definitive separation of Oriental Christianity from the ecumenical community with Western and Eastern Christianity was prompted at least as much by the Orient's national and political antipathies against Byzantine imperialism, as it was caused by the fact that the primitive theology of Oriental Christianity could not fully comprehend the theological universalism of conciliar decisions.

With all its aberrations and heresies (Gnosticism, Chiliasm, Montanism, Monarchianism, Origenism, Manichaeism, Arianism, Apollinarianism, Macedonianism, Pelagianism, Nestorianism, Eutychianism or Monophysitism—to mention only the major departures from orthodoxy; see separate articles) the Orient, after all, has to its credit in this period the gigantic accomplishments of Greek patristics—the Alexandrians: Origen, Clement, Cyril, and Athanasius; the Cappadocians: Basil, Gregory of Nazianzus and Gregory of Nyssa; as well as John Chrysostom and the Antiochene school—though the Orient itself failed to derive much profit from these achievements. Perhaps the greatest gift of Oriental Christianity, in addition to its patristic, is the foundation of monasticism (Anthony, Pachomius, Basil), which it transmitted unaltered to the East and in a basic transformation (Augus-

tine, Benedict) to the West. In the same epoch the scholarly Jerome in his refuge at Bethlehem, in fraternal cooperation with Greek and Jewish scribes, performed the great feat of translating the Bible into Latin for the West (Vulgate).

Rise and Struggle.—The native Oriental churches of Nestorianism and Monophysitism finally parted ways with the rest of Christendom in consequence of the ecumenical decisions on doctrine taken by the councils of Ephesus (431) and Chalcedon (451).

At Ephesus the teachings of Diodorus of Tarsus and Theodore of Mopsuestia, to which Nestorius subscribed, were condemned. They taught that in Jesus two distinct natures (*physis*) were embodied in two persons, that Mary had given birth only to the man Jesus, and that consequently only the man Jesus died on the cross. In this doctrine the traditional Iranian dualism of good and evil, of flesh and spirit, of God and the world, of God and man, were expressed only too clearly, despite all Christian transformation. Therefore, under Nestorius' leadership the predominantly Eastern Syrian Church formed an entirely natural combination with the Persian Church of Ctesiphon in building up a separate and native Oriental church. For over 800 years this church, under the name of the Great Church of the Nestorians, materially assisted by the Persians and Arabs, was the largest Oriental separatist church whose followers, organized in some 20 dioceses, spread far into India and China.

At Chalcedon, 20 years after Ephesus, the Alexandrine thesis propagated by Dioscurus was condemned because it maintained that in the Christ the divine and the human element is united to form the one and indivisible nature (*monophysis*) which is wholly divine in character. In this doctrine there are elements of the ancient Egyptian tradition of the deification of man and also of the doctrine of deification expressed in the Alexandrine *gnosis*. Under the influence of this doctrine even the orthodox Athanasius laid such strong stress on Christ's divinity that his Christology deprived Jesus' quality as a human being of almost all its content. We now see why the Egyptian Coptic Church ("Copt," derived from the Arabic *Kibti-Cupt*, that is, Egyptian) adhered to Monophysitism. In the further process of disintegration of the Byzantine state-church throughout the Orient, the mighty Monophysite church federation—aside from the Ethiopian Church which it dominated—also combined all other native churches, primarily those of Syria and of Armenia. In the mid-20th century Monophysitism still predominates in almost all of Oriental Christianity.

These historical developments in the theological affairs of Oriental Christianity, which left these two heretical churches in possession of the exclusive influence, clearly denote a retrogressive movement to the native religious traditions of these peoples, and consequently a further reorientalization of original Christianity. And the same conscious retrograde trend toward the non-Hellenistic historical traditions occurred in the social and political fields: a total defeat and suppression of Hellenism-Romanism-Byzantinism by native Orientalism.

Separatism.—Having grasped the meaning of these developments, we now can see why the adherents of these churches had no scruples in supporting the political struggles of the Persians and the Arabs against Constantinople. This also enabled the purely Oriental religions of Iranism and Mohammedanism to absorb with little difficulties these Oriental "Christians" as soon as the political conditions allowed or enjoined such reorientalization. This process of political and religious reorientalization of Oriental Christianity was unleashed in the entire Middle East by the decisive victory of the Arabs in 647 and it has continued ever since to gain momentum.

For the Nestorian Church it led to a complete collapse, consummated only in 1919, after World War I, in the Nestorian refugee camps of Ba-'quba near Baghdad. Of the erstwhile mighty and glorious Nestorian Church with its many millions of members and its influence reaching as far as China, nothing was left in the entire Middle East save a starving and plague-ridden colony of fugitives numbering about 60,000 souls.

Also of the once just as mighty and glorious Church of the Monophysites, only about 834,000 members live (1950) in Egypt (93 per cent of the Egyptians are Mohammedans) and about 150,000 members of the Syrian and Chaldean rites of the Monophysite Church dwell in the rest of the Middle East. Only the Armenian Church of Monophysitism succeeded in saving itself, with about 2,500,000 followers living in the Armenian provinces of Soviet Russia and 18,000 Armenians settled in the United States. It should be noted that the Armenian Church (q.v.) has one of the most glorious records of all Christian churches. It was the first, and also the only non-Hellenistic, state church of the Orient, founded in the late 3d century by St. Gregory the Illuminator, who baptized Tiridates III, king of Armenia. The one Oriental separatist church to continue unharmed from its foundation about the middle of the 4th century by St. Frumentius into our day, with all the traditions of its memorable and moving history and religious doctrine unbroken, is the Church of Ethiopia, which in 1950 numbered about 3,875,000 members.

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EDGAR ALEXANDER.

9. BYZANTIUM AND EASTERN CHRISTIANITY. The history of the relations between Byzantium (Constantinople) and the Middle East during the height of the Eastern Roman Empire (324–641 A.D.) is essentially the history of the continuous development of the traditions of Oriental Hellenism within the great historical sphere of Eastern Christianity. As

MIDDLE EAST

Top: Mecca, Saudi Arabia. Mecca is the holy city of Islam. Moslem pilgrims go there from all parts of the world.

Right: Biskra, Algeria. Women and child sit beside a primitive stone mill.

Bottom: Marrakech, French Morocco. The market at Place Djemaa-El-Fna in the inland city.

(1) and (2) © Ewing Galloway; (3) photo by Deane Dickason, from Ewing Galloway

MIDDLE EAST

Top: Damascus, Syria. The Orient Palace Hotel.

Left: Tunisia. An oasis in the foothills of the Atlas Mountains.

Bottom: Zliten, Libya, on the coast of the former Italian colony in North Africa.

(1) © Photo by Deane Dickason, from Ewing Galloway; (2) © Ewing Galloway; (3) © photo by Burton Holmes, from Ewing Galloway

shown in the section on *Rome and Western Christianity,* Rome was able to achieve a selective synthesis, combining her own traditions with the creative traditions of the Middle East in her original creation of Western Christianity and Western civilization, a process in which Rome integrated Hellenism and outgrew it. Byzantium, however, in full contrast to Rome, achieved no more than a quasi-Christian transformation of Hellenism. "This Hellenistic civilization, as it arose in the Near Eastern lands during the centuries which followed the death of Alexander the Great, remained unaltered after the Roman conquest of the Greek kingdoms; it determined the character of civilization in the Eastern Mediterranean under the early Caesars of Rome and it played the same historic role under the Christian emperors ruling from Constantinople" (Baynes; see *Bibliography*). This fundamental difference between Rome and Byzantium in their reactions to the Middle East and to Hellenism was so deep and decisive that it established itself as a permanent principle of political and cultural dialectic within the historical sphere of Christianity—between Christianity's western pole (Rome and the West) and its eastern pole (Byzantium—Moscow). This polarity continues to manifest itself in the present day tensions between East and West. (See section *Russian Messianism.*) In distinguishing the main characteristics of the Roman traditions of the West and of the Byzantine traditions of the East, we form an understanding of the entire structure of the Byzantine political and social system, as being a transformation from a pagan into a Christian manifestation of Hellenistic autocracy and theocracy and of Hellenistic collectivism and servility.

In the West we find the strict distinction between *jus sacrum* (sacred law) and *jus profanum* (secular law) and, in consequence, the rejection of all notions about the divinity and cult of emperors and kings; instead we find the recognition that the realms of the state and politics and of religion and the church each have their own set of rules. Moreover, we find in the West a general rule of strict separation of the political power of the state from the religious authority of the priestly hierarchies—with the spiritual authority of the *rex sacrorum* (king of religious rites) based on these hierarchies. The spiritual rule became visible and workable in the genuine religion of republican Rome in her highest office of priesthood, the *pontifex maximus* (principal pontiff), later paralleled in Christian Rome in the episcopal function of the pope. We find the strict distinction between the realms of *res publicae* (public property) and *res privatae* (private property), and the implied rejection of political totalitarianism and servility in any form as ultimate consequences of the personalistic concept of man and the state. To be sure, in the era of the Roman emperors (27 B.C.–476 A.D.) appear frequent, though temporary, flagrant breaches of these principles, particularly in the emperors' usurpation of the office of *pontifex maximus,* in the imperial god-emperor delusion and the religious cult of the state, and finally in the persecutions of Jews and Christians (largely attributable to this delusion). But these breaches only prove how deep had already become in imperial Rome the intrusion of Oriental Hellenism and how badly threatened by that time were the genuine Roman traditions. When therefore Constantine the Great in 324 A.D. exchanged Rome for Byzantium, this first Christian emperor symbolically abducted the Hellenistic theocracy from Rome—where it had always remained alien to the true Roman spirit—and thereby practically liberated ancient and Christian Rome from the acute threat of further Orientalization.

In the East the Hellenistic traditions developed the following major characteristics. Secular law became deified in the Byzantine theocracy; sacred law became secularized in the Caesaro-papist state church. This was achieved through the mutual penetration of the political power of the state and the religious authority of the church, a process in which the priestly hierarchy was subordinated to the political bureaucracy. To justify this move, the Byzantine state-controlled theologians invented the famous sophist formula of the politico-religious and religious-political "symphony" of church and state. This was ultimately expressed and justified in the indivisible unity of the autocratic, secular-ecclesiastic sovereign rights and the absolute ecclesiastic-secular office of the Byzantine emperor as *basileus* (king) and *cosmocrator* (lord of the world); this made him the secular incarnation of the creative power of the divine *pantocrator* (lord of all) and the personification) of the celestial *dominus et deus* (lord and god). In this order of Eastern Christian Caesaro-papism and Byzantine theocracy genuinely Roman and Western traditions could not flourish. Neither the separation of *res publicae* and *res privatae* nor that of the realms of public, private, and church life was possible. It follows necessarily that all institutions and vital values which depend on the personal separateness of the human being as well as on the natural laws of his individual liberty were nonexistent. However, in this Eastern order all traditions of the Hellenistic collectivism of Macedonian imperialism and Hellenistic-Roman imperialism could thrive all the better.

The integration of these two traditions was accomplished in another synthesis, that of Byzantium ("New Rome"), which united the special heritage of her Greek ancestry with the new religious phenomenon of Christianity, to form the new unity of Graecism-Hellenism-Christianity. Herein lies the origin of the novel historical phenomenon, Byzantium, in its threefold historical manifestation: the Byzantine state as autocracy, the Eastern Roman Church as Caesaro-papism, and the religious culture of the East as theocracy. We therefore must not fail to recognize in Byzantium the totality of an original synthesis with worldwide historical consequences. Not only was Byzantium in the realm of politics the historical heir to the empires of the Macedonians and of the Rome of the Caesars; it was also, in the realm of civilization, a creative transformation of Hellenism into Christianity, with a consciously retrograde movement toward classical Hellas, an emphatic rejection of the real Orient, and a selective continuation of imperial Rome. In this triple structure of the Byzantine synthesis, the world of Hellas, of the Orient, and of Christianity at the same time merged into and contrasted with one another in the most varied ways. Here is the source of the utterly complex Byzantine history of political and church forms, which for "non-Byzantines" has always remained a special opportunity for the worst misconceptions. Thus, for instance, the Byzantines proudly called their capital the "Roma Nova" and described themselves as genuine "Romaeans" (Romayos), to

attest that Byzantium was the sole legitimate heir to the traditions of the Roman Empire. However, just as proudly did they call themselves "Greeks," because they largely continued in political affairs the traditions of the *polis* (city-state)) and in spiritual matters the heritage of the philosophy of classical Hellas. And in the same way they described their "Eastern" Church as the "Greek Church" and their religious culture as "Greek Christianity," to emphasize their conscious theological and organizational alienation from Roman Christianity and from the non-Hellenistic Oriental Christianity of the Middle East. (See section on *Oriental Christianity.*)

Byzantium represents mainly the totalitarian state organization of the Greek *polis,* which did not know the separation of the realms of religion and the state: "The *polis* had the attribute of sanctity, and the relationship between the citizen and his *polis* was really his religion, as expressed in the various state cults. The Greek gods are not, as are most Semitic gods, the deities of the country and the soil; they are primarily divinities of the politically constituted citizenry. In Greece, religion has no autonomous development aside from the state with the vital spheres it encompasses. No church can there constitute itself a rival of the state by means of an independent priest caste as in the Oriental empires. The cults of the gods are state cults, the priests are state employees" (Bultmann). This state of affairs in the Greek *polis* had its exact counterpart in Byzantine theocracy, which it therefore was fully justified in calling Greek. This domination of the religious sphere by the political realm, whereby religion becomes identical with the polity and therefore the state also represents the church, as in turn the church represents the state, was especially characteristic of Byzantine theocracy. In this theocracy the unity of sacred and profane law—embodied in the total law of *nomos* (law) in the ancient *polis*—was modified by "Christian" characteristics only insofar as the secular omnipotence of the Greek *nomos* was expanded to embrace the theocratic omnipotence of the Byzantine *cosmos* and found its expression in the equally omnipotent office of representation and domination belonging to the Byzantine emperor as *cosmocrator.* On the First Council of Constantinople in 381 (the Second Ecumenical Council), Theodosius the Great had forced the ecumenical sanction for this status. From that time this thesis dominated the political and ecclesiastical life of Eastern Christianity, unaltered until the end of Russian czarism. "The year 381 is the birth date of the Christian State Church. In fact, only now was the creation of the New Roman absolute sovereign quite complete, who reigned supreme not over the bodies and possessions of his subjects only, but also over their souls and consciences" (Harnack). The texture of this *polis* tradition of Byzantine theocracy was also interwoven with the Hellenistic tradition of the Oriental god-king, which was expressed in the dignity of the diadem and in according the sovereign the honor of the great *proskynesis* (prostration). This sacramental honor, which Alexander the Great assumed from the Persian god-kings, was in turn imported by the first Christian emperor, Constantine, into the ceremonies of the Byzantine theocracy. Ever afterward, even the spiritual head of the Byzantine Church, who occupied the patriarchal throne in Constantinople, had to pay his "cosmocratic" monarch the honor of the great *proskynesis.* This instance is particularly expressive of the fundamental difference between the Roman West and the Greek-Oriental New Rome of Byzantium: in the West no mortal was thought worthy of the great *proskynesis;* it was not even allowed in the papal ceremonies. Western man may and will not prostrate himself except before God's majesty. Even to the supreme hierarchical dignity and authority of the pope or of a king he offers but the genuflexion of the left knee, while the flexion of the right knee is reserved for God alone.

The theology of the Byzantines, moreover, returns to specifically Greek traditions, in that it is based essentially on the intellectualism of Greek philosophy, especially on the Platonic notion of *logos* (spirit) and on Neo-Platonic mysticism. It is primarily the preponderance of the Alexandrine tradition (from Origen to Athanasius), with its strongly accentuated Christ-Logos idea, which has hindered the emergence of a personalistic figure of Jesus Christ and thereby the foundation of a psychological doctrine of the Trinity and of a concrete theological-philosophical anthropology according to the pattern of Western personalism. Likewise the Byzantine emphasis on asceticism, developed in a straight line from Oriental monasticism with its abnegation of the world and its hostility toward civilization, shows how utterly dependent Byzantine monasticism was on the Hellenistic-Oriental traditions. The same is true of the Eastern Christian doctrine of virtue in contrast to the Western Christian notion of a personal morality. Western morality looks toward the sanctification of man through divine grace and the divine sacraments, as working in everyday life in the concrete individual; on the contrary, the doctrine of virtue and kenosis (self-abnegation) as taught by Byzantine mysticism and sacramental impersonalism looks exclusively toward the deification of man in a supranatural realm.

The Roman, or rather the "Romaean" traditions of Byzantium refer chiefly to those of late Roman imperialism. In ecclesiastical policies the Byzantine state church and its patriarchate of Constantinople (which possesses no direct apostolic traditions) made persistent efforts to subject Roman Christianity and its papacy (as also the autonomous Oriental churches of the Middle East with their venerable traditions) to the political domination of the one and only "orthodox" emperor and the spiritual domination of the "orthodox" patriarchate. On the other hand, the Roman tradition gratefully acknowledged that Byzantium had to its credit the great achievement of collecting and codifying the entire *corpus* (body) of the Roman law (528–534 A.D.). However, this achievement of Emperor Justinian I is also primarily organizational, for the content of the *Corpus Juris Civilis* is exclusively an accomplishment of ancient and imperial Rome. The main work of codification, too, ascends to the jurisconsults and the traditions of the law schools of Rome and, particularly, of Beirut. Besides, Justinian's *Corpus Juris Civilis* received no visible sign of interest from Byzantium and its Eastern successors, including Russia, and left no mark on them. They all contented themselves with a typically Byzantine commentary and a short, watered-down excerpt from the Codex, the *Basilica* of Leo VI the Wise (886–912).

The epoch of Byzantium's political history in

which its face is turned toward the Middle East is essentially the time of the substitution and the liquidation of the heritage of Roman imperialism, to which as Romaeans the Byzantines believed themselves to owe allegiance. This period comprises the rise and decline of the Eastern Roman Empire from the foundation of Constantinople (330) to the Arab conquest of Egypt (642) in the reign of Emperor Constans II. The period is characterized by the effort of the Byzantines to extend the sphere of Roman imperial domination in all directions within the Middle East and to carry to an extreme the dictatorial government methods of Roman Caesarism. Various elements combined to form the closely knit unity of totalitarian state bureaucracy, state economy, and political despotism which through more than a millennium (324–1453) dominated the political and social life of Byzantium: in politics, the pattern and practice of the kingly despotism of the Syrian Seleucids; in economics, the slave and liturgical systems of the totalitarian state economy of the Egyptian Ptolemies; aided by the intricately elaborate tax system and absolutistic administration of Diocletian's bureaucracy. Since the indigenous peoples of the Middle East had been accustomed to such systems of force under their ancient traditions of Oriental despotism as well as under Macedonian and Roman imperialism, the Byzantines all the more could concentrate their efforts on defending and expanding their imperial reign on their borders. In the course of these efforts the Byzantines succeeded during Justinian's reign (527–565) in expanding their domain into Africa, southern Spain, and all of Italy in the West; into the Balkans, Asia, and Armenia in the East. But at the same time the imperialism of the Romaean emperors of Byzantium which was directed against Western Rome contributed greatly toward the gradually increasing exhaustion of the Eastern Roman Empire, which left the Middle East a prey, temporarily to the Persians and in the end to the Arabs.

The internal exhaustion of the driving forces both of Byzantine and of Neo-Persian imperialism had momentous historical consequences. First, the New Roman imperialism was so weakened that the West was spared the fate of permanent Byzantinization. Second, Byzantium protected the European continent, as well as the Balkans and the Middle East, against the threat of being submerged by the barbarism of the Vandals and other Asiatics. Third, Byzantium in its two centuries of struggles with the Sassanids preserved the peoples of the Middle East from having their own cultures and religions, including Oriental Christianity, destroyed by Neo-Persian fanaticism and imperialism. Fourth, the mutual attrition of the forces of Byzantine and Neo-Persian imperialism made the ascendancy and final victory of the Arabs possible, by which the Middle East regained the freedom to return to its original historic traditions and way of life. Thus, through the dialectics of world history, Byzantine imperialism, unwillingly but decisively, contributed to the indirect liberation of both Europe and the Middle East.

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10. BIRTHPLACE OF ISLAMIC CIVILIZATION. Arabia, called the "cradle of Islam," is the birthplace of all Islamic civilization. The founder of Islam was an Arab—Mohammed, q.v. (570–632 A.D.; Arab. Muḥammad), who exercised his mission and lived his whole life within the boundaries of the Arabian Peninsula. However much he may have borrowed from Jews and Christians with whom he came in contact in his early life, the background of his thinking was the life of his contemporary Arabia, and his mental outlook was that of a 7th century Arab. His preaching was in Arabic and was Addressed to Arabs. His Koran, q.v. (*Qur'ān*), which he intended to be the scripture of the new religion, was in Arabic. The cultus he worked out for his religious community was framed in terms of Arabian life in his own day. His early converts and most of the important figures in the earliest period of Islam were Arabs. The caliphs, their advisers, and the leaders of the great movement which created the far-flung Islamic Empire were all Arabs. With the expansion of that empire went the Arabic language (q.v.) and much of the pattern of Arab life as the Prophet Mohammed and his companions had lived it. Prayers were to be recited in Arabic throughout the world of Islam; scripture was to be read in the same language. The Kaaba, q.v. (Qibla), to which men were to turn in prayer five times daily, was the shrine in the holy city of Mecca in Arabia, the same shrine to which yearly ever since there have converged the pilgrim caravans bringing converts from all corners of the growing Islamic world to make contact with the spiritual center of Islamic life in Arabia.

Thus we see the tremendous influence which the Arabian connection has had on every aspect of Islamic civilization. It was not long before non-Arabs were more numerous than Arabs in the Moslem (Muslim) community. As the former entered the Islamic fold, they naturally brought with them from their own cultures many contributions which enriched, and in some measure molded, the developing Islamic civilization. Yet the Arab element has always been dominant and has given the characteristic form to the whole. In many places the languages of the conquered peoples were superseded by Arabic; but

even where they resisted supersession, they were in every case strongly influenced by Arabic. New peoples entering the Moslem fold began to write their local dialects in the Arabic script in spite of its unsuitability for non-Semitic languages. Hence it has followed that not only the the Persian and Turkic dialects, Urdu, Pushtu (Pashto), Panjabi, and Malay, are commonly written in a modified form of the Arabic script, but in more recent days Hausa, Fulah, and Nubian in Africa, Tamil and Malayalam in south India, and Moro in the Philippines have been written by the Moslems in those communities in a script based on what to them is the sacred Arabic. The influence of the Arabian connection on literature, art, and architecture, on dress and social customs is too well known to need more than a reference. A curious point, however, is the way in which the more prominent families among new peoples converted to Islam soon begin to produce genealogies connecting themselves with Arab stock.

The new religion which Mohammed preached in 7th century Arabia made so sharp a break with the older life of that country that his successors were wont to call the pre-Islamic days "the time of ignorance," interpreting literally the word *jāhiliyya* which Mohammed had used in his preaching with reference to that earlier period. They were, indeed, times of ignorance of Islam, but not, as so many later writers have suggested, times of barbarism; there existed at that time in the "cradle of Islam" a considerable culture which made important contributions to the succeeding Islamic civilization.

No archaeological expeditions have been permitted to work freely in Arabia, nor indeed has even surface exploration been possible save at a few scattered spots, so that even in the mid-20th century we have no adequate knowledge of early Arabia. A number of Paleolithic sites have been noticed by travelers, as well as a few Neolithic sites, showing us that the peninsula has been inhabited more or less continuously from the Old Stone Age. The little available evidence from skeletal remains suggests that in prehistoric times there were three racial stocks in the peninsula, the earliest being akin to the proto-Negroid stock found in early times throughout the belt stretching from Malaysia to Africa. Upon this proto-Negroid stock there descended from the north two waves of migration, one bringing round-headed people of the Armenoid stock, and the other long-headed people of the Mediterranean stock. When we reach historical times there is material evidence of contacts between peoples from Arabia and the early civilizations of both Egypt and Mesopotamia; but it is not until the term *Aribi* begins to appear in Assyrian inscriptions from the 8th century B.C. that we can speak of evidence of contacts with Arabs in our sense of the word. Peoples from Arabia were also in touch with the Holy Land in early times, for in the Bible we find mention of the Arabs proper.

This early evidence depicts the Arabs as a camel people, interested to some extent in the carrying trade, but more interested in raiding. They were organized into tribes and tribal confederacies under chiefs or chieftainesses, and for the most part preferred a nomadic to a sedentary life. Their fierce love of independence was remarked on by the Assyrian monarchs, who referred to them, as did Alexander the Great at a later date, as those who had never submitted to any great king. Their penchant for raiding made them a thorn in the side of those charged with maintaining the security of settled populations, and their ability to slip back into the wilderness made them a people peculiarly difficult to control. Representations of them on Assyrian monuments show them naked except for a breechcloth, with polled heads and short, pointed beards, fighting two to a camel, with bow and arrow and short spear. Their tents with the camp appurtenances and their small cattle are hardly distinguishable from those of the modern Bedouin.

But if the northern Arabs at that time were for the most part nomadic, predatory tribes, those of the south had a highly developed urban civilization, with great temples and palaces, a highly organized and stable social system, and an advanced economy based partly on agriculture and partly on sea trade from the Orient. Goods were then carried overland up the "Spice Road" to the northern markets where they could be traded to Mesopotamia, Egypt, and the Mediterranean lands. From their northern contacts, these Arabs from the south learned to write in an alphabet derived from the same origin as the Phoenician alphabet, and which in their own land they developed into an elegant monumental script. Inscriptions of about 800 B.C. have been found in south Arabia, but these are written in a beautiful regular script which tells of an already long period of development. Fairly recent excavation in the north uncovered a broken pot with a short inscription in these south Arabian characters, found in a context which it is believed cannot be later than 1000 B.C.; therefore we may assume that this southern civilization dated from at least 1500 B.C. Several features of this culture clearly show Mesopotamian influence, but its architecture, its social organization, and its religion seem to be genuinely native developments.

From the inscriptions we are able to learn something of the history of five kingdoms in south Arabia: the Minaean, Sabaean, Qatabanian (Katabanian), Hadramautic (Hadhramautic), and Awsanian. Inscriptions in Minaean and Sabaean have been found in considerable numbers at various sites in northern Arabia where the southern Arabs had established stations to handle that end of their trade. A few inscriptions found in as remote regions as the island of Delos and the Nile Valley suggest the extent of that commerce. About the 1st century A.D. a number of factors combined to impair their trade monopolies so seriously that from then to the rise of Islam there was a progressive decay in this south Arabian civilization. One result of this deterioration was the sporadic migration northward of groups of south Arabian origin, thus establishing the basis for that constant conflict between northerners and southerners which became so important a factor in later Islamic history. A second result was that the somewhat chaotic conditions in the south brought first the Abyssinian and then the Persian occupation in the century preceding Islam.

In the north we find no such advanced civilization until much later. Although migrant Arab groups had succeeded in establishing dynasties in a number of important centers such as Palmyra, Hatra, Emesa (Homs), Edessa (Urfa), Adiabene, and in Ituraea and the Characene, the basic populations over whom they ruled seem to have been non-Arab. The first traces of a truly Arab settled civilization in the north appear with the

Nabataeans, whose centers at Petra, Bostra (Bosra), Salkhad, Gerasa (Jerash), Damascus, Taima, and Gerra became famous enough to gain mention in non-Arabian history. They too were interested in the carrying trade, but also had an agriculture based on cistern and conduit irrigation. They built well-planned settlements and forts to protect their trade routes, carved great temples out of solid rock, developed a characteristic style of architecture and a pottery which for delicacy and beauty of form and decoration had no rival in the Near East, and from the 3d century B.C. to the 2d century A.D. they enjoyed a civilized life on a level with that of the eastern Mediterranean cities. Though Arabs by race, they learned and used Aramaic as their language for literary expression, developing their own modification of the Aramaic alphabet, thus providing the basis on which the Arabic script later was developed. Their art, coinage, architecture, and even their religion show that they had been considerably influenced by Hellenism. At Adra'a and at Bostra they even introduced Greek games. We can trace the record of their kings from about 169 B.C. until 106 A.D. when under Trajan their kingdom was incorporated in Provincia Arabia. Josephus bears witness to the involvement of their kings in Palestinian affairs, and it was from the territory of one of their rulers, Aretas IV, that St. Paul made his escape (II Corinthians 11:32). Three other little kingdoms in north Arabia are known to us from inscriptions which were written in north Arabian dialects but in an alphabet borrowed from the south Arabians. These were the so-called Lihyanian, Thamudic, and Safaitic kingdoms which belonged to the last years B.C. and the early centuries A.D. They too, especially the Safaitic, were strongly influenced by Hellenism. In Byzantine times we again find a number of similar small kingdoms, though in these the important elements were groups which had migrated from south Arabia. The most famous of them were the Lakhmids who centered at Hira (al-Ḥīrah) on the Euphrates, the Ghassanids who ranged from Damascus down to the Dead Sea, and the Kinda and Ribab in central Arabia. The Sassanids of Persia used the Lakhmids and the Byzantines used the Ghassanids as buffer states to protect their territories from the incursions of the nomads, with the result that these two groups served as channels whereby Iranian and Byzantine influences penetrated far into the peninsula. It is astonishing to note the array of culture words of Iranian, Aramaic, and Greek origin which can be gathered from the Koran and the old Arabic poetry.

The religion of pre-Islamic Arabia was basically the old Semitic paganism. There were sacred stones, trees, waters, and numerous holy spots where a sacrificial cult was practiced. There were male and female celestial deities associated with the sun, moon, stars, and heavenly phenomena. Of special importance was the fertility cult of the great mother goddess, who had a variety of names but was al-Lat (*the* goddess, par excellence), and who had various consorts at the different shrines. The ancient shrine at Mecca was a center of her worship in primitive times, but in the years immediately preceding Islam it had come to be a manner of pantheon for all Arabia where there were images of all the gods. Priesthoods appear to have been unimportant in ancient Arabia, but the soothsayer (*kāhin*) and the poet (*shā'ir*), both of whom under inspiration spoke oracular words, words of wisdom, words of weal or woe, were important personages. The Ghassanids had, for the most part, become Monophysite Christians, and important elements among both the Lakhmids and Kinda were associated with Nestorian Christianity, so that through them Christianity apparently was fairly well known both in north and south Arabia. (See section *Oriental Christianity.*) Colonies of Jews were to be found in nearly all the oasis settlements along the trade routes, and both in south Arabia and in the north they attained a position of considerable influence. In Medina at the time of the hegira (622), there were three important Jewish groups who played no inconsiderable role in the affairs of the city. There were certain Gnostic sects active in the area east of the Jordan, and the religion of Zoroaster no doubt had some influence on Arabs settled near the Persian Gulf. During the 6th century we have evidence of a strong movement toward monotheism in the north of the peninsula, some memory of which has been preserved in the Moslem tales of those individuals whom they called the *hanīfs,* and in the stories of a number of rival prophets with whom Mohammed's successor had to deal.

Any developed civilization, however, was only possible at a relatively few favored spots in the Arabia of that day. The greater part of the country was not sufficiently fertile to permit cultivation and sedentary life. Even the extraordinarily efficient irrigation engineering of the Nabataeans had not permitted them to push any great distance into the desert areas. For this reason the characteristic life of pre-Islamic Arabia was, as it has continued to be, the nomadic life. In the earlier period the inhabitants must have been ass-nomads similar to the type pictured on the 12th dynasty wall painting at Beni Hassan in middle Egypt. The effective domestication of the camel, however, enabled them to overstep the limitations imposed by dependence on the ass as a means of transport, and opened to them practically the whole Arabian Peninsula. The structure of nomad life was simple. The people were dependent on their herds, which in turn were dependent on water and pasturage, so that seasonal migration was determined by pasturage needs. The family was the unit of social life. A combination of related families was the tribe, authority over which was invested in the sheikh and his council of elders. Tribal confederacies often were formed, but they were stable only so long as some powerful leader could hold the groups together. The tribes were in constant conflict, and raiding had become almost a national sport in spite of the fact that it led to the dreaded blood feud.

The only forms of cultural expression generally found in such nomadic life were music and poetry. Of old Arabian music we know very little, but the sayings of the tribal wise men were famous even in ancient days, and a considerable body of verse attributed to pre-Islamic poets was collected by the Moslem savants of the Abbassid period. This verse bears witness to the extraordinary richness of the Arabic vocabulary, but it was a one-sided richness. There was an overabundance of words to express even minute distinctions of things that interested the nomad as part of the experience of his daily life—hundreds of words for camel and all that pertains to the

camel, for the date palm and its parts, for the desert and all concerned therewith, for the well and its water, for the nomad's natural emotions of love, fear, and anger, but remarkably few words for the world of ideas. Almost all the culture words, words for things of the spirit, words for the luxuries of more civilized life, were borrowed from Aramaic, Greek, or Iranian. (See also ARABIC LANGUAGE; ARABIC LITERATURE.)

It was into such a world that Mohammed came, bringing his message which united the Arabs as the spearhead of the movement that produced the Islamic Empire and with it the Islamic civilization. See also ISLAM; and section within this series on *The Arts*.

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11. THE ARAB CALIPHATE: ITS RISE AND DECLINE. Successorship to Mohammed.—On that memorable day, June 8, 632, when the Arabian Prophet Mohammed (q.v.) rather unexpectedly passed away, the newly born Moslem community was confronted with its first serious problem, that of successorship (*khilāfah,* caliphate). As long as Mohammed lived he performed the functions of leader, judge, army commander, and head of the state—all in one. The question now was who should succeed him in all these functions except that of prophecy, for he, as the last (*khātam*) of the prophets, could have no successor. This question of the caliphate, the oldest in Islam, has remained a living issue until the 20th century when the Kemalist Turks abolished its Ottoman phase and several pan-Islamic congresses were subsequently held in Mecca and Cairo to determine the rightful heir, but all without success.

The Patriarchal Period.—The aged abu-Bakr—father-in-law of Mohammed, member of his tribe, the Quraysh, and one of the earliest and more respected believers—was by a form of loose election declared successor, thus ushering in the first series of caliphs, that of the Orthodox (*rāshidūn*), so called because they followed closely in the footsteps of the prophet. The seat of this short-lived caliphate (632–661) was Medina, the city of the prophet. The conduct of these caliphs was unostentatious, patriarchal, and mostly inspired by religious motives. During the reign of abu-Bakr (632–634) the entire peninsula was brought under the sway of Islam. Arabia had to conquer itself before it could conquer the world outside. The enduring achievement of the third caliph, Othman ('Uthmān, 644–656), was the codification of the Koran (*Qur'ān*), which fixed the "word of Allah" for all time. The official version compiled under his auspices achieved canonical veneration throughout the world of Islam. During the reign of the second caliph Omar ('Umar, 634–644), who was the ablest of the group, the banner of the new faith was carried triumphantly eastward to Persia, westward to Barca in North Africa, and northward to the Taurus. At first intended primarily for booty, rather than permanent conquest, these raids developed into military campaigns that netted for Islam an empire that was to extend in the Umayyad (Omayyad) caliphate from Spain and France in Europe to Turkestan and India in Asia, covering all North Africa. Such rapid and brilliant successes at the expense of the two world powers of the day—Byzantine and Persian—were astounding not only in themselves but in their results. They ultimately changed the course of history.

The Theocratic Caliphate Becomes a Secular Power.—The first wave of Arab conquest was interrupted by the civil war between the fourth caliph, Ali ('Ali, 656–661), son-in-law of the prophet, and Mu'awiyah, governor of Syria and member of the aristocratic Umayyad branch of the Quraysh. Mu'awiyah (661–680), shrewd and realistic, "one of the four geniuses of Islam," wrested the caliphate from its legitimate incumbent Ali, established his seat in Damascus, provincial capital of Byzantine Syria, and ushered in a new series of 14 caliphs. He nominated his son Yazid as his successor, thus introducing the hereditary principle, built the first navy in Islam, and used it for the conquest of Cyprus, Rhodes, and other islands. His army he modeled on the Byzantine pattern. From Egypt as base his generals overran the Barbary states; from Syria they marched across the Oxus (Amu Darya) and Jaxartes (Syr Darya) into central Asia. On two occasions he stretched his mighty arm across the "land of the Romans" as far as Constantinople. It was he who changed the character of the caliphate from a theocratic to a secular system and established a model for his successors to follow.

Damascus at Its Height.—The caliphate established by Mu'awiyah attained the zenith of its power under Abd-al-Malik (685–705) and his son, al-Walid (705–715). It was then that the nationalization of the Moslem state was effected through the change of the language of the public registers (sing. *dīwān*) to Arabic—from Greek in Syria and from Pahlavi in Iraq and Persia; and through superimposing on the current Roman and Persian coins Koranic superscriptions or replacing the coins by new silver and gold Arab pieces. The architectural monuments of these two caliphs include the Umayyad Mosque of Damascus, the Dome of the Rock and al-Aqsa (el-Aksa) Mosque in Jerusalem. All three are still standing and rank among the finest in Islam. Jerusalem was and still is considered the third holiest place in the Moslem world, after Mecca and Medina. Moreover, al-Walid built at state expense homes for the lepers, the blind, the lame, and others afflicted with chronic diseases, the first of their kind in the annals of public health.

It was during the illustrious caliphates of Abd-al-Malik and his sons that the Arab Empire reached its height from Tours in northwestern France to Kashgar in Chinese Turkestan, an extent equaled by only few empires in history. Spain, in the course of those conquests, was brought within the embrace of Islam, where it remained in full or in part for over seven centuries; the Indus Valley was subdued and its conquest, after a long period of checkered history, eventualized as late as 1947 in the newly formed state of Pakistan. For the first time vital contact was established with a new ethnic element, the Turks, destined to become the great champions of militant Islam in eastern Europe.

Baghdad: an Intellectual Center.—The year 750 witnessed the inauguration of a new caliphate, that of the Abbasids, with whom the center of gravity in Islam shifted from Syria to Iraq. The Abbasids were so named from an uncle of the Prophet Mohammed. Their assumption of power

was consequent to their victory over their Umayyad rivals in the Battle of the Zab, a tributary of the Tigris. On the Abbasid side, Shi'ites ('Alids), Persians, pietists, and malcontents were arrayed. The Abbasid dynasty was the longest-lived (750–1258) and the most renowned of all the caliphates. Its orientation was Persiaward. Persian viziers, Persian wives, and Persian wines became especially conspicuous in the caliphal court. The destruction of the caliphate by Hulagu and his Mongolian hordes in 1258 brought to an end the Arab Empire.

The real founder of the Abbasid caliphate was the second in the series, al-Mansur (754–775), who built Baghdad. In a few years after its foundation, this city developed into an emporium of trade worthy of its position as successor of Ur, Babylon, and Ctesiphon. That was in the day of Harun al-Rashid (786–809) and his son al-Ma'mun (813–833). When still a crown prince, Harun conducted the fourth and last campaign against Constantinople and exacted a humiliating tribute from its ruler. Al-Ma'mun established in his capital a remarkable institution, Bayt al-Hikmah (house of wisdom), which was a combination of academy, library, museum, observatory, and translation bureau. He sent emissaries into the "land of the Romans" in quest of manuscripts, and patronized scholars, mostly Syrian Christians, who rendered Greek works into Arabic, often through Syriac. The period of translation from Greek, Syriac, and Persian lasted for about a century (c.750–c.850), in the course of which, Arabic, hitherto an imperfect tool of expressing scientific or artistic thought, came to possess the chief works of Aristotle and the Neo-Platonists in philosophy, the masterpieces of Hippocrates, Galen, and Paul of Aegina in medicine, the major treatises of Euclid and Archimedes in mathematics, and the principal composition of Ptolemy in geography. Hunayn ibn-Ishāq (Lat. Joannitius, 809–873), member of the Eastern Syrian Church, was the dean of translators; his interest lay in philosophy and medicine.

Original Contributions.—The period of translation in part overlapped and on the whole preceded a longer period of origination in which Arabic-writing scholars made their contribution to science, art, literature, philosophy, law, and linguistics. Jābir ibn-Hayyān (Lat. Geber, fl. 776), an Iraqi, produced a number of works that entitle him to the distinction of being the father of alchemy (itself an Arabic word, of ancient Egyptian origin). Al-Khwārizmi, Persian by nationality, produced (c.830) a book in mathematics, entitled *al-Jabr,* which was the first of its kind. Another Moslem scholar of Persian origin, al-Rāzi (Lat. Rhazes, 865–925), distinguished for the first time in the history of medicine between measles and smallpox. Ibn-Sīna (Lat. Avicenna, 980–1037), son of an Assassin from Bukhara, produced a medical work *al-Qānūn* (*The Canon*) in which he recognized the contagious nature of tuberculosis. A Damascene physician, ibn-al-Nafis (d. 1288), had an elementary conception of pulmonary circulation centuries before the Portuguese, Michael Servetus, credited with the discovery, was born. It is no exaggeration to claim that between the middle of the 8th and the beginning of the 13th century, Arabic, once the language of a few tribes in Arabia, had developed into a position of leadership in scientific, philosophic, and literary thought throughout the then civilized world.

In Spain.—The main treasures of science and literature which the Arabs in the East had acquired through translation or research were gradually passed on to the West, to Spain, which had been conquered (711–718) during the Umayyad caliphate and had become the seat of a local Umayyad dynasty independent of Baghdad. The dynasty enjoyed its heyday under Abd-er-Rahman III (912–961), who proclaimed himself caliph in Córdoba in 929. He thereby inaugurated a rival caliphate to that of the Abbasids, who had another rival in the Fatimids of Tunisia and Egypt. This Fatimid caliphate (909–1171) was the only major Shi'ite caliphate in the annals of Islam. A general of one of its early members built Cairo—which soon became the seat of the caliphate—with its al-Azhar Mosque, which has maintained its position until the present day as one of the earliest and largest centers of learning in the world. It was with this caliphate that the Crusades had to contend for the mastery of Palestine.

Under Abd-er-Rahman and his son al-Hakam II (961–976) the golden age of western Islam was enjoyed. Besides most of the Iberian Peninsula, Abd-er-Rahman's empire embraced a large part of North Africa. Al-Hakam's emissaries ransacked the East and West for books for his library, which reportedly contained 400,000 volumes. He is said to have established 27 free schools in the capital and enlarged the university in its mosque founded by Abd-er-Rahman I in 788. Moslem scholars in Spain built upon the intellectual foundations laid by their coreligionists in the East and produced some of the outstanding philosophers, scientists, and physicians of medieval Europe. Ibn-Rushd (Averroës, 1126–1198) of Córdoba became "the commentator" on Aristotle as Aristotle had become "the philosopher." Ibn-al-Baytār (d. 1248) of Malaga wrote the foremost treatise on botany in which 1,400 plants were considered. Ibn-al-Khatib (1313–1374) of Granada emphasized the infectious nature of the Black Death, which was ravaging Europe, when most people considered it an "act of God." Granada was the seat of the last of the petty states that arose on the ruins of the caliphate (929–1031). It survived until 1492, when it was destroyed by Ferdinand and Isabella.

Toledo: Center of Translation.—Toledo in the mid-12th century developed into an important center for translating Arabic works into Latin mainly through the interest of Archbishop Raymon. The algebra (*al-jabr,* whence the English word) of al-Khwārizmi was first translated by Robert of Chester and with it were introduced the Arabic numerals and the zero or cipher (both Arabic words). The commentaries of ibn-Rushd were done into Latin by Gerard of Cremona, who also translated the surgical works of Abul Kasim al-Zahrāwi (Lat. Albucasis or Abulcasis, d. 1013), the most distinguished surgeon Spanish Islam produced. These medical treatises were used in Oxford as late as 1778. The medical schools of Montpellier and Salerno, in France and Italy, also used textbooks originally written in Arabic. Michael Scot translated in Toledo a number of Arabic astronomical works. The names of a number of stars in European languages are of Arabic origin. Scot also worked in the court of Frederick II in Sicily who, like his predecessor, the Norman Roger II, patronized Arabic learning. Frederick founded

the University of Naples, which used as textbooks translations of Arabic works. Before the Normans, Sicily had been occupied and held by the Arabs (c.827–1091).

Of the three bridges—Spain, Sicily, and crusading Syria—through which Moslem learning and elements of Arab culture found their way into Europe, Spain was undoubtedly the most important. These elements, it is no exaggeration to say, contributed vitally to the reawakening of Europe and setting it on the road of modern progress. (See also ARAB PHILOSOPHY; ARABIC LANGUAGE; ARABIC LITERATURE.)

Other than the four Sunnite caliphates (of Medina, Damascus, Baghdad, and Córdoba) treated above, there was a late major caliphate, that of the Ottoman Turks in Constantinople. When Sultan Selim I in 1517 destroyed the Mameluk rule in Egypt, he found in Cairo a shadowy caliph, al-Mutawakkil, who claimed descent from the Abbasids. This series of nominal caliphs in Egypt had been started in 1261 by al-Mustansir—an uncle of the late Abbasid caliph in Baghdad—whom the fourth Mameluk, Baybars, had invited from Syria and installed in his capital with great pomp. Neither al-Mustansir nor any of his successors exercised any real authority in state affairs. The Mameluks (1250–1517) had superseded the Ayyubids in the rule of Egypt. The Ayyubids were descendants and successors of Saladin, who in 1171 had destroyed the Fatimid caliphate. Selim took along with him to Constantinople al-Mutawakkil. The claim that this puppet caliph transferred his office and title to the Ottoman sultan is legendary, but the fact remains that the Turkish rulers in Constantinople gradually absorbed the Arab caliphal privileges and title. In 1924, Mustafa Kemal (later Kemal Atatürk) deposed the last caliph of Turkey, Abdul Medjid (Abd-al-Majid), and thereby destroyed the entire institution. See also section on *Nationalism*.

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12. RISE OF THE TURKISH EMPIRE.

The Battle of Manzikert (modern Malazkirt, eastern Turkey) in 1071, in which Alp Arslan, Seljuk Turkish ruler of Iran (Persia), decisively defeated the Byzantine emperor, Romanus IV Diogenes, marked the beginning of the permanent settlement of Turkish peoples in Anatolia (Asia Minor) on a large scale. Smaller numbers of Turks, which had preceded the Seljuks in the Abbaside period, had been absorbed by them. The major Seljuk dynasties, in Anatolia or Iran, endured for about two centuries. Turkish immigration continued, however, and a subsequent revival of Turkish power in Anatolia early in the 14th century under the Ottoman dynasty led to the capture of the great Byzantine capital of Constantinople by the Turks in 1453, and within a remarkably short time, to the rise of the Ottoman Empire to a dominant position in the areas of the Middle East, the Balkans, the Mediterranean, and North Africa.

The peoples who created this great state were originally members of various nomad tribes of central Asia who, leaving behind them the more sedentary elements, had gradually migrated in a generally westward direction within that vast area, then had by degrees flooded over adjoining regions. Ever in search of pastures for the horses, sheep, and cattle on which their existence depended, pushed from place to place by other powerful, competing tribes, clustering when they could along the fertile banks of rivers and lakes, driven at times by drought to desperate migratory surges—upon reaching a region such as Anatolia, in which they could establish themselves permanently, they gradually lost their nomad characteristics and became sedentary.

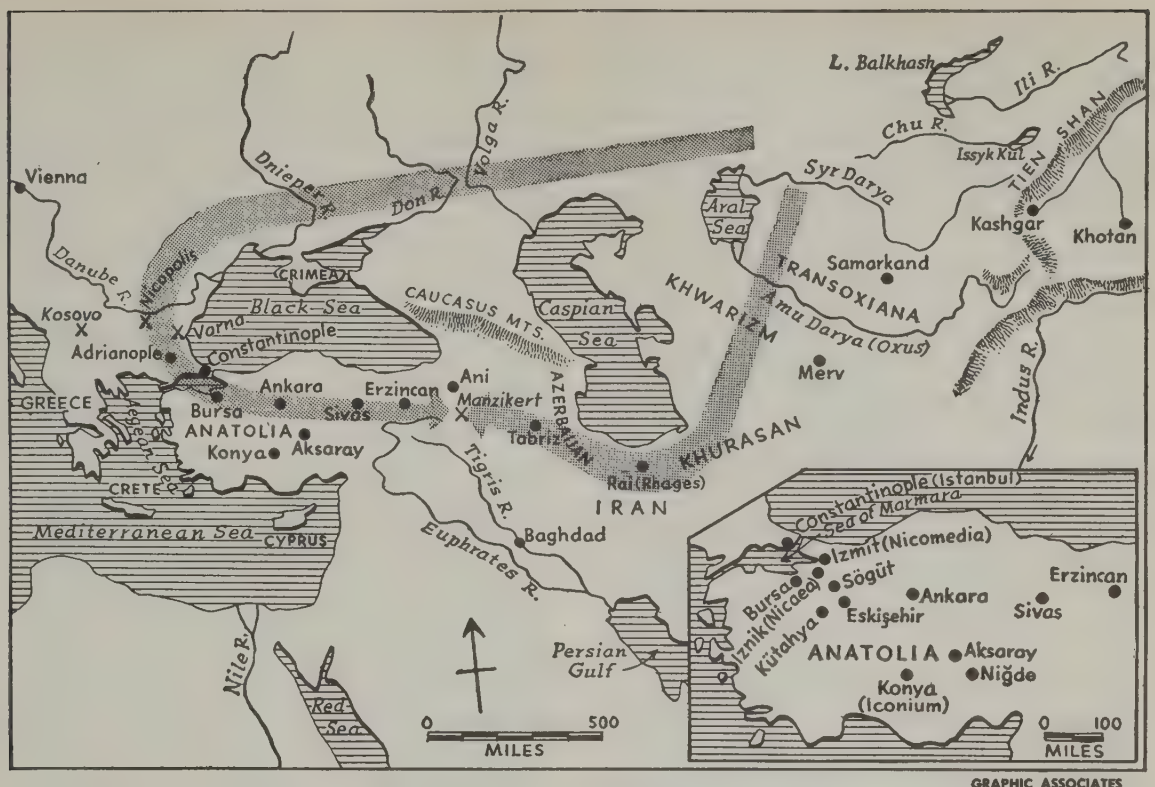
The famous appellations of "Seljuk" and "Ottoman"—two among many other shorter-lived Turkish dynasties—were derived from the names of dynastic founders of particular ability and good fortune, whose descendants were able to give their names to powerful, organized states. It should be remembered that the term "Turk," since the 6th century, has been a linguistic term applied to the widespread peoples speaking the Turkish family of languages.

A modern result of the widespread migrations of the Turks in former times is that there are fewer Turks living within the borders of the Turkish Republic than beyond them—in central Asia, Turkestan, Iran, the Caucasus, the Crimea, and along the Volga—some of the more easterly groups still living the nomad life of their ancestors.

Early Turkish Peoples.—For early accounts of the nomad Turkish tribes in the immense area of Mongolia and central Asia we are forced to rely chiefly on Chinese, Iranian, and Indian sources to complement the old Turkish traditions and such remains as the Orkhon inscriptions dating from the 8th century A.D. and found in 1899 south of Lake Baikal. Even before 1400 B.C. Chinese sources mention ancestors of a nomad people in Mongolia called the Hiung-nu (Hsiung-nu). About 209 B.C. these, and later other Turkish peoples living farther west, were united by Mete, leader of the Hiung-nu, who led his people in an invasion of northwestern China in 201 B.C., which they dominated for about 80 years. Defeat by the Chinese emperor, Wuti, and intertribal rivalries then led to a decline of Hiung-nu power, and about 60 B.C. the Western Hiung-nu migrated to the region north of the Aral Sea, or Lake Aral, which they reached in 36 B.C. From here, in the 4th century A.D., they migrated still farther westward, reached the Danube, and in the next century penetrated deep into Europe, the inhabitants of which knew them as the "Huns" of Attila.

In the early 4th century some of the Hiung-nu remaining in Mongolia participated in the conquest of northern China, where they were absorbed. Others, in the 5th century, moved westward, settling as had the Western Hiung-nu around the Aral Sea. Here, merging with what were perhaps older Turkish inhabitants of the area, the Ghuz (Ghuzz—more correctly Oghuz), they later gave rise to the great Ghuz people who were to play the chief role in the settlement of the Turks in Anatolia.

The period of Hiung-nu was followed by the rise and fall of the power of other Turkish peoples, notably the Avars, but the most brilliant period occurred after the establishment of a powerful state (5th to 8th centuries) in central Asia by the Kök Türk—called "Tu Kiu" by the Chi-



THE TURKS IN THE MIDDLE EAST

This map illustrates the accompanying article. The shaded arrows show the approximate routes traveled by the two divisions of Ghuz Turks, in the 10th and 11th centuries, from the Aral Sea region to the battlefield at Manzikert (1071). The Moslem Seljuk Ghuz had traveled east and south of the Caspian Sea through Iran; the non-Moslem Ghuz had moved north of the Black Sea and had entered Anatolia as auxiliaries of the Byzantine Army. The width of the shaded arrows is a matter of convenience, and it is not to be inferred from them that the two divisions of the Ghuz were of the same strength.

The inset shows Anatolia in greater detail, in order to illustrate the history of the Rum Seljuk state after 1071 and the Ottoman Empire of the 13th to 15th centuries.

nese—whose influence was felt as far west as the Amu Darya and the Black Sea. The homeland of these Kök Türk was in the mountainous regions of the central Tien Shan in the vicinity of the Issyk Kul (Issiq Köl), the large lake in what is now Soviet Central Asia, near the western border of the Chinese province of Sinkiang.

According to Turkish traditions about the Emperor Shu going back to the 4th century B.C. (known by Mahmud Kashgari in the 11th century), the Ghuz lived in the region of the Ili and the Chu. Later Turkish sources report them still in the Ili basin but also further west in modern Kazakhstan (Kazakh SSR) on the banks of the Amu Darya and the Syr Darya and between Lake Aral and the Caspian. Khwarizmian traditions, quoted by Al-Biruni (11th century) mention them as living east of Khwarizm neighboring the As and Pechenegs who lived west of that country. These references explain Strabo's "Ασιοι καὶ Πασιακοί (XI, 8, 2) and Ptolemy's mention of 'Ωξειανοί as east of Χωράσμιοι (VI, 12, 4). Thus it appears that even in the 1st and 2d centuries A.D. the Iranian As (Alan) and Turkish Pechenegs were west while the Ghuz were east of the Khwarizm clan. After still another Turkish people, the Khazars, had reorganized a powerful state between the Don and the Volga in the 7th century, the Ghuz living along the lower Syr Darya and between Lake Aral and the Caspian came under their sovereignty.

The Seljuks.—By the beginning of the 10th century many of the Turkish peoples had become Moslems. As great an Islamic scholar as al-Farabi (d. 950) was a Turk (probably a Turkoman or Qarlug). But the Ghuz Turks, under Khazar rulers who had accepted Judaism about 740, began to be converted to Islam only in the second half of the 10th century. The Ghuz chiefs, whose title was *yabgu,* had come under the influence of Judaism through the Khazars, although the Ghuz people as a whole had remained shamanist. In 922, however, one of the Ghuz nobles, who commanded the armies with the title of *sübashi,* received an Arab mission the secretary of which was the famous traveler Ibn Fadlan. His successor became Moslem, a notable event, for Seljuk Sübashi, a member of the same family, broke with the *yabgu* who remained loyal to the Khazars and led the tribes under his rule in a migration east of Lake Aral to the country of the Moslem Turkomans on the lower Syr Darya. His sons, the Seljuks—taking this name from their father—toward the end of the 10th century became involved in a struggle between the Turkish Moslem Qarakhan (Karakhan) dynasty which ruled the regions of the central Tien Shan and Kashgar (now in Sinkiang), and the Iranian Samanid dynasty which ruled central Transoxiana, the country northeast of the Amu Darya. In the beginning the Seljuks under their *yabgu* Israel aided the Samanids, but on the battlefield they went over to the side of the Qarakhans and were thus responsible for transferring Transoxiana from the Iranian Samanids to the Turkish Qarakhans in 999.

Shortly after this event there occurred a general westward movement of Turkish peoples under population pressures from the east, as described by Sharaf az-Zaman and al-Marvazi in the 12th century. About 1030 most of the Ghuz (some 600,000 families in 1048) who had remained loyal to the Khazars migrated with the Pechenegs north of the Black Sea, then south to the Balkans. Here some were conscripted into the Byzantine armies, as were some of the Pechenegs, and later fought against the Moslem Seljuk Ghuz in the campaign which ended in the Byzantine disaster at Manzikert in 1071. The Byzantine writer Michael Attaliates noted that the language, attire, and methods of war of the Seljuk Ghuz were precisely those of the "Scyths" (that is, the Pechenegs and Ghuz, or "Uz" as they were then generally known) in the Byzantine service. The fact that many of the "Scyths" deserted to the forces of Alp Arslan was a factor in his victory.

A second result of the population pressures from the east was that the Seljuks were forced to leave their lands east of the Amu Darya in 1035 and to migrate west of that river into Khurasan (Khorasan), southeast of the Caspian Sea. Here the Seljuks came in conflict with the Ghaznevids, a Turkish dynasty which had replaced the Samanids and which, following the extensive conquests of Mahmud of Ghazni (r. 999–1030), ruled over most of the great territory between the Tigris, the Amu Darya, and the Ganges. In 1040 at Dandanaqan in Khurasan, the Seljuk brothers, Chagrï (Chagïr or Chagar) and Tugrul (Toghrul or Tughril), the sons of Michael (the latter's name, like those of his brothers Israel and Moses, must have come to the Seljuks through the influence of the Judaistic Khazars) defeated the Ghaznevid armies. They thus opened the way to a swift conquest of Iran by the Seljuks and the foundation of a Seljuk state.

Tugrul (r. 1037–1063), an orthodox Moslem, also brought under his protection al-Qa'im, member of the dynasty of Abbasid caliphs at Baghdad whose power, faced with the rise of the Shi'ite Moslem sect, had dwindled to almost nothing. Until that time the Ghuz had called their chiefs *yabgu,* but Tugrul for the first time in Islamic history separated the temporal power from the spiritual. He left the religious power to the Abbasid rulers as "caliphs," while he assumed for himself the title of "sultan," meaning the holder of temporal power. Tugrul established his capital at Rhages (Rai or Rayy), the ruins of which are near the modern Iranian capital of Teheran, and in time the highly developed Iranian culture reasserted itself. The Turkish sultans became patrons of art and learning, and much of the actual government was in the hands of the great Iranian vizier, Nizam-al-Mulk (1018–1092).

Tugrul's nephew and successor, Alp Arslan (r. 1063–1072), extended the Seljuk domain by conquering Khwarizm, northeast of Khurasan, as well as the lower Syr Darya region, which had been the homeland of the Ghuz. Thereafter he took under his rule the remnants of Khazar Turks, whose state had collapsed as a result of the great westward migratory movements. In 1071, having defeated the Byzantine emperor, Romanus IV Diogenes, at Manzikert, Alp Arslan established the smaller Rum Seljuk ("Roman" or Western Seljuk) state in central Anatolia, side by side with the great Eastern Seljuk state already established in Iran.

Rum Seljuk State.—The Seljuk sultans of Rum, the heirs of Suleiman, a grandson of the *yabgu* Israel, whom Alp Arslan had made the ruler of the new state, remained under the domination of the Eastern Seljuk state in Iran only during the reign (1072–1092) of Malik Shah, the son of Alp Arslan. Then, as the Eastern Seljuk state began to disintegrate under the impact of civil wars, the sultans of Rum declared their independence, devoting themselves to taking over parts of Anatolia from the Byzantine Empire and to making the area a Turkish and Moslem country.

Central Anatolia (Lycaonia and Cappadocia), which Strabo (XII, 6, 1) had described as a steppe with little water but very suitable for raising cattle and especially sheep, became an ideal home for the Seljuks and the nomad Ghuz, and a firm base for their future expansion. The Seljuks had brought with them a great number of Iranians who immediately began the process of Moslemizing the newly occupied cities, and building mosques, Moslem universities, fortresses, and bazaars in the Iranian Transoxianan style, thus erasing the older patterns in these areas. The main element on which the Seljuks depended for repopulating the cities, however, was composed of Khwarizmians and the civilized Turkish element which had lived near Khwarizm and on the lower Syr Darya. These were the peoples that the Seljuks had brought with them when Alp Arslan had made conquests in that area resulting in their deportation. Also in the entourage of Alp Arslan and Suleiman were several princes from the Qarakhan dynasty (whom the Seljuks, as mentioned above, had once helped against the Samanids), and at a later date in the entourages of other Seljuk sultans were noblemen and scholars from Khotan (Hotien, Sinkiang, China). The architecture and irrigation system, as well as the agricultural methods and implements, of the villages and cities established by the Turks in central Anatolia (especially in the regions of Konya, Aksaray, and Niğde) were those of the civilized Turks who migrated there from eastern and western Turkestan. Since the great majority of the Turks who occupied Anatolia were Ghuz, however, other Turks arriving from the east quickly acquired the Ghuz dialect.

To the east, until the invasion of the Mongols, the Seljuk frontiers were successfully defended, but the sultans had to contend with sporadic attacks from the west, not from the Byzantine Empire, which was never to recover fully from Manzikert, but from the Crusaders. The Seljuk capital of Nicaea (modern İznik), which the Seljuks had captured in 1081, fell to the Crusaders in 1097; Iconium (modern Konya), to which the seat of government was moved, fell in 1190. These were temporary setbacks, however, and in 1235, upon the death of Alâeddin Keyqubad (Ala-ud-din Kaikobad) I, the Seljuk domain included all of Anatolia, with the exception of several minor states which paid tribute, one of these being Nicaea.

Meanwhile, however, the Mongols of Genghis Khan, beginning about 1219, had overthrown Mohammed, the Khwarizm shah of a Turkish dynasty whose rule had replaced the Eastern Seljuk state in 1157; and in 1243 the Mongols launched their attack on the Rum Seljuk state, defeating Giyaseddin Keykhusrev (Ghiyass ed-din Kaikhosrau) II between the cities of Sivas and Erzincan and bringing Seljuk independence to an end.

John III Vatatzes, Greek emperor at Nicaea—the city of Constantinople having been in the hands of Latin conquerors since 1204—came to terms with the Mongols and extended his borders considerably in central Anatolia at the expense of the Seljuks. Although the Mongols retired after advancing as far as Ankara (Angora), they intervened more or less directly in Anatolian affairs thereafter, particularly after Hulagu, a grandson of Genghis Khan, settled in northwest Iran and established the Mongol Il-khan (subordinate khan) dynasty, under which Mongol viceroys were appointed for Anatolia. Hulagu also ended the Abbasid caliphate in 1258.

During the era of the Il-khans, which began in 1256 with the conquests of Hulagu, and ended effectively in 1336 with the death of Musa, Turkish Anatolia, together with Azerbaijan, constituted the backbone of the Il-khan state It was this period which marked the second stage in the Turkification of modern Turkey in terms of culture and population. More than two million Eastern Turks and a number of Mongols came in the wake of Hulagu and the result of this influx of such a large mass of Eastern Turks was that the older elements were driven westward to the Mediterranean and Marmara coasts, while the Greek population was compelled to emigrate to Greece and Macedonia The Byzantine historian, Georgius Pachymeres, described this as "the evacuation and migration of the Christians and the occupation and settlement of the Turks."

The descriptions and accounts given in the letters of Rashid al-Din (1250?–1318), a Jewish vizier of the Il-khan period, show that the Il-khans created new settlement areas in Anatolia by opening canals in the Tigris-Euphrates region. The secret of the subsequent success of the Ottomans, who, after establishing a new state which succeeded the Seljuk state, extended their power to the Balkan Peninsula, can be explained in the fact that the Tabriz-Constantinople commercial road became an extremely busy artery of trade, and that the entire area between Tabriz (now in Iran), Ani (its ruins are near the USSR-Turkish border), Erzincan, Ankara, and Eskişehir (these last three in modern Turkey) became a vast new area of settlement.

The Ottomans.—Records concerning Osman (or Othman—whence the word Ottoman) and his son Orkhan (Orchan) were not collected until a century after the former's death, and by that time it was already difficult to establish past events with accuracy. It was said that Osman's father, Ertogrul, had been a tribal chief whose father had moved from a place called Mahan and had settled in Akhlat after the armies of Genghis Khan had overrun Khurasan. There is a story told of Ertogrul's unexpected arrival on the scene of a battle between the Seljuk sultan, Alâeddin Keyqubad I, and the Khwarizm shah, Jalal ad-Din, successor to the Mohammed overthrown by Genghis Khan, and of Ertogrul's throwing his forces on the side of the sultan, who was on the point of being defeated, thereby helping him to victory. The facts related are shrouded in darkness, but nevertheless reflect historical truth Mahan, the place mentioned in these chronicles, is the name of a town lying to the west of the ancient city of Merv (now Mary, Turkmen SSR), which had long ceased to be remembered at the time the chronicles were written. The fact that the name appears at all is evidence that genuine facts are recorded. According to the chronicler Idris Bitlisi, Ertogrul was rewarded for his decisive action in the battle by being made overlord (*sahid*) of the district of Sögüt, in northwestern Anatolia near the cities of Bursa (or Brusa) and Kütahya. The potentialities of such a position on the eastern borders of a weakened Byzantine Empire, which would not emerge from the foreign domination of the Latin Christians until 1261, were to be fully realized by the Ottoman dynasty.

Osman (r. 1288–1326), who succeeded his father as lord of Sögüt, began the gradual but persistent expansion of the Ottoman domain toward the Bosporus and the Black Sea, Bursa falling to his forces after a lengthy siege (1317–1326). Nevertheless, since he is listed among the beys who paid tribute to Germeyan Oghlu, bey of Kütahya, who was himself paying a tributary tax in 1314 to the Mongol viceroy, it is apparent that Osman was at that time merely a tribal chief linked to the Mongol Il-khan rulers through several intermediaries.

Orkhan (r. 1326–1359) continued his father's policies of gradual encroachment on the Byzantine Empire with such success that at the time of his death the Ottoman domain had been increased to about three times its extent under Osman. Nicaea was captured in 1331, and Nicomedia (modern İzmit) in 1337 or 1338. With the latter conquest, the Ottoman domain reached to within 60 miles of Constantinople. Orkhan's inscription on the mosque at Bursa shows that his title was still that of bey (noble), but there can be no doubt that he acquired complete independence toward the end of his life. During the reign (1359–1389) of his son, Murad I, there was no question of being tributary to any ruler to the east, the Il-khan state having come to an end. Murad I inherited an excellent army and a well-organized state which dominated the Anatolian landbridge between Asia and Europe and, overshadowing the remnants of the Byzantine Empire, allowed the Ottomans to intervene in Byzantine affairs.

The Ottoman conquests in Thrace on the European side of the Byzantine Empire as early as 1357, in the last years of Orkhan's life, were probably due to the beginnings of plans for the eventual conquest of Constantinople, the greatest and most strategically located city of that section of the Middle East. Verses prophesying that the Turks would one day conquer the Byzantine capital were compiled long before the event took place. In the copies of an Arabic work, written probably by Abi ibn-Ali Bakr al-Haravi, a scholar from Herat, there is a passage attributed to the prophet Mohammed which may be translated: "How great an emir, and how lucky his army, is the emir named Mohammed who is destined to conquer Constantinople." This passage is contained in copies published even in the time of Orkhan. After the fall of the city to Mohammed II (1453), a tablet inscribed with it was placed on the door of the church of the St. Sophia.

There is no doubt that the sons of Orkhan, who conquered Edirne (Adrianople) in 1361 and made it their capital, were persons imbued with a great ideal, who knew their ultimate goal. The steady decline of Byzantine power and the easy conversion to Islam of the Turkish tribes which had settled in the Danube Basin along the Black Sea coast, made the Ottomans, who were born courageous fighters, believe that ultimately they would beget "the sultan who joins the two con-

tinents and two seas," making Constantinople their capital. The sieges of that city (1391–1395 and 1397), the steady expansion of the empire in the Balkans under the Ottoman sultan, Bajazet (Bayazid) I (r. 1389–1403), and his victory over the Crusaders at Nicopolis in 1396 were due to this ideal, as well as to the steady increase in the Turkish armies, which were absorbing the warlike Turkish and Tatar tribes both north and south of the Black Sea. Bajazet also extended his domain eastward in Anatolia, until by 1395 it included Sivas.

The struggles among the petty feudal states which had replaced the Il-khan power east of Bajazet's realm made it possible for the Turk-Mongol conqueror Tamerlane (Timur), who had already established a great state with its capital at Samarkand, to gain easy victories over them. This, and the fact that several rulers had taken refuge with Bajazet when their lands were conquered by Tamerlane, tempted the sultan to take over many of the eastern provinces, a task which appeared easy. The result, however, was a conflict between Bajazet and Tamerlane over Sivas and Erzincan. Tamerlane, who had planned the conquest of China, seriously tried to avoid a conflict which meant becoming involved to his west, but the outcome was the Battle of Ankara in 1402 in which Bajazet was taken prisoner by Tamerlane and died in captivity, while his domain was plundered by Tatar armies as far as Bursa.

Although this setback retarded the conquest of Constantinople for about half a century, the struggle between Bajazet and Tamerlane initiated a broad cultural exchange between Eastern and Western Turks, and two important results were that Qadi Zadei Rumi, a Turkish scholar, went to Samarkand to study mathematics in the university founded by Ulug-Beg, Tamerlane's grandson, and that Ali Kushcu, a great mathematician from Turkestan and a professor of the same university, came to the Ottoman lands to develop learning. Many other intellectuals, craftsmen, and painters were also attracted from the east. The tangible results of these cultural exchanges were the Green Mosque and the mausoleum in Bursa built during the reign (1413–1421) of Mohammed (Mehmet) I, a son of Bajazet.

In spite of 20 years of civil wars and attacks on the Ottoman Balkan possessions from the north following the Battle of Ankara, the rapid disintegration of Tamerlane's empire after his death in 1405 permitted an unhampered revival of Ottoman power under Murad II (r. 1421–1451), a son of Mohammed I. His victories at Varna (1444) and Kosovo (1448), re-established the Ottoman position in the Balkans.

The empire, which had become a great power in the northwestern Middle East under Murad I and was restored to that position by Murad II, next became a power of global importance with the conquest of Constantinople in 1453 by Murad's son, Mohammed (Mehmet) II (r. 1451-1481). It reached perhaps its highest point under Suleiman the Magnificent (r. 1520–1566), at whose death the Ottoman domain in Europe extended nearly to Vienna on the west and beyond the lower Dnieper River into the Crimea on the east; in Asia from the Sea of Marmara to the Persian Gulf by way of the Tigris-Euphrates river system, and including Palestine and the Red Sea coast of Arabia; in Africa from Egypt along the Mediterranean seacoast into Algeria. The decline of the empire, when it set in at the end of the 17th century, was gradual, a decay from within, accelerated toward the end, in the 19th century, by the twin forces of European imperialism and nationalism acting on the supranational Ottoman state. Nationalism grew strong not only in the Balkans, where by the beginning of World War I little remained of the great Ottoman domain, but also in the Middle East. In this region the remaining Ottoman possessions were stripped from the empire following the war, and the concept of nationalism finally triumphed in Turkey itself in a pro-Turkish but anti-Ottoman movement resulting in the abolition of the sultanate in 1922 and the establishment of the Turkish Republic in the following year.

See also MIDDLE EAST—*European Imperialism; Nationalism;* TURKEY—*History.*

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13. EUROPEAN IMPERIALISM. The more ancient history is studied, the more evidence it gives of commercial relations and cultural symbiosis between the Near and Middle East on the one hand and the Near East and Europe on the other. The main route along which such exchanges have passed is the Mediterranean seaway; on these waters the vital international carrying trade has, in general, been in European hands since Phoenician times. Such, certainly, was the usual case in earlier Moslem times, and such it remains today. Century by century, significant advances were made in the design of Mediterranean ships, in navigation, and in the techniques of naval warfare; but no truly fundamental change in the importance of this sea to mankind's culture and commerce—from the European shores of the Atlantic to the Red Sea, Persian Gulf, and on to India—took place until western European enterprise discovered the alternate all-sea passage direct to Middle Eastern ports via the Cape of Good Hope. This discovery was commercially and politically so important that it was immediately exploited on a large scale. Only two years after Vasco da Gama returned from the first all-sea voyage to Calicut (1499), a sizeable Portuguese fleet already lay at Lisbon with a valuable cargo of Middle Eastern pepper and spices, while concurrently, a Portuguese war fleet had reached the Red Sea in order to protect the new India route and block any trade which still sought to go by the time-honored routes by way of Alexandria and the Mediterranean.

This fundamental alteration in world trade patterns suddenly and irretrievably upset many vital, long established balances. In the Atlantic, Portugal's triumph attracted the competition and enmity of successive, stronger rivals. Finally it was to be France and England who, as they struggled for commercial dominion in the Middle East, were drawn into combinations with, and responsibilities toward, local Middle Eastern powers, until at last the Indian Empire became the brightest jewel in the crown of the English queen-empress. England's successes naturally entailed control of the vital shores along the India route; accordingly, she became a Persian Gulf and a Red Sea power as well.

In the Mediterranean, the effects of the exploitation of the Cape route to India were even more immediately disruptive than they were in India itself. The commercial empires which Italian maritime states, especially Genoa and Venice, had maintained in the Levant prior to this time were

now, at one stroke, robbed of most of their important India trade, while the Moslem states in the Levant, which had traditionally profited from the overland sector of that trade's transit, suffered no less loss. Among these Moslem states the balance of power was so swiftly and profoundly disturbed as to evoke a speedy displacement of traditional rivalries and conflicts. No longer was the usual alignment in the Moslem Near East to be Egypt plus Syria on the one hand, as against Mesopotamia and Persia plus Asia Minor on the other. Instead, Persia, under the Safawid (Safavid) dynasty (1501–1736) and also in a measure in direct contact with western Europeans who came to her down the Volga as well as up from the Persian Gulf, now emerged as a Shi'ite Moslem entity and so established that essential identity which has distinguished the Persians from all other Moslem peoples to this day.

Farther to the west, the Ottoman Turkish Empire of Constantinople for its part reacted to the new situation by immediately conquering the Mameluke Moslem state of Syria (1516) and Egypt (1517), thus bringing the central Arab world under its own rule. Henceforth it was the Ottomans who attempted, frequently but ineffectively, to regain for the Levant that valuable overland Indian trade which the opening up of the Cape route had so largely diverted into western European hands.

Europe's commercial enterprise in the Levant —the Moslem Levant and the Greek Orthodox Levant as well—had in general tended to take the form of more or less formally chartered companies, which, in pursuit of trade, maintained permanent representation and stations (called "factories") at principal Levantine ports and even in a few important commercial centers inland. The presence of such foreign colonies in Levantine lands had naturally created many problems, and had ultimately evoked a systematized procedure for regulating the status and for stipulating the privileges and responsibilities of resident non-Levantine traders as against the native populations and governments of the Levantine world. These regulations were ordinarily embodied in treaties negotiated either between a Levantine sovereign and the European sovereign of a Levantine colony, or else between the Levantine sovereign and the European chartered company itself; treaties of this description were customarily drawn up in sections (*capitula*), whence the modern term "capitulations." This term is unfortunately open to misinterpretation, for the original meaning was by no means that a weak Near Eastern sovereign "capitulated" in granting what amounted to extraterritorial rights to stronger western European trading states in his realms, but quite the opposite: namely, that for his own convenience a Near Eastern sovereign rid himself of the need to trouble with the detailed affairs of an insignificant colony of this sort, and instead entrusted the conduct of those affairs to the colony and to its own ultimate sovereign or charter holder overseas. (See also section on *The Law of the Near and Middle East.*)

A comparable system of factories, colonies, and capitulations extended also to India as western European sea commerce exploited the direct sea route thither, eventually to displace local Indian governments and develop into a European imperial power ruling local subject peoples. In the Near East, however, matters did not go so far. Instead, local authority—represented principally by the Ottoman sultan and the Persian shah—for long decades remained strong enough to confine western European interests more closely to primarily commercial objectives.

But eventually the Ottoman Empire, the last powerful champion of the nearer Orient against Europe, also grew weak. The date best marking the turn of this tide is probably 1683, the year of the second and last unsuccessful Ottoman attempt to take Vienna. Prior to this, in their relations with European powers the Ottomans, although often temporarily defeated, had not suffered the loss of a major territorial gain once it had been consolidated and incorporated into their state. After 1683 the exact opposite became the case. Thenceforth, although often temporarily successful against European power, the Ottomans were always finally pushed back and forced to give up territory to one or another of their European foes.

In consequence, those capitulations traditionally accorded Europeans by the Ottoman sultan (and which had always to be renewed upon the accession of a new sultan) took on a wholly new connotation, although they retained their traditional wording and form. The transaction now became in truth the "capitulation" of a weaker Near Eastern power in granting extraterritorial rights to stronger European powers which were not only commercially interested in the Near East but also were frequently intent upon imperial gains which were much more than simply commercial in scope.

True, after 1683 the Ottomans continued grimly in their attempt to resist European power, but they were now completely imprisoned and purblind within the total horizons of their own Moslem culture and civilization and so—like almost the entire Near East of the time—they long failed to realize that their European foes had assumed so new an aspect that the traditional Moslem means and methods of conflict were no longer adequate to hold Europe off. Thus responsible opinion within the central Moslem world proved fatally slow in realizing that Europe, as it coalesced into national states, strengthened by a profoundly effective industrial and economic revolution and increasingly motivated by belief in such concepts of human destiny as liberty, fraternity, and equality, was also coming into possession of a totally new and unheard-of degree of power, together with the means to deliver that power, on schedule, to even the most distant field of conflict. This tardiness in apprehending the nature of new realities in Europe was, moreover, all the more fatal for the Moslem world since various ideas and techniques from western Europe were already being received or appropriated by non-Moslem minorities within Moslem lands with comparative alacrity. At the same time western Europe was finding in itself not only the means but also the motives to extend its commerce, and often its direct political control, to ever more remote regions of the globe.

Thus, long before Napoleon's Egyptian venture (1798–1799) at last aroused responsible Near Eastern authority to a rudimentary appreciation of the new European challenge which it had to confront, England was already firmly established in India and Habsburg forces were making continuous gains in the Ottoman Europe. Russia, too, after suffering an initial check when Peter the Great attempted to descend directly into the Balkans, had begun to come down through the

Caucasus back door and to use Persia as a not entirely unwilling tool against Turkey, at the same time laying the groundwork for Russian advance into Moslem central Asia.

Thus the main outlines of the 19th century's Eastern Question (q.v.) had already become plain by Napoleon's time. The traditional frame of reference was to regard the Near East as being a "problem," that is, which Western imperialist Great Power was to gain control, political or commercial, in a given region of the nearer Orient.

Two of the major imperialist contenders were, for the most part, involved in the question overland and hence were primarily interested in making territorial annexations: Austria-Hungary and Russia. Two others were concerned with the question principally in a maritime sense: England and France, and these nations also had interests in the farther Orient, so that the central Moslem world also became for them the route of vital imperial "life-lines." Certain key areas and points thereby took on new significance as important foci of Great Power ambitions, rivalries, and strategy in the 19th century Near East: (1) the Straits area, the Dardanelles, Marmara, Constantinople city, and the Bosporus, and with them the mouths of the Danube, the Crimean complex, and Odessa; (2) the Persian Gulf, and with it Basra and Baghdad; (3) the region of Suez and with it Aden, their importance greatly increased after the completion of the Suez Canal in 1869; (4) and finally such vital natural routes as the Belgrade-Salonika highway, the Belgrade-Constantinople-Baghdad roads, and the Taurus passes between Asia Minor and Syria.

During the second half of the 19th century still further complications were to enter the Eastern Question. Among Great Powers, Germany emerged, new and strong, active alike by land and sea, so effective that she gradually caused a realignment of the other main forces involved, for in her presence England, France, and Russia eventually had to draw together, and in so doing perforce relaxed the Western powers' traditional resolve to keep Russia from the Straits area at any cost. Also affected was Britain's previous stand against Russian gains in Persia, in central Asia, and in the Persian Gulf as well. A further complication was the emergence, one after the other, of a whole series of resolute, hot-headed Balkan nationalisms. This complication thenceforth has troubled all big power calculations concerning the area, and has meant that big power gains here have frequently had to be disguised as the "protection" of a small nation state which not seldom is ultimately ungrateful to, and uncooperative with, its "protector." It is not for nothing that this area has given diplomacy the verb "to Balkanize." Yet another and extremely important complication in the Eastern Question was the ascent of oil to the position of a vital commodity in world economy, for the Near East proved to have great stores of this mineral, not only at the head of the Persian Gulf and elsewhere in Persia and Mesopotamia, but also in the Arabian Peninsula and in the Caucasus.

During the 19th century, moreover, the Great Powers had come to be in conflict in many other areas of the world as well as in the Near and Middle East. Therefore the course of events in the Moslem world was continually conditioned by the posture of imperialist rivalries in regions far remote.

It is true that the local peoples of the Near and Middle East were now finally aware that they could never, of themselves, defeat the West's new machine of power; during the 19th century they had, therefore, increasingly endeavored to take over certain parts of that machine for their own use. Most of these attempts were of little immediate avail, for these would-be Westernizers had a most imperfect understanding of the new realities which they were striving to grasp. Still, they persevered, for the impact of western Europe was coming to have an increasingly profound effect upon the lives of many of them—an impact on economic, social, and political life as well as on the intellectual. And as Near and Middle Eastern leaders became increasingly self-aware, they were increasingly resolved to become themselves the creators of sovereign nation states and so to end the systems of imperial domination and exploitation-plus-tuition under which they largely lived and to which, in fact, they owed the main share of the progress they had made so far. Nevertheless, in the ultimately most significant field, in their attempts to gain enough *power* to enable them to realize their goals, they made, and today are making, little real advance. Instead, the West's available power resources and techniques continue to outstrip them at a dizzy pace.

The accumulated tensions of the Eastern Question, and of the Near and Middle East's responses thereto, reached a climax with World War I, important actions of which were fought in the Near East with Near Eastern manpower playing a sizeable role therein. In the interlude between the two world wars, two Near Eastern nation states attained a degree of national sovereignty which could be called "unqualified"—Turkey and Iran—but of these only Turkey assembled enough strength to deter aggressors in World War II. Again, only Turkey was able to make significant headway with her program of compulsory, wholesale, forced-draft westernization-plus-nationalism. Between 1918 and 1939, other nations and would-be nations of the Near and Middle East achieved really no more than qualified sovereignty at best. Important actions of World War II were also fought in the Near East, although in this case no local forces played any important role. Since 1945, the aftermath of war has enabled further areas of the Near and Middle East to gain independence: India and Pakistan, Lebanon and Syria. The status of Palestine has been radically and violently altered. (See Israel.) Other local nation states which had a measure of qualified sovereignty have at least moved closer to true sovereignty. All this has been achieved principally because the Great Powers have, in their weaknesses at home, been obliged largely to forego their imperialist programs abroad; but the prospects of such nation states are not brightened by the consideration that another great power, Soviet Russia, has simultaneously re-emerged in the role of imperialist expansion, although the other newly emergent world power, the United States, is visibly reluctant herself to employ the traditional concepts and techniques of European imperialism.

Above all, with the partial exception of Turkey, none of the nation states of the Near and Middle East has at its disposal adequate power to deter aggression, or good prospect of soon being able to assemble such resources in significant degree. Hence in 1950 it was even truer than

in 1850, just as in 1850 it was truer than it had been in 1750, that all progress and local achievement in the Near and Middle East were overclouded by the fact that the area is a power vacuum in a world where power ultimately decides most of the mundane destiny of mankind. See also separate articles on the countries of the Middle East.

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14. RUSSIAN MESSIANISM AND THE MIDDLE EAST. In its ultimate portentious consequences, Russia's history had been much more deeply influenced by the traditions of the Middle East than the usual interpretation of Russia's "Byzantine heritage" would lead one to think. A total survey of the ideologies and traditions of the ancient Orient in their influence on the course of world history opens a deeper insight into the specific importance of these traditions for Russia's internal history and the history of her foreign relations. Such a systematic survey of the elements that enter into the history of this Oriental area in ancient times, primarily the "negative heritage" bequeathed to it by Greek antiquity, will help us to a better understanding of the Russian problems of today. More light must be shed on the Oriental and Byzantine heritage which takes first rank among the formative factors in Russian history. In so doing we shall find that Russia was (1) the general objective on which the traditions of the Middle East worked, with the result of forming Russian autocracy; (2) the special objective of Byzantinism in the formation of Russian theocracy; (3) the common objective of both traditions in forming the typical Russian messianism; and (4) in consequence of these three developments, it was precisely the Middle East which became the main objective of Russian imperialism.

Autocracy.—The history of Russian autocracy is, on the one hand, an extreme manifestation of the Byzantine doctrine of the state: ". . . the Russians have sought salvation in the political institution that was the bane of the mediaeval Byzantine world. They felt that their one hope of survival lay in a ruthless concentration of political power and worked out for themselves a Russian version of the Byzantine totalitarian state." [1] In this "Russian version," however, we discover a fundamental feature which distinguishes the despotic character of the Russian political and social system in its pre-Christian (Oriental and pagan) sense from the Christianized, Hellenized form of its Byzantine prototype. This difference is twofold: first, there is in Russian autocracy a special emphasis on the nationalistic exclusiveness of the Russian state, in contrast to Byzantium which, with its genuinely "cosmopolitan" attitude, did not know devotion to a purely "Greek" state. Russian autocracy is the conscious expression of an absolutistic, nationalistic political system; it is thus a reversion from the Byzantine attempt, made under Christian influence, to transcend the native civilization of the *polis* (city-state) as growing out of the Greek *nomos* (law) and to transform it into the cosmocratic order of the Hellenistic *cosmopolis.* (See section *Byzantium and Eastern Christianity.*) The full retrogression from this Byzantine attempt now came to life on Russian soil. Russian autocracy thus marks the defeat of the Byzantine *cosmopolis* and, in its place, the expansion of the city-state of antiquity to fill the wide spaces of the Russian realm. The fact that Russian autocracy has its roots in the traditions of the ancient city-state had such fundamental consequences for the whole development of the political structure of Russia that even today " . . . On this point there is no real difference between the views of Plato and of Lenin." [2] On the other hand, the second characteristic feature of Russian autocracy was an element neither of the Byzantine *cosmopolis,* nor of the *polis* of antiquity: It is the notion of the "folk," with this term's connotation of "blood and soil." This element of Russian autocracy, of being consciously rooted in the folkways (*Volkstum*), made it entirely compatible with the kindred traditions of the native Oriental peoples. If we analyze this characteristic trait of orientalism, we find that the main content of the native popular cultures lies in the palpably materialistic, the naturally physical elements—in contrast to both Byzantium and Hellas. This enters as a typically Oriental trait into Russian popular culture with its religious veneration for the soil (*matuschka syra-zemlja*), for sacred "little mother earth." "Hence it follows that the greatest religious temptation for a Russian will be a pantheism of a sensual (*hylozoistic*) kind. Sacred matter rather than spirit is the object of veneration." [3] This typically Oriental leaning toward hallowing material things and materializing transcendental values was the deeper source of Russian sectarianism which, in its religious oddities and wide diversities, far surpasses even the sectarianism of Oriental Christianity from which in many respects it directly originates. (See section *Oriental Christianity.*) In the same way, the theological peculiarities of the Russian Sophianists—Vladimir S. Solovyov (Soloviev, 1853–1900), Leo P. Karsawin (1882–), Sergei N. Bulgakov (1891–1944); the blasphemous doctrine of the "God-bearing people" and its exclusively "Russian Christ"—Fyodor Dostoyevsky (1821–1881); the monstrosities of the sexual Eros-"theology"—Vasili V. Rozanov (1856–1919), Dmitri S. Merezhkovski (1865–1941), even Solovyov—they all have their roots in this "pantheism of a sensual kind." Even the peculiar Russian cult of the sacred icons and its theological justification bears a striking resemblance to the sacred cult of pictures and statues in ancient Egypt. In the end this ideological complex offered the possibility for the Bolshevists to transform the old Russian theocracy into the neo-Russian technocracy; for all these phenomena are

[1] Toynbee, Arnold J., *Civilization on Trial,* p. 181 (Oxford Univ. Press, New York, 1948).

[2] Crossman, R. H. S., *Plato To-day,* p. 215 (Oxford Univ. Press, New York, 1939).

[3] Fedotov, G. P., *The Russian Religious Mind,* p. 20 (Harvard Univ. Press, Cambridge, Mass., 1946).

in perfect "accord with Russian history and may be explained, all in all, as a fundamental Russification and Orientalization" (Berdyaev).

When in this manner the traditions of the Greek *polis* and the Asiatic heritage of Mongolian despotism coalesced with those of Oriental idolatry of the "folk" and the state and formed a further combination with the social and spiritual collectivism of Byzantium, the peculiar "folkdom" structure of Russian autocracy was produced. The Russian individuals were born and forever confined by destiny to this framework of political despotism and social collectivism. This is the reason why the masses of the Russian people—comparable to the masses in ancient Greece and the Orient, their comrades in this fate—never felt a psychological compulsion to revolt or to organize a systematic social and political opposition in the Western sense of the term. This Russian "folk-body" with its marked Oriental collectivism was forced to exist within a rigid system of political serfdom which carried on almost "naturally" the traditions of both Hellenistic-Byzantine despotism and the Greek slave-state, merging them into the historical novelty—first of the old-Russian czarist autocracy, and then of the neo-Russian technocracy and the "democracy," Leninist-Stalinist "version." "The Orientalism of the state, rebuilt by Diocletian, was paralleled by the orientalization of social life which had fallen to the level of oriental, pagan societies. Slavery was not only one of the basic social institutions but the model type for all social relationships. Everyone was the slave of his superior and the master of his inferior. The ethics of slavery, in the disguise of Christian humility, were accepted and idealized in the Byzantine Church. In reading the Byzantine historians one is appalled by the amount of cruelty and perfidy occurring at every step. . . . Certainly there was cruelty in the Western middle ages too, but in Byzantium one is confronted by a cold passionless cruelty which finds no moral opposition from either the narrating authors or—with rare exceptions—from the contemporary Church. . . . A certain amount of hypocrisy was naturally created by the half-conscious feeling of incompatibility between the pagan structure of society and Christian standards." [4] If we relate but the generally known facts of Russian history to this description of Byzantine autocracy, as stated by one of the most important among contemporary Russian historians, the parallelism with the so-called "Russian version" (Toynbee) is striking. A similar parallellism appears when we recall the ancient Greek examples of Athens and Sparta and then turn to their "Russian version" of today—Stalin's "democracy." In Athens, ". . . Plato would find a resemblance between his own ideal State and Communist Russia. Both are attempts to make life conform to a strictly rational pattern. . . . No combination of citizens intent on their own economic ends must be allowed to threaten or cajole the government, whether it be a company anxious to increase its profits or a trade union formed to protect the standard of living of the poorer classes. . . . Plato believed the philosopher must become king; Lenin achieved it. Those qualities in Communism which shock us most, its suppression of the opposition, its sacrifice of the individual life to the great plan, its hostility to all rival creeds, are the qualities which Plato would have most admired." [5] If we finally add the well-known scheme of Sparta's despotic structure—a minority of citizen leaders who reigned supreme over the majority of laboring *metoeci* (metics) and Perioeci and the pitiful slave army of the helots—we see again an exact parallel to their "Russian version" of today: the Communistic leader hierarchy, the disenfranchised masses, and the pitiful forced labor battalions. In all these parallelisms we find an entirely objective manifestation not only of the Byzantine, but even more of the Oriental heritage of unfailingly autocratic Russia.

Theocracy.—The essence of Russian theocracy also reveals a strongly modified version of the Byzantine pattern. Russian Caesaro-papism always interpreted the relationship between church and state with a strong bias for the domination of all organized religious life by the state, whereby the true character of the church became distorted. It is a fact that in the pre-Muscovite era, beginning with Vladimir's conversion to Christianity (989) up to the institution of the patriarchate of Moscow (1589), the church in Russia enjoyed more liberties and greater independence from the immediate domination by the state than was true under the reign of the Byzantine "symphony" of church and state. This was possible only because the church with its hierarchical organization was not Russian at all but typically Byzantine, and because the Russian bishops (partly native Byzantines) were subordinated directly to the patriarchs of Constantinople and only indirectly to the Russian sovereigns. However, no sooner had the czars of Moscow achieved the independence of the Russian Church from the Byzantine state church, than they began to subject all religious life more and more to the autocratic state authorities, a process which reached its goal under Peter the Great (1721) when the patriarchate was abolished and the church completely nationalized. After Peter the Great, the Russian Church—in full contrast to the Byzantine state church—did not enjoy comparative religious and theological independence; it became exclusively an instrument of state autocracy, the czar ("gossudar") uniting in his person the offices of emperor and patriarch. Thus, Byzantine Caesaro-papism was transformed in Russia into a new kind of Caesarism in which, following the typical Oriental pattern, the czar's person and office became the supreme and exclusive temporal incarnation of divine authority and the sole source of both secular and sacred law. The hierarchical structure of the church imitated that of its model, the church of the ancient *polis,* in which the cult of religion turned into the absolute cult of the state and the priests were state employees. "The Greco-Russian priesthood never was, and never will be, anything but a militia of the Russian State, distinguished from the secular troops of the Empire only by their uniforms" (Custin); see *Bibliography.* This explains also why in Stalin's Russia of today the patriarchate, in spite of its name, was not only able to find a *modus vivendi* with the neo-Russian autocracy, but lent itself willingly as the instrument for the Russianization of all non-"orthodox" religious groups and ecclesiastical institutions in the eastern European area, as far as these states were exposed to the domination by Moscow. We also understand why the modern "orthodox" doctrine

[4] Fedotov, G. P., *The Russian Religious Mind,* pp. 36-37 (Harvard Univ. Press, Cambridge, Mass., 1946).

[5] Crossman, R. H. S., *Plato To-day,* pp. 213-214 (Oxford Univ. Press, New York, 1939).

of the state (Kartashov) could meet with Stalin's full assent when it declared that the Byzantine state-church-symphony should now be replaced by a system which goes back to the "pre-Constantinian" pattern of the state, with the implication that it would be based on the Oriental and the ancient Greek state autocracy.

This typically Russian model of an absolutistic, nationalistic theocracy is based as much on the full identification of the intrinsic natural values of the Russian soil (*russkaja zemlja*) and people with the spiritual values of the Russian religion, as it is based on the identification of the church life with the political-social. Thus the naturalistic, materialistic character of this "theocracy" in which "sacred matter rather than spirit is the object of veneration" was the necessary precondition for the success of the experiment of Russian Bolshevism. In Bolshevism the old materialistic and sensualistic theocracy found its ultimate manifestation in entirely secularized form, in the neo-Russian technocracy. In this process of transformation nothing of the typically Russian peculiarities, embodied in the old theocratic order, needed to be scrapped. The basic difference is only that the naturalistic mysticism—of the sacred "little mother earth" (*matuschka zemlja*), of the "Russian Christ" and the folk-bound "integral body of Christ"—was replaced as a formative principle by the rationalistic mysticism which surrounds the material resources of Russia, the electrification, the communal-technical collective and the machine. In this virtually "organic" transformation of the mystical naturalism of Russian theocracy into the rationalistic materialism of neo-Russian technocracy lies the creative originality of the Communist experiment—as yet much too little recognized and evaluated—which makes of it a novel feature in world history. Lenin, who had a truly mystical veneration for electricity and the machine, deserves recognition as a true Russian for having grasped these possibilities at an early stage, and for having the force of a genuine autocrat and technocrat to utilize all political and organizational potentialities by substituting the new technocrat values of electricity and the machine for the old values and forms of theocracy. How very factual is this connection between old Russian theocracy and neo-Russian technocracy can be noticed even in the outward forms of this transformation when, with as much passion as success, the "God of electricity" was raised as substitute for the old "Russian God"; the totalitarian human "collective of the machine" as substitute for the old Russian totalitarian "body of Christ"; and the "devotion to the machine" for the "imitation of the Russian Christ." Meanwhile, following quite naturally the dialectics inherent in this process of transformation, the dominant formative principles in all of Russian history, "Pan-Russianism" and "nothing-but Russianism," have largely prevailed over the extreme messianic and apocalyptic features, including the extremes of technocratic atheism and hatred of religion. Instead, the autocratic structure of Russian life has once more been consolidated within the old traditions with the one difference: that the despotism of the former czarist theocrator, sanctioned by religious messianism, has been replaced by the dictatorship of the neo-Russian technocrators, Lenin and Stalin, sanctioned by Communistic messianism.

Structure of Messianism.—Russian messianism, historically, is a mixture of the Oriental idolatry of "folkdom," the political arrogance of the Greeks, and the exclusivity of Byzantine orthodoxy, to form a religious-political system of boundless fanaticism and lust for power. The God-chosen people ("folk") of the Russians is the sole incarnation of the true Christian community and its way of life, and of Christian charity. Consequently, whatever is alien to the Russian "folk" as the only begotten exponent of "Russian love" (Dostoyevsky) is necessarily of inferior rank—a close parallel to the exclusiveness of the Hellenes of antiquity as against the barbarians. After the fall of Byzantium and the heretical behavior of the Roman Church, the Russian Church becomes the only God-ordained representative of the genuine doctrine of Christianity and of the truth of orthodoxy. Moreover, the only way for the other Christian churches to atone for their apostasy and find true salvation is to return to the bosom of "Orthodoxy" (Boulgakoff). The Russian Empire, finally, being the historical manifestation of the "chosen people's" will and the only visible exponent of the church's spiritual mission to embrace all mankind, is the sole institution charged with leading all the world toward the order and peace willed by God, and capable of so doing. It follows that the capital of this empire must assume all traditions, all leadership ever exercised in world history by any other metropolis, just as exclusively as this empire combines in itself the succession of all previous empires: Holy Moscow becomes the hub of the world! And since in the messianism of Holy Russia all the traditions of the *orbis christianus* centering on Rome are concentrated, it is only natural that now Moscow must unite all the traditions, first of the original papal Rome, then of the Byzantine New Rome now in the hands of the "infidels," in order to give to humanity in a Third Rome the living law of a historical and spiritual world community. In other words: all nations must be Russianized, all churches must become orthodox, the entire world must become Russian (Dostoyevsky).

These are the principal ideas and aspirations of Russian messianism, as heralded long ago in the early Russian *Saga of Prince Vladimir* by the Metropolitan Spiridon. According to this saga, Russian history dates back to the age of Noah and centers around one aim: to endow Rurik (Ryurik), the founder of the Russian Empire, with the legitimacy of a direct line of succession, beginning from the world realms of Egypt, Alexander the Great, the Indian crown, Rome, and Byzantium. Ever since this primitive work, the historical, political, and theological literature of Russia, in innumerable variations and with growing seriousness, has filled these aspirations with a concrete content. As early as the 16th century, these ideas were given a clear direction within state and church policies in the thesis of the *Third Rome,* as formulated by Philotheos of Pskov. Later, laid down in the 19th century in the ideologies of the Slavophiles, these aspirations find their systematic expression and intensification in history, philosophy, and theology, most completely in the writings of Aleksei Khomyakov (1804–1860), Ivan V. Kireyevsky (1806–1856), and the Aksakov brothers, Konstantin (1817–1861) and Ivan (1823–1886). This messianism reaches its ultimate climax in Fyodor Dostoyevsky's Pan-Russianism (*An Author's Diary,* 1861, 1873 to 1881), in Nikolai Danilevsky's Pan-Slavism (*Russia and Europe,* 1869), in Kon-

stantin Leontyev's Pan-Byzantinism (*Byzantinism and Slavism,* 1874; *The East, Russia and Czarism,* 1885). This is the epoch in which in the political sphere this messianism is definitely transformed into Russian imperialism, through the writings of men like Sergei S. Uvarov (*Orthodoxy—Autocracy—Nationalism,* 1843), Konstantin P. Pobiedonostzev (1827–1907), and the journalistic work under the leadership of Mikhail N. Katkov (1818–1887). During this entire trend, one solitary Russian made an attempt to correct this Pan-Russian form of messianism. This was Vladimir S. Solovyov whose ideological essay *La Russie et l'Église Universelle* (*Russia and the Universal Church*) could not be published in Russia, but was printed in Paris (1889). He tried to establish a very problematical connection between the imperialism of the czars and the universalism of papacy to form a "free theocracy" as a new unit for world domination.

We can without difficulty recognize the astonishing parallelism, identity even, between the autocratic attitude, the orthodox intransigence, and the Pan-Russian missionary drive and urge for world domination of the theocratic messianism of czarist Russia on the one hand, and the technocratic messianism of Communist Russia on the other. The difference lies only in the ideological motivation and formulation of the aims; in practical result it comes largely to the same. On principle, technocratic messianism has replaced the religious motive by the social motivation of the Marxist doctrine of salvation; instead of the world domination by ecclesiastical orthodoxy and theocratic imperialism, it proclaims the world domination by Marxist orthodoxy and technocratic imperialism. We can therefore understand and evaluate the entire history and organization of the Communist aspirations for world domination under the autocratic leadership of the Third International of Moscow only if we place the technocratic messianism of Red Moscow into its proper context in the genuinely Russian historical and ideological perspectives. For, "they managed to get rid of the Czar, but not of Czarism" (Masaryk). "Under the Hammer and Sickle, as under the Cross, Russia is still 'Holy Russia' and Moscow still 'The Third Rome'" [6]

Imperialism.—In Russian imperialism all the great traditions and ideologies of Russia have worked together to form an instrument of concerted political and military action versus the non-Russian world. Russianism thus transfers the country's own political messianism as Pan-Russianism into the sphere of world affairs, and at the same time it transfers the material struggle for Russia's own economic interests into the struggles among diverse economic interests on the world scene. In this narrow interlocking of ideological and economic interests lies the basic difference between Russian imperialism and its Western counterpart, for the exponents of Western imperialism had and have mostly material interests at heart. Ever since the days of the Congress of Vienna (1815) down to the latest negotiations among Western powers under American leadership, this cleavage was the main source of the deep-rooted difficulties which have over and over again beset the international political relations between the West and Russia. In czarist imperialism, every apparently concrete political objective in the international sphere had nevertheless its background in typically Russian ideologies. Equally today Soviet Russia's apparently concrete political set of problems in world affairs always has an added ideological element, that of technocratic messianism and imperialism. Any judgment on Russian international policies that would be based on purely rational motives of practical politics would be bound to err, in failing to take into account these historical perspectives. As a matter of fact, it is impossible to "understand" the Russians unless one has deeply probed into their past and has thereby learned to distinguish clearly their aims as formulated in their practical policies of the day from the overriding momentum of their ideological imperialist aspirations. The moment we take the wider view, Russian imperialism will necessarily emerge as that great threat to the world which no one has seen more clearly than two great Russians when, in laying down their judgment, they temporarily broke loose from the ideological traditions of their own Russianism. One of them, Vladimir Solovyov, in his Western period, ably characterized the dangers threatening from Russian imperialism thus: "The Russian Empire, isolated in its totalitarianism, is nothing but a threat to Christianity, a danger of struggles and wars without end." (*L'Idée Russe,* Paris 1888.) And similarly Lenin, in his Western period, passed a judgment of condemnation on Russian imperialism which has once more in our day become very much up-to-date: "Being Great Russians, we are swelled with a feeling of national pride, and this is precisely why we have such an intense hatred of our slave past in which the aristocratic landlord led the mushiks into wars to strangle the liberties of Hungary, Poland, Persia and China. And it is precisely for this reason that we also hate our slave present in which that same landlord, aided and abetted by the capitalist, leads us into a war to strangle Poland and the Ukraine and to wipe out the democratic movement in Persia and China" (*Sotsial-Democrat,* No. 35, Bern, Dec. 12, 1914).

Because of the Oriental origins of its ideological traditions, Russian imperialism has always regarded the Middle East as the main target for its aims and actions in power politics. Even the problems of the Far East and the European aspect of her Pan-Slavistic Balkan policies were always secondary to the central theme, Russia's Middle East policies. Here Byzantium and Turkey were the permanent chief objectives of political and military pursuits. "What we want is the good of Slavdom and the entrance to the Black Sea; no Port Arthur, no Shan-hai-kwan, no Pei-ho can take the place of the Bosphorus (*Novoye vremya* [*New Time*], April 1901). Likewise, all ideological aspirations have for their pivot the Russian domination of Constantinople and the entire heritage of Byzantium. They found their strongest, undisguisedly messianistic expression in Dostoyevsky's political writings (*An Author's Diary*) and in the pathological fanaticism of Leontyev. Even in the grand game of imperialism which Russia used to play steadily in her international alliances and treaties, the Middle East problem with its centers in Turkey and Persia forever occupied her main interest. How very deeply the preponderance of the Middle East problem is rooted in the traditions and aspirations of Russia was proved most impressively by Stalin's neo-Russian imperialism when in his negotiations with Hitler in 1940 he laid down a "Russian solution" for the Persian and Turkish

[6] Toynbee, Arnold, *Civilization on Trial,* p. 183 (Oxford Univ. Press, New York, 1948).

questions as *conditio sine qua non* for an open mutual military alliance, otherwise declaring war between Soviet Russia and Nazi Germany to be unavoidable.

A short survey of Russia's wars of aggression waged in central Asia and against Byzantium-Turkey shows more clearly than any long historical treatise that the Eastern Question (q.v.), as the crucial problem of Russia's destiny, was always in the forefront of Russian foreign policies and drive for expansion. We now understand why Stalin, though well aware of the perils of his position, could not avoid tieing up Russia's entire future, win or lose, with the Eastern Question. Of her own free will, Russia waged more than 19 wars of aggression in the Middle East. In the distant historic past, the period up to the domination by the Mongols, she carried on four rapacious wars against Byzantium, only to be four times ignominiously repulsed: in the years 860 (Rurik), 911 (Oleg), 941 (Igor), 1043 (Yaroslav). It seems a paradox of world history that Russia first came into contact with Byzantine Christianity only through these aggressions, to which she thus owes her Christianization and her Byzantine traditions. No sooner had the Russians of Kiev rid themselves of their Mongol masters—with the conquest of Kazan, 1552—than the great era of Russian aggressions began. In 1556 Russia conquered Astrakhan and thereby won access to the Caspian Sea. In 1696 she conquered Azov, establishing herself firmly on the Black Sea. After that, Peter the Great, followed by Catherine II, set out on the warlike "Road to Byzantium," but although important minor conquests were made, the coveted goal of Constantinople forever eluded them. This period of eight fruitless aggressive wars against Turkey (1710–1711; 1736–1739; 1768–1774; 1787–1792; 1806–1812; 1827–1829; 1853–1856; 1877–1878) and seven aggressions against Persia and the central Asiatic borderlands has permanently branded czarist Russia with the sorry reputation of being an unequaled international peace-breaker. With questionable pride the Leninist historian Mikhail N. Pokrovski could eventually characterize the results of Russian imperialism with these words: "We Russians—and this I, a pure-blooded Great Russian, must admit—have in the past been the greatest robbers imaginable." (*Trudy pervoi vsesoyuznoi konferentij istorikov-Marksistov,* that is, *Report on Conference of Marxist Historians,* Moscow, 1930.)

We need only follow the history of the developing Soviet-Russian policies and actions from the outbreak of World War II against the Middle East, primarily aimed at Persia and Turkey. We shall then see that in this respect also Communist Russia endeavors to follow faithfully in the footsteps of czarist imperialism. The future and the destiny of the Middle East essentially depend on whether Soviet Russia at last can reach the very goal that eluded czarist Russia, a prize which Stalin himself, in his greatly conceived gamble with Hitler for the mastery of the world, was not allowed to grasp: the "Russian solution" of the Persian and Turkish questions. Also in this decision the champions that face each other are the United States as exponent of the Western traditions and guarantor of the liberties of the nations of the Middle East, and Soviet Russia as the exponent of neo-Russian imperialism and Communist technocracy. See also section 18 of this article.

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EDGAR ALEXANDER.

15. NATIONALISM. In the Middle East, as in all countries outside the North Atlantic region, modern nationalism has been a product of contact with the West and with modern Western civilization. There, as everywhere, its coming presented to the traditional societies of the prenationalist age a challenge to reform and adjust the whole structure of their group life, their cultural aspirations and their individual outlooks. Modern nationalism became a force in the Middle East only in the 20th century. But in the preceding one hundred years, the Napoleonic armies and, many decades later, British administrative practice and American education had sown the first seeds, which were slowly to take root among a few individuals of the ruling classes and to set them thinking about the need to transform the ancient civilizations of the Mediterranean Orient into modern nations.

Beginnings of Nationalism.—At the beginning of the 19th century, Middle Eastern society was organized on a traditional religious basis. The religion which was by far the most important numerically and which at the same time was the religion of the ruling class was Islam. By its whole teaching and its outlook Islam, though Arab in its origin, was strictly international, or rather supranational, representing a brotherhood of the faithful irrespective of descent or race, language, or native land. This community of civilization and way of life maintained itself until the 20th century, more intense in its feeling of unity and more unified in its outlook than medieval Christianity had been. The only differentiation was according to religious sects within Islam, and in that respect it might be said that the Shi'ites represented, on the whole, a Persian national tradition, while the Wahhabis, a sect founded in the middle of the 18th century in the Nejd in the Arabian Desert, tried to revive the original features of desert-Arab Islam. The conquests of the Wahhabis, who were animated by a fanatical crusading spirit (Karbala, sacred city

of the Shi'ites, taken in 1801; Mecca, sacred city of the Sunnites, 1802), and the short reign of these religious warriors over the whole of central Arabia, from which they were dislodged only in 1818 by Egyptian troops, can be regarded as the first manifestation of a new Arab nationalism, though still in a strictly traditional and medieval garb. The same ruling house, the family of Sheikh Mohammed ibn-Saud (d. 1765) of the Nejd, which led the Wahhabi expansion in the early 19th century, was to head the second, and this time definitely nationalist, ascent of Wahhabi power in the 1920's.

The Egyptian Army which had broken the Wahhabi power in 1818 was the first fruit of the penetration of Western concepts of the modern nation state into the Middle East. The French occupatoin of Egypt (1798) laid the foundations not only for exploration of the history and culture of ancient Egypt (creating thereby the historical background for future Egyptian claims to nationhood and glory), but also for administrative, economic, and military reforms, which were started by Mehemet (Mohammed) Ali (1769–1849), an Albanian soldier of fortune, who in 1805 became Turkish governor of Egypt. With the help of French instructors he built up the rudiments of a modern army and navy, and planned to make Egypt the center of an Islamic renaissance and of a Europeanization of Islamic society.

It was a period when the influences of the French Revolution and of the Napoleonic wars aroused nationalist aspirations throughout the Near East, not only in the Serbs and Greeks but even in Turkey, where Selim III (r. 1789–1807) planned in 1793 the complete reorganization of the military system, and Mahmud II (r. 1808–1839) abolished the Janizaries (1826), while in the year of his death his youthful successor, Abdul Medjid (r. 1839–1861), issued the first reform decree. This decree, the Hatti-sherif of Gulhané, was the first wedge in transforming the obsolete medieval theocracy into a modern nation state, and in introducing the beginnings of modern economy and education. However, these early reforms in Egypt and Turkey did not strike roots. There was not yet an educated class filled with a sense of national responsibility. This began to grow only in the last decades of the 19th century, when closer contact with Europe had been established, when American schools had been founded (Robert College in Constantinople, opened 1863, and the Syrian Protestant College, later renamed the American University, at Beirut, 1866), and especially when the British had set the example of a modern administration in Egypt, where under these conditions security of law and capitalist enterprise helped develop the beginnings of a native middle class.

Growth of National Consciousness.—As the result of the fact that European Turkey was most closely exposed to Western influences, and that its officers and administrators had to acquire knowledge of European languages and science, a literary and political awakening in the European sense could first be noticed among Turkish intellectuals in the 1860's. Ibrahim Shinassi founded in 1860 the first unofficial Turkish newspaper, *Terjumani Ahval* (*The Interpreter of the Situation*) which changed its name to *Tasviri Efkâr* (*Tablet of Opinion*) the next year. In 1862, Namik Kemal Bey, the great agitator and poet, joined the paper. These years marked the beginning of the steady growth, in spite of governmental repression, of nationalist agitation among the intellectuals. Many of them lived abroad and there published papers, such as *Hürriyet* (*Freedom*) in London (1864), which were smuggled into Turkey, and organized the Young Turk political movement. Western prose and poetry were translated into Turkish, and there was created a literary language which could express modern secular emotions and aspirations. It was, however, only in 1908 that this reformist nationalism entered the political stage with the successful Young Turk military revolt. Meanwhile, the Young Turks had changed their name to Ottoman Committee of Union and Progress, and their rising nationalism encountered the difficulty presented by the rise of other and opposed nationalisms in the formerly supranational Ottoman Empire.

Among these new nationalisms which worked for the disintegration of the Ottoman Empire were not only those of the Christian peoples (Armenians, Greeks, Serbs, and Bulgarians), among whom religious organization had often acted as a national church, but for the first time national movements among Mohammedan peoples, above all the Arabs, and to a lesser degree the Albanians and Kurds. With them, as in Egypt and Persia, nationalism became vocal in the first decade of the 20th century, though in Egypt proper the nationalist slogan "Egypt for the Egyptians" was first heard as far back as 1878. But this early movement, led by one of the few officers of Egyptian origin in the Egyptian Army, Arabi Pasha, collapsed quickly in 1882 and provided the occasion for British occupation of the country.

Early 20th Century Nationalism.—Only at the beginning of the 20th century did nationalism appear as a force in Egyptian public life, at the same time that it did in Turkey, in Iran, and among the Arabs. In all these cases, as throughout Asia and Africa, these new nationalist aspirations drew encouragement from the Japanese victory over Russia and from the example of the Russian revolution of 1905. Until then nationalism had been a purely intellectual and cultural movement, confined to the very small group of westernized intellectuals. The few attempts at what might be called a political awakening were hindered by the despotism of Abdul Hamid II, and by the apathy of the masses. At the beginning of the 20th century Najib Azuri founded in Paris a Ligue de la Patrie Arabe and began the publication of a periodical proclaiming Arab independence. Only in Egypt, under British influence, did there exist a possibility for the formation of a free public opinion, of political agitation and education, while at the same time the security of law, established by the British, favored the growth of capitalism and thereby of a native middle class. Mustafa Kamel (1874–1908), who had studied in France and had tried to mobilize French public opinion against England's predominance in Egypt, started in 1898 a movement for national schools in Egypt, and founded in 1900 the Hizb al-Watan (the National Party) which wished to teach the Egyptians self-emancipation, and demanded the union of Egypt and the Sudan under purely Egyptian control.

Mustafa Kamel died the same year that the Ottoman Committee of Union and Progress (the Young Turks), frightened by the possible consequence for Turkey of the British-Russian agree-

ment of 1907, compelled the sultan to reintroduce the constitution which had been in force for only a short time 30 years before. The following year (1909) Abdul Hamid was deposed, and the Young Turks assumed full control of Turkey, with the aim of transforming it into a modern centralized nationalist state. Exalting the principle of nationalism as the foundation of the multiracial empire, they were forced to encounter the hostility of the non-Turkish races within that empire, and in a long period of wars, lasting from 1910 to 1922, the Young Turk regime foundered, and the Ottoman Empire was dissolved into its national components. To support the Turkish national policy, the Young Turks under the leadership of Enver Pasha (1881?–1922) developed the theory of Pan-Turanism—a union of all the Turki-speaking peoples, the bulk of whom lived within the confines of the Russian Empire. Pan-Turanism was, in that way, not only to add great numerical strength to the Ottoman Turks, a minority within the Ottoman Empire, but also to counteract Pan-Slavism and the Russian designs against Turkey. At the same time, the Turks who had for centuries regarded themselves exclusively as members of the Islamic civilization, founded largely on Arabic and Persian cultural traditions, rediscovered their pre-Islamic racial and linguistic past.

Of a different nature than Pan-Turanism was the Pan-Arab movement. Its first beginnings fall also in the period after 1908; in fact, it was a countermovement to the strong emphasis on Turkish and Turanian nationalism, destroying the unity of the Islamic world. Pan-Arabism wished to unite definitely the Arab provinces of the Ottoman Empire, the Fertile Crescent of Mesopotamia and Syria, which stretched from the Persian Gulf to the Suez Canal, and the nomad inhabitants of the Arab desert, of which only the fringes, especially Hejaz with the holy cities of Mecca and Medina, were under Ottoman control. But many Pan-Arabs went further and dreamed of the union of all Arabic-speaking countries, which would include not only Egypt but the whole of North Africa. The center of these Pan-Arab aspirations was partly in Syria, where it was led by intellectuals who worked for the decentralization of the Ottoman Empire and Arab autonomy within it; partly in Mecca, where Husein ibn-Ali (1856–1931), whose family was descended from Mohammed, was appointed in 1908 sherif of Mecca, and thereby the custodian of the holy places of Islam.

The same years after 1908, which saw the beginning of political nationalism among the Turks and Arabs, witnessed a similar development in Persia. There, the Islamic reform agitation of Jamal al-Din al-Afghani (1838–1897) and the westernizing tendencies of Malcolm Khan, a Persian diplomat of Armenian descent, had laid the foundations in the later part of the 19th century for an awakening of the small Persian intelligentsia to the need of national reform. Under the influences of the Russian Revolution, at a time when Russia was the decisive imperialist power in Teheran, a Persian revolutionary movement broke out at the end of 1905 and forced the introduction of a constitution, which also allowed for the growth of a Persian press. Russian intervention in June 1908 tried to put a stop to this constitutional development, but under the inspiration of the Turkish Revolution, the nationalists reasserted themselves in 1909, to be defeated again at the beginning of 1912 by Russian intervention.

Nationalism After World War I.—This was the situation in the Middle East at the outbreak of World War I. Its consequences were felt even more strongly in Asia than in Europe. Throughout the Middle and Far East, from Egypt to China, the events and slogans of World War I aroused not only the intelligentsia, but for the first time began to stir the native masses. Under national leaders who now arose in all the Middle Eastern countries, the peasant masses awakened from their age-old lethargy and submissiveness. This was the result of the penetration of Western ideas into the East. Some of it was communicated by formal education, especially in India under British leadership. Most of it, however, was "in the air," an expression of the German term *Zeitgeist*. The ideas and movements which had activated Europe in the 19th century now spread to the Middle East and Asia, where, however, the intellectual and social conditions did not exist, nor the moral traditions, on which these movements had been founded in Europe. On the other hand, the Middle East developed a number of capable leading personalities. Their various social positions reflect the stage of development in the different countries. In Turkey, the leadership fell to a member of the officer class, from which had come also the leaders of the Young Turk movement: Mustafa Kemal, later called Kemal Atatürk (1881–1938). In the Arab lands capable leaders came from ruling families in nomadic Arabia: Abdul-Aziz ibn-Abd-al-Rahman al-Faisal ibn-Saud, generally called Ibn-Saud (1881?–), originally the Wahhabi sultan of Nejd and in 1932 king of Saudi Arabia; Faisal I (1885–1933), son of Husein ibn-Ali, and briefly king of Syria and later of Iraq. In Egypt, leadership fell to the new middle class, which during the British occupation had risen from peasant ranks: Saad Zaghlul Pasha (1860?–1927), who was succeeded by Mustafa el-Nahas Pasha (1876–). In Persia, which after World War I changed its name officially to Iran, thus re-emphasizing the national connection with ancient glories, the leadership was exercised by Reza Khan Pahlavi (1877–1944), a soldier who made himself shah and ruled from 1925 to 1941. Each of these leaders tried to reform the government of his country on the basis of nationalism and westernization, but each one proceeded in a different way, according to the social development and geographic situation of his country.

Leadership in this general trend was taken by Turkey. As a result of World War I, the Ottoman Empire was dissolved. From the ethnical center of the Turkish population, from the highlands of Anatolia, came the victorious opposition of the Turks under Mustafa Kemal against the victors of World War I. His successes against the Greek invaders of Anatolia in 1922 made it possible for Turkey to establish her complete independence within her ethnic frontiers by the Peace Treaty of Lausanne (1923). Only in eastern Anatolia did the Kurds form a national minority and resist in several uprisings their forced integration into Turkish nationality. Mustafa Kemal's reforms transformed Turkey from a medieval Islamic nonnational state into a modern secular nation state. Ziya Gök Alp (1875–1924) may be regarded as the intellectual father of the new nationalism, with its reinterpretation

and reappreciation of the Turkish past and its application of Western ways to the Turkish future. Under the impact of the new nationalism, Islam was deposed as the religion of the state; modern law was introduced instead of Islamic law; special attention was paid to the indoctrination of the people with the new ideology and to the spreading of literacy; the vernacular was divested of its Arabic and Persian words and influences; Latin script was introduced instead of the Arabic; and an all-out effort was made to establish the new Turkish civilization on the twofold foundation of ancient Turkish traditions and of modern Western influences, thus weakening the impact of the Islamic civilization which had shaped Turkish life and destiny for the last six centuries.

Reza Shah Pahlavi tried to emulate Mustafa Kemal's nationalist reforms, but the conditions in Iran were much less favorable than in Turkey. Iran possessed neither the long cultural contact with the West nor a governing class with administrative abilities; on the other hand, the hold of religion and the density of native cultural traditions was greater there than in its western neighbor. Yet there, as in all other Middle Eastern lands, the 20th century could be called the age of the making of a nation, the conscious reawakening of its past as a guarantee of a culturally and politically mighty future. As in Turkey, this new nationalism was accompanied by efforts toward a strict centralization of government, the emancipation of women, and the modernization of economic life. The new nationalism also forced the tendency to rely for the much-desired industrialization of the country, as far as possible, upon the country's own resources, and to emphasize strongly rights and claims springing from the jealously guarded full sovereignty of the nation.

More complex was the development of nationalism in the Arab-speaking countries. Various factors fought against an early unification of all these lands into one Arab national state, as the nationalists demanded. There were important religious minorities, such as the Shi'ites in Iraq, the Christian Maronites in Lebanon, and the Copts in Egypt, and there was the opposition of the fanatical Wahhabis to the other Mohammedans. There were the great cultural and social differences between the settled population of the trading cities and sown land and the nomads of the desert. There was the strength of local traditions and vested interests. Even stronger as a retarding factor was the hesitation of the Egyptians between allegiance to a "Pharaonic" civilization of the Nile Valley and the common tie of culture and language with the Arab lands; also the rivalry of the various dynasties for leadership, especially those of Husein ibn-Ali of Mecca, of Ibn-Saud, and of Egypt (King Fuad I, 1922–1936, and Faruk I, 1936–). The situation of nationalism in the Arab-speaking countries may be compared with that in Italy in the first half of the 19th century, when similar circumstances delayed the unification of the Italian nation propagated by nationalist intellectuals.

During World War I, Arab intellectuals in Syria put forward the claim to Arab independence from Turkey, and Husein ibn-Ali entered into an agreement with the British to revolt against the Turks, while the British promised to support Arab independence under Husein. His son Faisal led the famous revolt in the desert which was inspired by Col. T. E. Lawrence. Husein was recognized as king of Hejaz (1916), but he was unable to carry his claims to other Arab lands. Faisal, after an unsuccessful attempt to establish himself in Damascus as king of Syria, which would include all the lands from the Taurus Mountains to the Sinai Peninsula, became with British help king of Iraq in 1921. There he was successful in gaining full independence for his country and having the British mandate over Iraq terminated in 1932. The Syrians were less successful. Their country was put under a French mandate, and was divided into a predominantly Christian Lebanese republic in the coastal district, and a predominantly Mohammedan hinterland which became the center of nationalist agitation. The independence of these two states (Syria and Lebanon) was achieved only after 1941. Meanwhile, Faisal's older brother, Abdullah ibn-Husein, who had claimed the Syrian throne after Faisal's defeat there, had become emir of Transjordan under British mandate. With the proclamation of the independence of Transjordan in 1946, Abdullah assumed the title of king and became the senior member of the family left by Husein ibn-Ali, the Hashemite family. In 1949 the name Transjordan was changed officially to the Hashemite Kingdom of the Jordan. On July 20, 1951, Abdullah was assassinated by an Arab fanatic.

Husein ibn-Ali himself lost his kingdom in 1925 to Ibn-Saud, who at the head of his Wahhabis created (1932) a unified Arabian Peninsula from the Persian Gulf to the Red Sea and assumed the title of king of Saudi Arabia. For the first time in over 1,000 years the desert obeyed a unified rule which assured and protected peace and commerce. Ibn-Saud set out to settle the nomadic population and to modernize the primeval living conditions; necessarily this was a slow and arduous task, in which he was helped by royalties from the American oil companies.

Of all the Arab-speaking lands, Egypt is not only the most populous but also stands out for its wealth and for the relatively progressive quality of its administration, built up under the British occupation. There the nationalist movement strove to end British occupation and to establish the full independence of Egypt; to bring the Egyptian colony of Sudan (conquered by the Egyptians in 1820 but lost in the 1880's) under full Egyptian control and end the Anglo-Egyptian condominium established in 1899 after the reconquest of the country by Anglo-Egyptian forces; and to transform Egypt into a parliamentary democracy with a modern social and educational policy. At the end of World War I, a nationalist delegation (in Arabic, *Wafd*) under the leadership of Saad Zaghlul Pasha demanded permission to put before the peace conference Egypt's claims to full national independence. When this attempt was frustrated, Zaghlul became the leader of the Wafd Party, which wrung from the British ever larger concessions. Egypt was declared independent by Britain in 1922 and received a parliamentary constitution. The nationalist struggle in Egypt was in no way directed against only Britain. The court was in bitter opposition to the Wafd and to its democratic demands. The Anglo-Egyptian Treaty of 1936 removed the last restrictions from Egyptian independence, and the Conference of Montreux in 1937 put an end to the system of capitulations and privileges of Americans and Europeans.

The conflicting tendencies among the Arab countries were at least temporarily bridged by their common resistance to Zionism and to the transformation of Palestine with its originally large Arab majority into a Jewish national state. To that end, the Arab states formed an Arab League (q.v.), but its diplomatic and military measures did not avail against the formation of the state of Israel (q.v.), thereby creating the vast problem of Arab expelled persons and refugees from Palestine. This ineffectiveness of the Arab League reveals the present weakness of Arab nationalism and the need for further reforms and educational measures to restore the Arabs to what their nationalists think is their rightful place in history and in the Middle East. See also articles on the separate countries of the Middle East.

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16. SOCIAL AND ECONOMIC PROBLEMS. The social and economic problems of the Near and Middle East stem mainly from their social and economic system which is still generally in a semifeudal stage of development. In agriculture, large landholdings are the rule, and the peasants are mostly sharecroppers who live on a low level of bare subsistence. In industry, the old handicrafts are on the decline and modern mechanized manufacturing is slowly developing but is still largely carried on by small-scale enterprises. Trade with other countries is also on a small scale and per capita foreign trade is very low. Exports consist mainly of food products and raw materials and imports are mainly manufactured goods. Traditionally, trade has been carried on mostly with Europe but in the mid-20th century trade with the United States grew to a leading position. Since World War I oil production has developed rapidly under concessions granted to foreign corporations in which American and British capital predominates. Oil royalties have become one of the most important resources for the budgets of such Middle Eastern countries as Iran, Iraq, Saudi Arabia, and Kuwait.

Most of the countries of the Near and Middle East have but recently emerged from colonial status into the responsibilities of political independence. In all of them, the practice of democracy is still in its early stages and leaves much to be desired. Government administration is generally inefficient, and corruption in administrative and political affairs is prevalent.

The standard of living of the people of the Near and Middle East is generally very low. A small minority of rich landowners and businessmen, however, are very wealthy and live in luxury and abundance. The laboring masses of town and country are very poor and ignorant, and lead a life of continuous struggle for a bare subsistence. In between the wealthy minority at the top and the poverty-stricken majority, there lies a small but weak middle class consisting of salaried business employees and technicians, government officials of the lower grades, and members of the liberal professions. This middle class does not fill the wide gap in the social structure and has very little political power. However, it produces the intellectual and progressive elements in the population which are gradually exerting more influence on social and political development.

The basic problems of the countries of the Near and Middle East derive from their backward social and economic structure. Although some of these countries have made important progress toward a more productive industrial system, the social structure of most of them is still largely semifeudal in character. This is manifested in the system of land tenure which is the basis of their agricultural organization but which affects directly or indirectly all fields of social and economic life. No definition of this semifeudal economy can be attempted here, but a description of its main features is given below in the discussion of agriculture which constitutes the main productive activity on which almost two thirds of the population in these countries depend for their living.

As a result of this backward state of economic organization, productivity is low and per capita national income is small. In agriculture, the system of land tenure does not allow production to increase because of the lack of incentive for greater efficiency and for capital investment. The peasants are mostly share-tenants cultivating the lands of absentee landlords. The share-tenant has no security of tenure on the same plot of land. He is not certain of keeping the land and receiving the fruits of any improvements he might be able to make by greater exertions or by investment of his savings. But even if he is allowed to retain the same plot of land, there is little incentive for him to increase production since he does not get the full reward of his efforts inasmuch as the landlord would receive his share of any increase in production. In any case, his share of the crop is so small that he is unable to save and invest in improving the land. The peasant therefore has neither the ability nor the incentive to increase production from the land.

Consequently, methods of cultivation are generally primitive, and in most areas agricultural implements have not been improved for centuries. There is little agricultural machinery in use and scientific agriculture is almost unknown. In general, technology is at an extremely low level and far behind the advanced technology of the industrialized nations. On the other hand, there is small hope that the landlords will initiate progressive development in agriculture. The large semifeudal landowners are satisfied with their share of the product which yields them considerable income without effort and enables them to live an urban life of idleness and luxury. Traditionally, these semifeudal landlords are lazy and self-satisfied, as well as reactionary in their social and political outlook. They are the proponents of the established social order and resist any changes which threaten their position in society. They engage in politics with the purpose of maintaining their position of wealth and social domination.

The dependence of the peasant on his landlord is complete, and in his narrow and limited vision seems irrevocable. He rarely has an opportunity to work and make a living other than to remain

on the land and be subservient to his master. He is frequently indebted to the latter, or to the grain merchant who closely cooperates with him. But, he is not only dependent on the master economically and financially but also socially and politically. If any dispute arises among the peasants, they have resort to their feudal lord to have it settled. In time of trouble or hardship, they go to him for advice and help. Whenever any problem arises which requires intervention with the government administration or the courts, it can be settled only with the landlord's help or through his influence. During elections, the peasants vote for their landlord or for candidates supported by him. They dare not vote against him since the secrecy of the ballot is not assured in practice, although it may be established in law. The power of some landlords is such that they could defy the government and even instigate a revolt which might be difficult to quell. The power and domination of the semifeudal landowners in some of the countries of the Near and Middle East would seem extremely difficult to overthrow without a revolutionary upheaval. A more gradual evolutionary development through the institution of basic reforms by constitutional processes is possible but would require foreign support for its success. In view of their cultural background the educated sections of the population would welcome such support from the Western democratic world from which they expect enlightened cooperation and help in bringing about the basic reforms and developments required.

The underdeveloped state of agriculture in the countries of the Near and Middle East sets limits to their capacity for industrialization. Because of the low purchasing power of the rural population and the limited market for manufactured goods, there is little scope for large-scale, low-cost manufacturing enterprises capable of competing against the products of the industrialized nations. It may be possible to develop some manufacturing industries with the help of tariff protection; but in the long run, efficient and competitive industries must depend on a large market to make possible mechanized, low-cost, large-scale production. In the Near and Middle East the extent of the market is limited, on the one hand, by the relatively small population of countries separated by tariff barriers, and on the other hand, and even more so, by the low purchasing power of the majority of the population. Finally, the development of manufacturing industry is hampered by the insufficiency of capital for investment resulting from the low income of the people and their limited ability to save.

The economic backwardness and poverty of the people of the Near and Middle Eastern countries result in many social problems which are characteristic of underdeveloped countries in general. There is a high degree of illiteracy which hampers progressive development both in social and economic affairs. The proportion of illiterates exceeds 80 per cent in many areas. Superstition is prevalent and reactionary social traditions and customs govern the lives of the people. Disease is rampant, epidemics from time to time taking a heavy toll of populations already weakened by undernourishment or defective diet. Social services in general are either nonexistent for the majority of the population or are in a rudimentary state. In fact, in most of the countries of the Near and Middle East, government is regarded by the majority of the people as an instrument of coercion and oppression. Public officials are feared and shunned; in many cases they are positively disliked and only the most necessary contacts with them are made. This attitude is the result of long periods of autocratic government or of foreign conquest and domination. Even with the attainment of independence and the establishment of democratic institutions, the same outlook toward government still exists and can be changed only gradually.

In any case, the establishment of independent national governments is not enough. It is necessary that such governments be truly democratic and representative of the people. However, reform cannot be effected where, as a result of the semifeudal social structure, governments are controlled by reactionary forces whose interests are threatened by social progress and enlightenment. The basic problem is one of education by which the emancipation of the people can be gradually achieved. But the reactionary semifeudal forces in control of the government are generally in opposition to educational programs and movements which threaten to do away with their authority over the people.

Another major obstacle to the development of education and social services is the weak financial position of most of the governments of the Near and Middle East. They have limited funds which are mainly devoted to the most essential functions of government, such as security, justice, and necessary administrative services. Only a small proportion of the budget is devoted to education, public health, and public works. The income of the government is not only limited by the low national income, but also by its inability to tax effectively the politically powerful rich classes which exercise control over it. In fact, in most of the countries of the Near and Middle East the taxation system is the most backward and inefficient part of the governmental structure. It usually consists mainly of indirect taxes which fall more heavily on the poorer classes. Even where direct taxes are instituted, they cannot be administered properly so as to insure collection from wealthy landowners and businessmen. Instead of contributing to a reduction of the great inequality of wealth, the taxation system perpetuates and aggravates that inequality.

The social and economic problems of the countries of the Near and Middle East are all intimately related. They all form part of one pattern and constitute one complicated problem of underdevelopment in all fields of economic and social life. With conflicting ideologies and divergent pressures coming from the outside world, this immense and complicated problem cannot be solved by the efforts of the people of these countries alone. Such advances as have been made by some of the governments of the region, sometimes with private and public help from the West, fall far short of the requirements of social and economic development. Considerable help is needed from the more advanced countries in bringing about a more progressive social and economic system in the Near and Middle East. Certainly within the United Nations, and possibly also through bilateral arrangements, important results may be achieved in promoting the economic and social advancement of the countries of the region. The Charter of the United Nations provides for cooperation between the advanced nations and the underdeveloped countries

MIDDLE EAST

Top: Beirut, Republic of Lebanon, main seaport for the Levant States.

Right: Jerusalem, Palestine. These Greek women are kneeling, in the Church of the Holy Sepulchre, before the vase containing a flat ball said to occupy the "center" of the world.

Bottom: Piraeus, Greece. General view of the busy harbor of Piraeus, seaport of Athens.

(Top) Photo by Deane Dickason, from Ewing Galloway; (others) © Ewing Galloway

MIDDLE EAST

Top: Seaport of Aden in the British protectorate on the Red Sea.

Left: Saudi Arabia. Oil refinery at Ras at Tannura on the Persian Gulf, built by the Arabian American Oil Company.

Bottom: Stabilizer plant at Dhahran, Saudi Arabia. The company's on-the-job training program has turned desert nomads into capable technicians.

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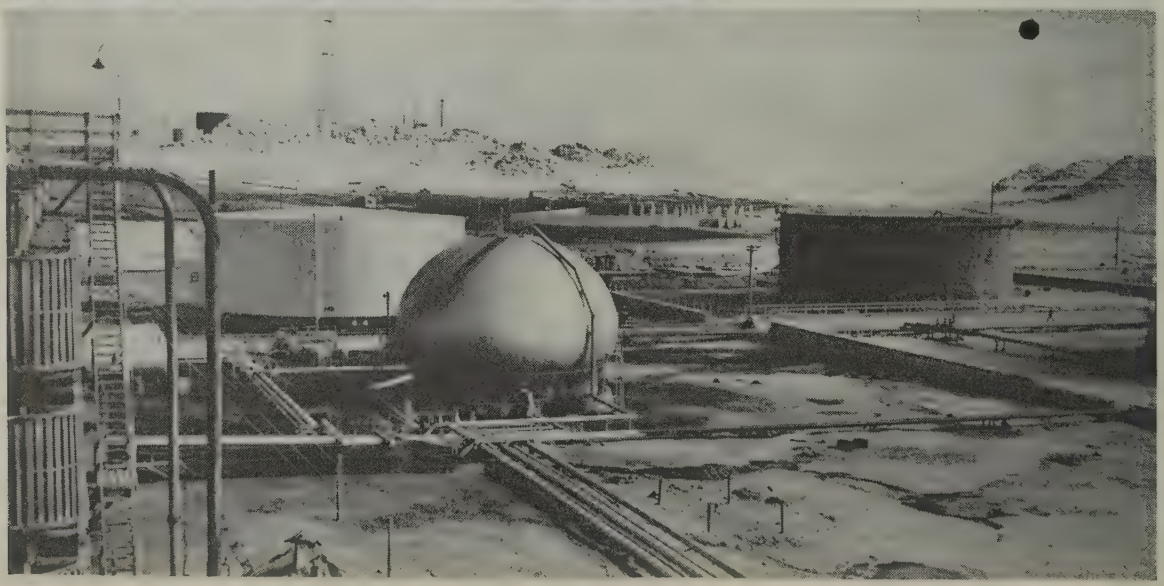

for that purpose. It is also the policy of the United States government, as proclaimed by President Truman in his Point Four Program, to assist with its scientific and industrial resources in the improvement and growth of underdeveloped areas. Such assistance, both technical and financial, is badly needed by the countries of the Near and Middle East. On the other hand, communism has infiltrated into these countries and is appealing to the downtrodden masses with glowing promises of a better life achieved through Communist-directed revolutionary changes.

The most important question is what road will the countries of this strategic region follow. Under pressure of world developments they are presented with a choice between Western political democracy with an economic system of capitalist free enterprise or of the mildly Socialistic economy of the welfare state on the one hand, and the Communist-led system of planned socialism requiring a radical transformation of existing social, economic, and political institutions.

This choice is being rapidly forced on them both by their internal evolution and by the impact of world pressures and developments. The poverty-stricken, disease-ridden masses of the Near and Middle East are slowly awakening to the misery of their condition and gradually are realizing that it is not unalterable. The remarkable development of the means of communication in recent years has brought them into contact with more advanced nations whose scientific and technological progress has made possible higher standards of living for all classes of the people. The instruments and machines of modern industrial civilization have reached them both in peace and in war. They are being told that there is hope for improvement of their condition and that they can produce more with new instruments and methods and so raise their standard of living. They are coming to realize that they can be rid of diseases and epidemics and that their work need not be painful and strenuous. Their right of education is being affirmed, and they have come to believe that they need not remain illiterate and ignorant. With this growing realization that it is possible for them to have a better life, their desire for improvement is gradually becoming an insistent demand for a higher standard of living. This demand constitutes a challenge not only to their own governments but also to the more advanced and powerful nations. There is little hope in the present world situation that the governments of the Near and Middle East would meet this challenge effectively by themselves. Some of them, like Turkey and Greece, have made remarkable advances with financial and technical help from the United States. But most of them are unable, by their own efforts and resources, to effect more than a few superficial reforms and small-scale development projects which would prove to be inadequate to meet the seriousness of their situation. The reactionary forces opposed to social and economic advancement are still powerful, while the progressive forces have not yet developed enough strength to enable them to gain control of the government and to bring about basic reforms and progressive social transformation. Moreover, the Western powers have in the past generally supported the reactionary semi-feudal forces which stand for the maintenance of an outworn social system destined to disappear and have thus incurred the enmity of the rising progressive forces. However, these forces can be won over to the cause of democracy and would be eager to cooperate with the freedom-loving peoples of the Western World on the basis of new concepts and methods capable of promoting the economic and social development of the countries of the Near and Middle East.

In this regard the aims of the United States and its Western European allies must be clear and forceful, for as a result of their experience under the domination of Western European imperialism, the peoples of the Near East are suspicious of the policies of the Western powers. While technical assistance from them may be welcome, there is still fear of Western economic imperialism, as well as doubt that private capital from Europe and America would be willing and able to promote economic development for the interests of the people of the region. Foreign corporations have engaged in the past, and continue to engage at present primarily in making high profits without contributing much to the economic development of these countries. Moreover, it has been difficult for the weak local governments and for labor which is largely unorganized to influence the price and wage policies of these powerful foreign corporations. For instance, they have practiced discrimination in favor of their foreign employees by giving them the most responsible positions and by paying them much higher salaries than local employees. Past experience with private foreign capital points to the danger of exploitation of the people by powerful foreign monopolistic interests which would lead to a reaction against the Western powers and their economic policies in the Near and Middle East. If the peoples of this region are not effectively helped in their social and economic development by the United States and Western Europe but are, on the contrary, exploited by American and Western European capital, they may be induced to travel along the road leading toward communism which presents itself as a tempting solution to their backwardness and their misery. To prevent such a development, Western democracy must come forward boldly and vigorously with farsighted policies and effective plans for helping the countries of the Near and Middle East in a courageous and well-directed effort to attain higher standards of living and greater freedom for their peoples.

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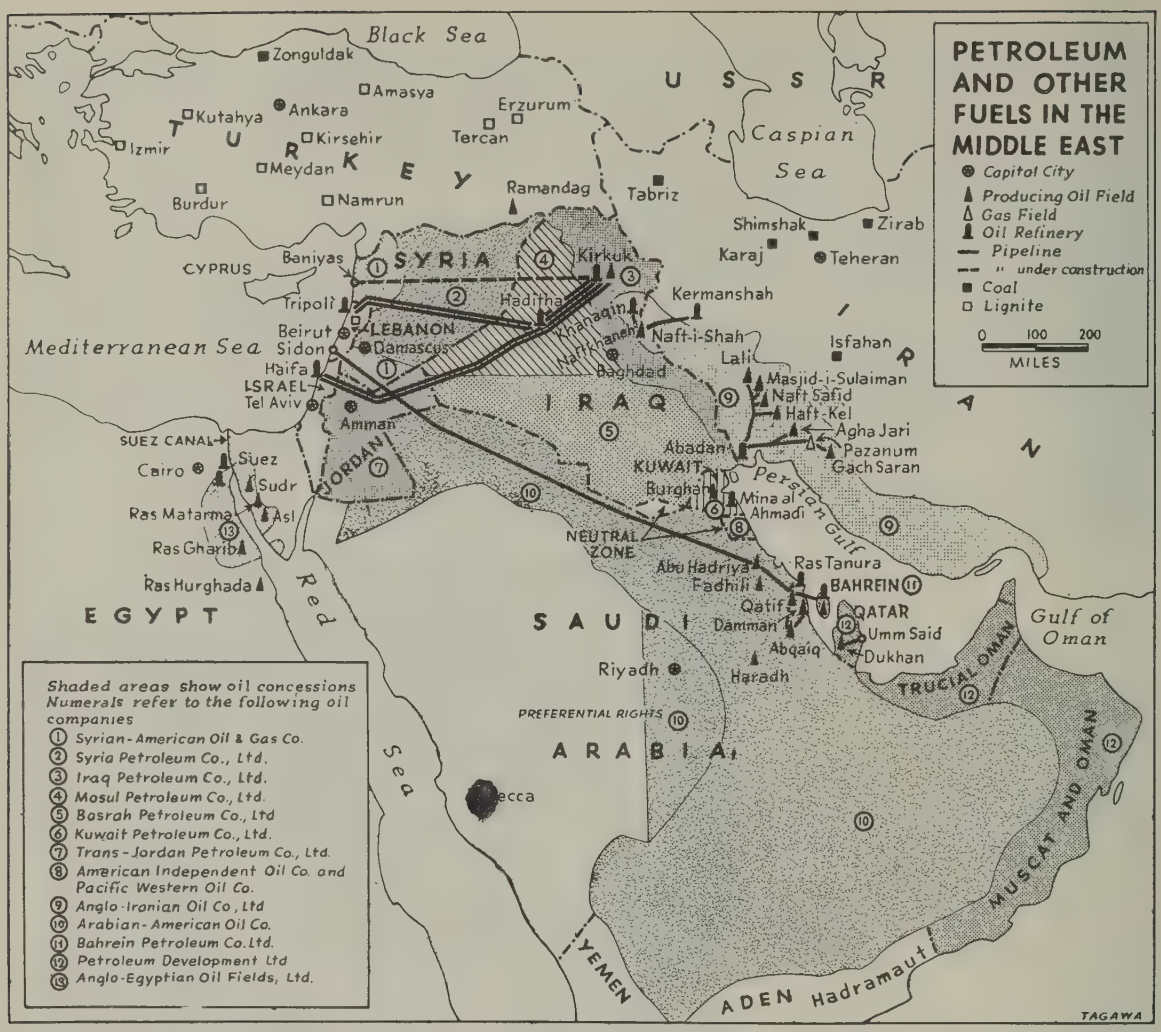
17. PETROLEUM. The Middle East probably has the greatest oil deposits in the world; the proved reserves constitute two fifths of the world total, and the geological formation makes low-cost production possible. Oil is, however, unequally distributed over the region. Hence, while oil plays a leading part in the economy of the countries bordering the Persian Gulf, its contribution to the other Middle East countries is slight or negligible.

The existence of oil in the region has been known since ancient times, but Middle Eastern countries lacked the technical skill necessary for its exploitation, as well as the large capital investment required not only for extracting the oil but for transporting it by pipeline over long distances to ports. Therefore, the industry has been established in the region by foreign interests, mainly British and American, which brought in capital, introduced necessary skills, and provided



markets. Oil production, begun shortly before World War I, has shown an almost continuous expansion, accelerated during and after World War II.

World Position.—According to estimates for early 1949, proved oil reserves in the Middle East account for about 42 per cent of the world total, as compared with 35 per cent in the United States and 12 per cent in Venezuela; most of the remainder are in the Union of Soviet Socialist Republics and Indonesia. These Middle Eastern reserves are located mainly on the shores of the Persian Gulf in Kuwait, Iran, Iraq, and Saudi Arabia. The potential reserves are believed to be much larger than the known reserves.

Before World War II the region supplied a small portion (3.6 per cent in 1928 and 6.4 per cent in 1938) of the world crude oil output, excluding that of the USSR. Middle East production amounted to 16 million metric tons in 1938, reaching 58 million tons in 1948, 71 million in 1949, and about 88 million in 1950. The region contributed 13.1 per cent of the world supply (excluding that of the USSR) in 1948, and 16.4 per cent in 1949, compared with 6.7 per cent in 1944. At the end of 1950, the Middle East was producing at a rate equal to almost one fifth of the world total.

The main producers in 1949 were Iran, traditionally the most important in the region, Saudi Arabia, and Kuwait. Iraq, which before 1945 had been the second largest producer, had become the fourth. Other producers are Egypt, Bahrain, Qatar, and Turkey.

Most of the important fields in the region have been discovered only comparatively recently; during World War II the execution of plans for expansion of the industry was delayed because of shortages of materials, equipment, and manpower. Inadequate transport facilities were another major obstacle. There are large-scale plans, however, to develop both the oil resources and the transport facilities of the region in order to enable Middle Eastern output to meet an increasing proportion of the growing world demand for petroleum.

Refineries.—Refining capacity and the production of refined oil products in the Middle East have increased considerably since 1940. This is owing to the expansion during the war and the postwar period of the refineries in Abadan, Iran; Haifa, Israel; Bahrain and Suez; and the construction of refineries in Ras Tanura, Saudi Arabia; Tripoli, Lebanon; and Kuwait. At the end of 1948 there were 12 refineries in the region with a total daily capacity of about 940,000 barrels.

Despite considerable expansion in the refining capacity of the region, the amount refined remains substantially below the crude production of the area. In 1949, Middle Eastern refineries were capable of processing about 300 million barrels of the total 530 million barrels of crude production. The remainder was exported in crude form.

mainly to Europe and North America, where it was refined.

Pipelines.—Lack of adequate transport facilities has hampered the expansion of oil production in the Middle East. To remove this obstacle, the petroleum companies of the region have undertaken the construction of ports and pipelines. The chief ports which the oil companies utilize to handle the exports of the region are Haifa, Sidon, and Tripoli on the eastern Mediterranean coast, Abadan and Bandar Mashur in Iran, Ras Tanura in Saudi Arabia, Mina al Ahmadi in Kuwait, Umm Said in Qatar, and Bahrain on the Persian Gulf. These ports are the terminals of pipelines or possess refineries.

Certain petroleum companies of the region, in order to expand their exports and to reduce transport charges, have undertaken the construction of large pipelines from the oilfields to the eastern Mediterranean coast. Pipelines from Kirkuk to Tripoli and from the Arabian oilfields to Sidon have been completed, and plans are under way for the construction of others. In addition, there are numerous small pipelines connecting the oilfields of Bahrain, Iran, Kuwait, Qatar, and Saudi Arabia with their Persian Gulf ports.

Production and Transportation Costs.—There are indications that the production costs of crude petroleum in the Middle East are considerably below those of other major producing areas, in spite of the large capital investment required for extraction and transport. Almost all Middle Eastern petroleum is extracted from flowing wells, and the equipment is of high quality. The production rate of these wells, which aggregated 396 at the end of 1949, is high; their daily average output was about 3,728 barrels, compared with an average of 11 barrels for 450,000 wells in the United States, and 21 barrels for the world. Labor costs are low, and petroleum production per worker is comparable with that of the United States and Venezuela. In the Middle East, royalties and tax payments ranged between 13 and 35 cents (U.S. currency) per barrel in 1948, while in Venezuela the average for 12 major oil companies was 86 cents, although royalty rates were subsequently raised in several Middle Eastern countries.

Information concerning the actual cost of production of petroleum is not available for most of the Middle Eastern countries. The production cost of crude petroleum at the end of 1947 in Saudi Arabia was estimated at 24 cents per barrel, excluding a royalty payment of about 21 cents and the cost of transport to the refinery of 2.5 cents. The cost of production in Saudi Arabia may be regarded as roughly representative of the cost of crude production in other major oil-producing countries of the Persian Gulf. In Venezuela the average cost of crude production of the 12 major oil companies in 1948 was about 68 cents per barrel, excluding taxes and royalty payments.

The geographical position of the Persian Gulf oilfields necessitates heavy transportation costs in order to reach world oil markets. The greater part of Middle Eastern oil passes through the Suez Canal and has to pay a toll, which in August 1949 amounted to 18 cents per barrel. As a result, the transport cost of oil in 1949 from the Persian Gulf to Southampton, England, was from $1.04 to $1.08 per barrel, compared with 50 to 55 cents a barrel from Puerto La Cruz, Venezuela, to Southampton.

World Markets.—The importance of Middle Eastern oil in world markets has increased rapidly. In 1946, the Middle East (excluding Egypt) had an exportable surplus of petroleum amounting to 545,000 barrels per day in comparison with 1,028,000 barrels per day in the Caribbean area, while in 1949 the corresponding figures were 1,191,000 barrels and 1,251,000 barrels, respectively. In addition to its own requirements, which increased from 145,000 barrels per day in 1946 to 212,000 in 1949, the Middle East has met the main part of the petroleum deficits of Europe, the Far East, and Africa. There have even been shipments of crude oil to North America, despite the long sea haul. During 1949 and 1950, sales and prices of Middle Eastern oil were affected by the general dollar shortage and by the devaluation of several European currencies. It is expected that more Middle Eastern oil will reach world markets as pipeline facilities to the eastern Mediterranean become available, replacing the tanker transport of 3,600 miles by little more than 1,000 miles of pipeline and eliminating the payment of Suez Canal tolls.

Local Importance.—The contribution of oil to the economy of the various Middle Eastern countries differs widely. In such countries as Iran and Iraq, oil constitutes one of many sectors of the economy and accounts for only a small part of the national income, while it plays an important part in the balance of payments and the government budget. Thus, in Iran direct payments by the oil industry to the government, together with local expenditures, such as wages and purchase of materials, do not exceed 10 per cent of the national income; of this total, royalties represent a third. Similar proportions obtain in Iraq. In Bahrain and in Kuwait, on the other hand, oil extraction ranks higher than all other economic activities together. In Kuwait, the number of local workers employed in the petroleum industry, and their dependents, constitute about a fifth of the total population; in Bahrain they represent a fourth.

The oil companies have contributed directly in varying degrees to the development of the areas in which they conduct their operations. They have often built roads, cleared large areas of the countryside, organized transport facilities, and established new settlements. In some countries, the oil companies have assisted the government, by providing technical advice and advance payments on account of future oil royalties, in the implementation of the country's general development plans. Thus, in Saudi Arabia and Bahrain, the companies have provided technicians, machinery, and seeds for agricultural programs, have installed medical and educational facilities, and have constructed works for public use.

Foreign Exchange.—Most of the petroleum companies which operate in the Middle East and are owned by foreign interests have, in many cases under their concession agreements, the right to dispose freely of their foreign exchange earnings. Thus, the foreign exchange proceeds of oil exports are not under the control of the governments, and a considerable part of the earnings of oil companies do not return to the producing countries, except in the form of investment.

Nevertheless, the oil companies play an important role in the balance of payments of oil-producing countries of the Middle East. They supply substantial amounts of foreign currency to the local economy in the form of direct payments

to governments, local expenditure on production and construction, and advances to governments on account of future income from the petroleum companies.

This has made possible a large expansion in the import trade of the oil-producing countries, but a part of the increase has consisted of food, luxuries, and manufactured goods—part at least of which could be produced locally—rather than capital goods and machinery.

Fuel.—Petroleum constitutes by far the most important source of energy used in the Middle Eastern countries. It is cheaper in the Middle East than other fuels, and its price compares favorably with that of petroleum in other countries, especially nonproducing countries But in several countries prices are raised considerably by excise duties. Most of the oil concessions and pipeline agreements contain provisions for supplying the oil requirements of the country, but the demand for petroleum and its products in the region, though increasing, is small. In irrigation, agriculture, and mining many of the operations are still largely performed by primitive methods involving the use of human energy or draft animals. Petroleum provides a source of fuel in the Middle East for motor vehicles, domestic uses, production of electricity in the cities and, in some countries, for agricultural pumping machinery and small-scale industries. A significant part of the local consumption of oil meets the needs of the oil companies themselves and of bunker supplies for ships passing through the eastern Mediterranean and the Red Sea.

Employment.—In the course of their activities, petroleum companies in the Middle East employ a certain number of workers and provide some technical training. The labor-absorbing capacity of the industry is, however, by its very nature, limited; therefore, except in Bahrain and Kuwait, the total number engaged in the oil industry constitutes only a small fraction of the population. Even if fields complementary to petroleum production proper are included, the total employment is not great. Nevertheless, in several countries of the Middle East the oil companies are by far the largest employers of industrial workers. The petroleum companies in these countries have directly provided jobs for more than 100,000 local workers.

In the Middle East as a whole, about 85 per cent of the total number of petroleum company employees are nationals of the countries concerned, and in some concession agreements provisions have been inserted in favor of employing local workers. One of the main obstacles to the employment of nationals is the shortage of workers with the required industrial background, at least in the early stages of exploration and production.

The absence of technical training and experience among the workers of the Middle East has made it necessary for the petroleum companies in the region to promote the training of skilled and partially skilled workers and supervisors, with emphasis mainly on methods of increasing productivity and of enforcing safety standards. The major training and educational programs of the oil companies include general education to eliminate illiteracy, together with vocational training and some education at the college level. The competition between oil and other industries for the employment of the limited number of Middle Eastern skilled workers has thus been reduced to a great extent, and the development of other branches of the national economies hindered as little as possible.

NOTE:—The preceding section on *Petroleum* is based on the *Review of Economic Conditions in the Middle East*, chap. 3, published by the United Nations Department of Economic Affairs (New York, March 1951).

Individual Countries.—Iran and Saudi Arabia have, in normal times, the greatest production of petroleum in the Middle East, followed by Kuwait, although production there was started comparatively recently.

Bahrain.—Petroleum on this island was the first produced in the general area of Saudi Arabia. The concession, covering the entire island, is operated by the Bahrein Petroleum Company, Limited (owned equally by the Standard Oil Company of California and The Texas Oil Company). Production began in 1933, and in 1950 was 1,512,000 metric tons. The refinery, with a capacity of 155,000 barrels per day, obtains additional crude oil from the production of the Arabian-American Oil Company through pipelines to the mainland of Saudi Arabia.

Egypt.—The Egyptian fields are located along both shores of the Gulf of Suez, south of the canal. The production in 1950 was somewhat more than 2,328,000 metric tons. The chief fields are Ras Gharib, Ras Matarma, Sudr, Asl, and Ras Hurghada, although the latter in 1948 had declined to a yield of 900 barrels a day. Both the Ras Hurghada and Ras Gharib fields are operated by British interests. The newer fields of Sudr (1948, operated jointly by the Socony Vacuum Oil Company and Anglo-Egyptian Oil Fields, Limited) and Asl (1949) indicate a greatly increased Egyptian production.

Iran.—Production from the huge fields of the Anglo-Iranian Oil Company, Limited (52.5 per cent owned by the British government) in 1950, before the application (1951) of the law nationalizing its properties, was 32,259,000 metric tons. Production began in 1913. Anglo-Iranian's concession measures about 100,000 square miles.

Iraq.—The greatest production here is in the Kirkuk field (developed in 1927 and operated by the Iraq Petroleum Company, Limited—total concession, 32,000 square miles) at the end of a double pipeline leading to Tripoli in Lebanon and Haifa in Israel. The pipeline in normal times conveys 80,000 barrels a day. A field at Basrah (Basrah Petroleum Company, Limited, owned by Iraq Petroleum) has a smaller production of a very high grade. The total production in 1950 was 6,600,000 metric tons.

Kuwait.—This small country has the largest single oil structure yet found—about 75 square miles. The first oil was struck in 1937 at Burghan, but due to World War II commercial production was not reached until 1946. The production in 1950 was 17,280,000 metric tons, and the proved oil reserves (1949) are 1,487,000 metric tons, the largest in the Middle East. The Kuwait Oil Company, Limited, having a concession over the entire area, is owned jointly by the Gulf Exploration Corporation and the Anglo-Iranian Oil Company, Limited.

Qatar.—The concession of Petroleum Development (Qatar), Limited, a subsidiary of the Iraq Petroleum Company, Limited, covers the entire area. Production began in 1949, and in 1950 was 1,635,816 metric tons.

Saudi Arabia.—The Arabian-American Oil Company (owned since 1939 by four American

companies) has a concession of 440,000 square miles. Production began in 1936; in 1938 it was 67,000 metric tons; in 1950, 26,905,000 metric tons were produced. A total personnel of 17,345 was employed in 1950, of which 2,826 were Americans, the rest Saudi Arabians. Of the latter some 4,600 were enrolled in the education program conducted by the company.

Turkey.—The first production was in 1940 in the Ramandag area in the Tigris Basin of southeastern Turkey. The production in 1950 was somewhat more than 15,536 metric tons.

18. THE UNITED STATES AND THE SOVIET UNION IN THE MIDDLE EAST. At the intercontinental crossroads between Europe, Asia, and Africa, between the Mediterranean and central Asia, the Near and Middle East of today is a focal point of international interest, even as it has been almost from the dawn of history. It could, perhaps, be said to have emerged into modern history with the opening of the Suez Canal in 1869. The interest of imperial Russia and the Soviet Union in this vast area, with its population of some 100,000,000 people, mostly of Moslem faith and somewhat varied culture, is obvious and long-standing. Despite the recent development of a somewhat dynamic nationalism within some of the indigenous elements in the Middle East, a widespread poverty has made the people something of a prey to Soviet Communist propaganda. The political and imperialistic character of Soviet aspirations in the area became quite evident during the course of World War II—if they had not already become clear—and more particularly during the Hitler-Molotov discussions of Nov. 12-13, 1940.

American interest in the Near and Middle East also is long-standing, although Americans themselves are not too often aware of the fact. This interest has been evinced not only in the religio-cultural and philanthropic realms, but also in the economic sphere, particularly in oil and tobacco. It may be noted, for example, that the Middle East contains two fifths of the proved oil reserves of the world, accounts for one fifth the current production, and supplies Western Europe with 90 per cent of its crude, and 75 per cent of its total oil imports.

The first American treaty of commerce and friendship with the Ottoman Empire dates from May 7, 1830, when the United States, even at that early date, manifested an interest in commercial freedom in the Turkish Straits. American educational institutions, such as Robert College (opened 1863), the American University at Beirut (1866), Istanbul Women's College (1871), and the American University at Cairo (1919), to mention only a few, exerted a basic influence throughout the Middle East, as well as elsewhere. In a very real sense, however, it was World War II which brought out the American political and strategic interest, one expression of which came on Dec. 3, 1941, when President Franklin D. Roosevelt, in extending lend-lease assistance to Turkey, almost on the eve of the Japanese attack on Pearl Harbor, declared the defense of Turkey vital to the defense of the United States. President Harry S. Truman, on April 6, 1946, noted that the Middle East, because of its vast natural resources and of the fact that it lay across routes of land, air, and water communications, was "an area of great economic and strategic importance," the nations of which were "not strong enough individually or collectively to withstand powerful aggression." While it was not difficult to see how such a region "might become a center of rivalry and conflict," the president expressed the view that "no country, great or small, has legitimate interests in the Near and Middle East which cannot be reconciled with the interests of other nations through the United Nations. The United Nations have a right to insist that the sovereignty and integrity of the countries of the Near and Middle East must not be threatened by coercion or penetration."

As an example of the continued interest of the United States in the Near and Middle East, following the close of the London Conference between the United Kingdom, the United States, and France, both the United States and the United Kingdom issued statements with respect to Greece, Turkey, and Iran, on May 19, 1950. The American secretary of state, Dean G. Acheson, reaffirmed "the deep interest of the United States in the security of Greece, Turkey and Iran and our determination to continue our policy of supporting these and other countries which are striving through military and economic efforts to safeguard their independence and territorial integrity." A few days later, on May 25, the United States, the United Kingdom, and France announced agreement to supply arms to Israel and the Arab states only for "legitimate self-defense." President Truman declared that the three-power statement was designed to promote peace in the Near East.

In October 1950, Greece and Turkey accepted invitations issued in September to become associated with appropriate defense planning of the North Atlantic Treaty Organization with regard to the Mediterranean area.

Aside from the resurgent nationalism of the Middle Eastern peoples, the new factors at play in the region in the postwar era were undoubtedly the dynamism of Communist action and propaganda, in the service and in the interest of the Soviet state, and the position of the United States, granted that France and the United Kingdom also had long-standing interests with which they were concerned. In view of the common victory in the war against the Axis, there was some prospect of pacific adjustment, economic reconstruction, and political stability in the Middle East in the postwar era, especially if external political security, not subversion or control of the states along its frontiers, was the desideratum of the Soviet Union. Many of the problems, and more particularly problems pertaining to Greece, Turkey, and Iran, were discussed in some of the great international conferences held during the war and the immediate postwar period, such as those at Moscow, Teheran, and Cairo (1943) and Yalta and Potsdam (1945). (See also PACTS AND CONFERENCES.)

In the postwar period, however, it seemed clear that the Soviet Union, contrary to its announced position at Teheran and Yalta, was reluctant to withdraw its military forces from Iran. Evidently Soviet policy had reverted to the position of November 1940 when it had been stated that "the area south of Batum and Baku in the general direction of the Persian Gulf" constituted "the center of the aspirations of the Soviet Union." In any case, contrary to its wartime promises, Soviet troops were not withdrawn, and Soviet policy encouraged the dissident pro-Communist Tudeh Party in subversive activities

against the government of Iran, especially in the Province of Azerbaijan. The result was that the Iranian government, in the first case of its kind, brought the issue before the Security Council of the United Nations on Jan. 19, 1946. It charged the Soviet Union not only with keeping its forces on Iranian soil contrary to its agreements and the wishes of the Iranian government, but also with interfering in Iran's internal affairs in an attempt to subvert the government of the country. Both the United Kingdom and the United States firmly supported Iran in its appeal to the United Nations regarding Soviet actions and, in the end, Soviet troops were withdrawn; in December 1946, Iranian forces moved into Azerbaijan. The Security Council, however, has retained the Iranian question on its agenda. The Soviet Union, meanwhile, has continued an intermittent pressure and propaganda against Iran, while the United States has sought to bolster Iran's independence and to encourage economic reconstruction. In the interest of cementing American-Iranian relations and of acquainting Americans with the problems of Iran, the shah of Iran visited the United States in November-December 1949.

On Oct. 19, 1950, Iran and the United States signed the first Point Four agreement allotting $500,000 to Iran, raising to $120,000,000 grants and credits extended to Iran, while an Export-Import Bank loan had been approved on October 10. A Soviet-Iranian trade agreement was signed on Nov. 4, 1950.

The Republic of Turkey offers another example of the significant development of American interest in the Near and Middle East since the end of World War II and of the conflict of policy between the United States and the Soviet Union. But the issues involved did not reach the acute stage as in the instances of Iran and Greece, partly because there was no indigenous Communist Party in Turkey and because of the firm determination of the Turkish people and the Turkish government, in any event, to resist overt aggression against Turkey. Soviet designs on the Turkish Straits and Turkish territory, despite the Anglo-Soviet statement of Aug. 10, 1941, confirming Soviet fidelity to the Montreux Convention (1936) and indicating that the Soviet Union had no designs against Turkish territory, appeared to be those set forth in the Hitler-Molotov discussions of November 1940, when revision of the Montreux Convention in the interest of the USSR was demanded. On March 20, 1945, the Moscow government denounced the long-standing Soviet-Turkish treaty of nonaggression (1925, 1929, 1941), and on June 7, 1945, it was indicated to the Turks that the Montreux Convention should be revised to permit joint Soviet-Turkish defense of the Straits, and that the Kars-Ardahan region should be ceded to the Soviet Union. On Nov. 2, 1945, the United States, in view of the discussions at the Yalta and Potsdam conferences, set forth its views that (1) the Turkish Straits should be open to the merchant vessels of all nations at all times, and (2) to the transit of the warships of Black Sea powers at all times, with (3) passage of the warships of non-Black Sea powers permitted only through the specific consent of the Black Sea powers or when acting under the authority of the United Nations. These principles were rejected by the Soviet Union, in its note of Aug. 7, 1946, when it insisted that the establishment of a "new regime" for the Straits should be the sole concern of the Black Sea powers and that Turkey and the Soviet Union should organize the joint defense of the Straits. Turkey rejected the Soviet position because of its obvious implications, and the United States, together with France and the United Kingdom, continued to take the position that legitimate Soviet interests could be served without sacrificing the independence of the Turkish Republic. Interestingly enough, the United States became one of the first commercial powers in the Straits during the postwar period, assuming first place in 1945–1947. American commerce continued to lead that of the USSR in the Straits in 1950. While the American, British, and Turkish governments were all willing to discuss the problem of the Straits in an international conference, the Soviet government evidently saw no useful purpose in entering such a conference, and the public discussion of the problem of the Straits came to an end in the autumn of 1946.

Nevertheless, the pressure on Turkey continued, in the press and over the radio, as well as otherwise, and as late as Oct. 24, 1947, Andrei Vyshinsky, then deputy foreign minister of the Soviet Union, made reference to the Kars-Ardahan region during a denunciation of the Turkish government in the Political and Security Committee of the General Assembly of the United Nations. Because of this constant pressure, of the tremendous defense burden placed on the Turkish government, and of the importance of Turkey as a factor of stability in the Middle East, President Truman, on March 12, 1947, included Turkey in his statement of the so-called Truman Doctrine, and $100,000,000 in military and economic assistance was earmarked for Turkey, an amount which by 1950 had been extended to approximately $164,000,000. In addition to technical assistance in economic development under this program, American military and naval advisers were sent to Turkey to assist in training the Turkish armed forces for purposes of defense against possible aggression.

Greece represents another, and perhaps the most striking, example of the troubled situation. Attacked by Italy, Germany, and Bulgaria during the war, victim of Italian, German, and Bulgarian invasion and occupation, torn by internal dissension, materially and spiritually wounded by war, Greece became the center of an international Communist attempt to overthrow its constitutional system in the period following the war. In view of Soviet promises to Bulgaria in November 1940 as to both Greek and Turkish Thrace, and of Bulgarian and Yugoslav aspirations to Greek Macedonia, there appeared to be little question that, in assisting the Greek guerrillas, one aim, at least, was the establishment of another Communist dictatorship in Greece, and the possible detachment of Greek Macedonia from Greece. When the United Kingdom, in February 1947, announced it could no longer shoulder the burden in Greece, the United States began its program of assistance under the Truman Doctrine, announced on March 12, 1947. Some $600,000,000—about 70 per cent of which went to military assistance because of the seriousness of the guerrilla warfare—was extended under this program, and altogether more than $1,000,000,000 in the period from 1944 to 1950, in one form or another. Expenditures for military aid to Greece and Turkey during the three-year period 1947–1950 were in the neighborhood of $700,000,000.

Together with other interested powers, the United States also carried the problem of threats to the political independence and territorial integrity of Greece to the United Nations which since 1947 has had a Commission of Investigation, and also the United Nations Special Committee on the Balkans (UNSCOB, 1947–1950), with observational and conciliatory functions, in Greece, in an attempt to solve the problem. It is interesting to observe that, like the original Commission of Investigation, UNSCOB has found abundant evidence as to foreign Communist assistance to the Greek guerrillas, the vital importance of which was openly proclaimed by the Greek Communist Party in January 1949. Moreover, on Jan. 23, 1951, the Greek Communist Party declared that if the "Democratic Army of Greece" had won in 1946–1949, Greece would now be "under the warm aegis of the Soviet Union" like the other "people's democracies." As a result of American assistance, the work of the United Nations in Greece, and the determination of the Greek people themselves, the guerrilla movement was crushed in 1949, and Greece, as indicated in the elections of March 5, 1950, was given a renewed opportunity for political, social, and economic reconstruction.

These are but three of the most significant instances illustrating the vital place of the Middle East in the troubled world of today. They are selected for purposes of brief characterization because they have been so striking, and because the pressure on Greece, Turkey, and Iran has been more direct. Yet the conflict in the Middle East is not confined to these countries, which are merely on the periphery of a much vaster area. But because of their geostrategical location they have borne the brunt of the Soviet pressure thus far. The conflict is not merely a struggle between the Soviet Union on the one hand, and the United States and the United Kingdom on the other, or even between East and West. The Middle East as a whole has been involved, including the Levant, Palestine, Jordan, Iraq, Egypt, and Saudi Arabia. In the interest of preserving the area as a bastion of the free world and of developing it along the road to economic reconstruction and progress, the Point Four and Technical Assistance programs have been developed, the end results of which yet remain to be seen.

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19. THE IMPORTANCE OF THE MEDITERRANEAN. At midpoint of the 20th century the United States had a naval force of considerable size stationed in Mediterranean waters and was also building up airbases on Mediterranean shores. Moreover, under the North Atlantic Treaty (q.v.), it was joined in a defensive alliance with Italy—a Mediterranean state; with France—a state with Mediterranean interests and dependencies; and with Great Britain, whose interests in the Mediterranean basin had been called vital for over two centuries. Finally, the United States was furnishing two other Mediterranean states—Greece and Turkey—with military and economic assistance to sustain their independence. (See section *The United States and the Soviet Union in the Middle East.*)

Fifteen years earlier, in 1935, the United States had no military forces in the Mediterranean and no notion of ever finding it important to station any there. Its active contacts with the region were commercial and philanthropic, carried on by individual Americans pursuing their private ends. Its diplomatic interest and influence were best reflected in a note of the Department of State which said, "Following the traditional American foreign policy, which forbids participation by the United States in . . . questions which are entirely European in their scope, the Government must refrain from any expression of opinion."

The change that has taken place in a short time is extreme. Yet there has been no particular marked alteration within the Mediterranean region. The changes have taken place elsewhere—in the position of the United States in the world and in the relations of the United States with the Soviet Union. Characteristically, developments in the outside world have had a powerful effect on the interest in the Mediterranean of states far removed from that region. An examination of certain geopolitical, historical, strategic, and economic factors will suggest the reasons for this.

There are two basic geopolitical facts concerning the Mediterranean. The first is that it links western Europe, North Africa, and the Middle East. The second is that, in conjunction with the Middle East, it forms a geographical unit which is the key sector of the Eurasian littoral.

The first of these two facts has been an important element in the history of the Western World. The second was an essential feature of the political and economic control which western Europe long exercised over the coastal regions of Asia. In the middle of the 20th century, both facts have a compelling influence on the policies and actions of the major powers of the world.

The basic historical fact is one on which British policy for a long time rested. Control of the Mediterranean seems to give a major power the ability to exert a degree of influence in central and eastern Europe, in the Middle East, and in Africa out of all proportion to the actual force maintained in the Mediterranean. The long British demonstration of this possibility was made, however, when the Russian Empire was not a strong and organized world power. It was also made in a time when Great Britain was establishing an unquestioned authority over the coastal regions of Asia.

Neither of these two conditions now exists. The Soviet Union is a strong and organized world power. The Asian littoral is politically broken up into relatively weak independent states, no one of which is capable of maintaining its independence by its own resources. This change, while possibly modifying the historical use of power in the Mediterranean, has increased rather than diminished the importance of controlling this region—or at least of preventing its control by another power. The British policy statement of 1936 was a clear appreciation of this importance. Then, in connection with the Italian-Ethiopian War, it was declared that British authority in the Mediterranean would be maintained at all costs because, if control passed to an unfriendly state, the international position of Great Britain would be vitally threatened.

The strategic significance of the Mediterranean follows from what has just been said. The

region is one in which small shifts in the relative influence of competing major powers can rapidly lead to comprehensive changes in their strategic positions with respect to each other. Strategically the Mediterranean is a highly sensitive area. (See also section *Geostrategic Uniqueness.*)

Economically, in the sense of being a producing area, the Mediterranean is not of the first importance. Its significance lies in its being a vital segment of a world system of distribution and communication. Transportation costs between western Europe and south Asia are related to the availability of the Mediterranean sea route. The economic distribution to Europe of the oil of the Middle East depends on a free use of the Mediterranean. The operation of a vast complex of air transport rests upon agreements with the states of the eastern Mediterranean.

There is one conclusion to be drawn from this brief survey. The Mediterranean has been, is, and will continue to be a focal point of policy for any world power that has global interests and that depends upon sea and air communications to maintain those interests. By the same token, the Mediterranean becomes an important consideration in the policy of a rival world power, by being a region in which the unrestricted use of sea and air routes can be seriously checked. This conclusion can be translated into a picture of the relations of the United States, Great Britain, and the Soviet Union in the year 1950.

It is certain that when the United States sent large military forces into the Mediterranean in 1942, its action was motivated entirely by the military consideration of defeating Germany and Italy. Even the extensive use of American resources by the Middle East Supply Center and the various other Allied civilian agencies had no other purpose than to maintain the basic economy of the area in order to have a stable base for military operations.

The British effort, even though linked with that of the United States in a combined command, did not and could not have so limited and concentrated a purpose. The Mediterranean was a vital factor in historical British policy and the considerations thus raised could not be overlooked. It was inevitable, in these circumstances, that the superior force of the United States would become linked with the British experience which defined control of the Mediterranean as the basis for exerting influence outside the Mediterranean.

By the end of World War II, the United States can be said to have positively supported the re-establishment of traditional British control. Two years later, in 1947, the United States can be said to have developed a national policy with respect to the Mediterranean which differed in no significant respect from that of Great Britain. The Truman Doctrine (March 1947) asserted the importance of the independence of Greece and Turkey, proposed economic and military assistance for this purpose, and acknowledged that such action was an acceptance by the United States of responsibilities which Great Britain had formerly carried but could no longer undertake.

This fully developed interest in the Mediterranean was not a sudden thing. It was the culmination of several years of military and political activity. It was also one of the consequences of the deterioration of the international situation; for relations between the major Allies of World War II did not grow into a pattern of increasing harmony, but into a pattern of conflict.

That this might be the possible character of these relations was felt at an earlier stage in the Mediterranean than elsewhere. In 1944, after Italy was defeated and it had become Anglo-American policy to restore a democratic Italy, relations between the major Allies began to deteriorate in the Mediterranean. Communist leaders took over the resistance movements in Yugoslavia and Greece and turned against the governments in exile to which Great Britain was committed. The Soviet Union, after driving the German Army out of the Balkans, made political preparations for controlling Bulgaria, Rumania, and Yugoslavia. The Soviet Union also expressed an interest in the control of the Dardanelles, in base rights in the Dodecanese Islands, and in participating in the future control of the former Italian colony of Libya. Simultaneously, heavy pressure was brought to bear on the Turkish government to achieve some of these ends.

When the major powers conferred at Yalta (February 1945), their agenda contained 10 items representing specific issues that had developed in the Mediterranean and its Balkan hinterland. Although agreement was reached on many other matters at Yalta, the powers were unable to do more than note for future consideration the Mediterranean issues that had come before them.

These issues increased in number and grew in seriousness through 1945 and 1946. By the end of the latter year, the United States and Great Britain were following parallel and mutually supporting policies in the Mediterranean. The common feature of these policies was the intention of keeping the Soviet Union from gaining a foothold within the Mediterranean basin. For its part, the Soviet Union exerted a steadily mounting pressure to achieve precisely this end. Thus, before the Truman Doctrine was stated and before the idea of a "cold war" was generally admitted, the Mediterranean region was marked out as an area in which opposing purposes and interests came into recognized conflict.

The more this conflict extended to other parts of the world—Germany (1947), western Europe (1948), China (1949), and Korea (1950)—and deepened in intensity, the greater became the interest of the United States in the Mediterranean.

A question can be asked and answered at this point. Why did so extreme a shift take place in American thinking about the Mediterranean? It took place because the Mediterranean came to occupy a key strategic position in the security system which the United States began to construct after 1947. But although this position is comparable to that which the Mediterranean has in the British security system, it is not identical. In the American view, the Mediterranean is a key strategic area only in reference to the Soviet Union and its possible aggressive actions. There are two points to be noted in this connection. If the Soviet Union penetrated the Mediterranean, the economic communications of Europe with the Middle East and the Far East would be cut. Moreover, the access of the United States and Europe to the oil resources of the Middle East would be difficult at best and impossible at worst. Conversely, Anglo-American control of the Mediterranean allows sea and air power to come within striking distance of the industrial heart of the Soviet Union. Thus, Soviet policy is subject to the influence of this threat. When these two points have been noted, however, the basic inter

est of the United States in the Mediterranean is exhausted. (See also section *The United States and the Soviet Union in the Middle East.*)

Great Britain, while sharing this basic interest to the full, has supplementary interests which run far beyond those of the United States. These consist of an accumulation of commercial and financial relations, of political and cultural influences, of military bases and strategic understandings; the whole very completely integrated with the security and well-being of the British Isles.

The United States has no comparable set of interests in the Mediterranean. It is, however, dependent upon existing British relations to support the basic interest it has developed. The identity of this basic interest with that of Great Britain makes possible this unusual relationship between two great powers. The consequence of the relationship is, however, that the United States is generally obliged to support the supplementary interests of Great Britain in order to achieve its own essential interest, and Great Britain is generally obliged to accept the American definition of the basic interest in order to ensure its supplementary interests.

It is unlikely that the situation here described will undergo any radical change except under conditions of war. The Anglo-American combination that has developed in the Mediterranean is committed to perpetuating itself by the nature of the relations of each partner to the Soviet Union. It is in the Mediterranean and in the Middle East that these relations are most precariously balanced, for there the opposing powers come face to face. The least activity of the one is immediately felt and responded to by the other. Unless a new pattern in international relations develops and United States policy becomes less conditioned by considerations of security, the interest of the United States in the Mediterranean will be a continuing one.

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20. THE LAW OF THE NEAR AND MIDDLE EAST. Practically the whole of the Near and Middle East was at some time or other under the rule of Islam, and Mohammedan law is still valid, to a greater or lesser extent, in most of the countries belonging to that region.

The sacred law of Islam, or the Shari'a, is based on four principles: the Koran, the practice of the Prophet Mohammed, the consensus of the community as represented by its scholars, and the method of reasoning by analogy. The consensus of the scholars is considered infallible, and what once has been sanctioned by consensus can (in theory at least) never be repealed. It therefore preserves all the details of the Shari'a in its traditional form, and has become the most powerful conservative element in Mohammedan law. Other factors making for rigidity were the impossibility of legislation after the death of the prophet when both the revelation of the Koran and the model practice of the prophet came to an end; also the conviction that grew up among the scholars from the 4th century of the hegira (the 10th century A.D.) onward that all essential questions had been finally settled, and that in future no one was entitled to deduce the law independently from its sources, but that all had to follow the teaching of one of the recognized schools of law. The four schools of law that have survived in orthodox Islam until the present are the Hanafite, the Malikite, the Shafi'ite, and the Hanbalite schools. They regard one another as equally orthodox, and provide four alternative interpretations of the sacred law. The separate communities of the Shi'ites (in several branches) and of the Ibadites have their own systems of Mohammedan law.

This sacred law of Islam, as it was being elaborated by the scholars, developed from the beginning not in close connection with, but in conscious opposition to, the practice. It is not a system of law in the Western meaning of the term, but the expression of a religious ideal which, it is believed, was fully realized only in the early period of Islam. After the failure of repeated endeavors to put the sacred law into practice, of which the most notable example was the attempt of the first Abbasid caliphs of Baghdad, a balance gradually established itself in most Islamic countries between legal theory and legal practice. The theoretical validity of the Shari'a was acknowledged without reserve, but it was largely superseded in practice by administrative procedure and by commercial and other custom. The state increasingly assumed jurisdiction in matters of criminal law and taxation, as well as in the more important cases concerning property. This led to separate legislation alongside the Shari'a, of which the most important earlier examples are the Ottoman *kanun-nâmes* of the 15th and 16th centuries. The cadi, the judge under the sacred law, usually retained jurisdiction only on matters of family law or "personal status" (marriage, divorce, paternity, maintenance, guardianship, inheritance, legacies) and pious endowments (*waqf*), often together with other branches of land law—all subjects which were felt to be more or less closely connected with religion. Thus throughout Islam there arose a twofold administration of justice, the religious and the secular, long before any Western influence made itself felt.

As a body of religious duties, the Shari'a claims the allegiance of Moslems only, and both the theory of law and the practice of administration in Islamic countries left the non-Moslem communities free to bring the lawsuits that arose among themselves before their own communal authorities and have them settled according to their own religious or customary law. As a result of this, in most countries of the Near and Middle East the several religious communities have preserved their own personal status, even where the rest of civil law, penal law, and commercial law are uniformly ruled by modern codes. From the end of the 12th century onward, a similar status was given to the subjects of European countries, mostly merchants, who were temporarily resident in Islamic territory; the consuls of their own countries exercised civil and criminal jurisdiction over them. The details of these arrangements were settled in state treaties between Moslem and Christian rulers, and from the heads or paragraphs in which the terms were set out, these treaties were called capitulations. Though this development corresponded essentially with the doctrines of the Shari'a, the capitulations were actually modeled on the previous treaties of western Europe with Byzantium and the states of the Crusaders. The capitulations, which enabled strangers to live under their na-

tional laws in most countries of the Near and Middle East, remained in force in many cases well into the 20th century, but have now been abolished everywhere except for the zone of Tangiers and for the capitulation in favor of the United States in the whole of Morocco. In several countries of the region under consideration, however, the subjects of Western states have preserved their own personal status in the same way as the local non-Moslem communities.

A revival of Mohammedan law took place in the Ottoman Empire from the middle of the 15th to the end of the 16th century, and from that time onward the Shari'a in its Hanafite form actually ruled the law of contracts, obligations, and civil procedure in the Ottoman Empire. As part of the administrative reforms of the 19th century, this Hanafite law was codified and enacted as the *Mecelle* or Ottoman Civil Code in 1877. While in Turkey itself the *Mecelle* was superseded by the new Civil Code of 1926, it is still valid law (subject to later changes by legislation) in the territories that were detached from the Ottoman Empire in 1918. In recent years, under the influence of modern political and social ideas, the attitude of legislative bodies to Mohammedan law has changed considerably. The legislative powers are no more content to leave the sacred law undisturbed within its own, more or less restricted, sphere of personal status and law of *waqf,* but want to modify it, according to their own requirements. This has led to the unprecedented phenomenon of secular legislation concerning the Shari'a, a phenomenon which is apt to change its traditional character deeply. Starting with the Ottoman family law of 1917, most modernist legislation has taken place in Egypt from 1920 onward, and other countries in the Near and Middle East have followed suit. In contrast with the modifications to which the Shari'a has been subjected in independent Eastern countries, whether Islam is the official religion of the state or not, it has been maintained, practically unchanged, in those countries which are protectorates, colonies, or integral parts of Western powers.

This is the background of the legal situation in the several countries of the Near and Middle East, which can be summarized in a few representative examples as follows. See also ISLAM.

Morocco (French Protectorate).—In the greater part of the country, as far as the subjects of the sultan are concerned, the cadis apply Malikite law in matters of personal law of the Moslems and in matters of real property, as far as the land has not been put by its owners under French law; the secular tribunals of the sultan are competent for the rest of civil and commercial and for criminal matters. In the territories inhabited by Berber tribes, which before the protectorate were in a state of chronic rebellion against the sultan, customary law is applied by customary tribunals.

Egypt.—Hanafite law is applied to Moslems by cadis in matters of personal status and *waqf,* but the sacred law on all these subjects has been more or less deeply modified by secular legislation in recent years. The personal laws of a number of non-Moslem communities, including subjects of Western countries, are officially recognized; these personal laws are applied by the religious courts of the several communities and by the consular courts respectively. For the rest of civil law, commercial law, and criminal law, modern codes of French inspiration (with some slight regard for institutions of Mohammedan law) are applied by the national tribunals. In the slightly modified Egyptian Civil Code of 1948, the principles of the Shari'a are mentioned, together with custom and natural justice, as rules to follow in cases in which the code gives no explicit or implicit ruling.

Syria, Lebanon, Israel, Jordan, Iraq.—The laws of these countries show a certain family likeness, because parts of Ottoman legislation, though variously modified by later statutes, have survived in them. The *Mecelle,* in particular, is still the basis of civil law in these countries, with the exception of Lebanon (Code of Obligations and Contracts of 1932) and Syria (Civil Code of 1949). The Shari'a is everywhere applied to Moslems by cadis in matters of personal status and *waqf* (Hanafite law to the orthodox majority of Moslems, Shi'ite law to the Shi'ite minorities), though the law of *waqf* was modified by modernist legislation on the Egyptian model in Lebanon in 1947 and in Syria in 1949. The personal law applicable to Jews in Israel and to Jewish minorities elsewhere is rabbinical law.

Saudi Arabia.—As a result of the religious reform movement of the Wahhabis, Hanbalite law alone is valid in all branches of law, personal, civil, and criminal. Commercial law is ruled by a Commercial Code which is derived from the Ottoman Commercial Code but does not contemplate the possibility of giving and taking interest on money. The only commercial tribunal that applies this code sits in Jidda.

Yemen.—Here, too, Mohammedan law, in its Shi'ite Zaidi form, is alone valid in theory; in practice, however, it is tempered by the customary law of the tribes.

Iran (Persia).—Of the recent legislation, which was enacted mostly between 1926 and 1935, the penal law is inspired by Western models, the law of contracts, obligations, and inheritance closely follows the Shari'a but passes over in silence some antiquated dispositions (such as those referring to slavery), whereas the law of marriage introduces only few modifications of traditional Mohammedan law. The form of Mohammedan law valid in Iran is that of the so-called "Twelver" branch of the Shi'a. The ordinary jurisdiction is that of the secular tribunals; the cadis are competent in a restricted range of cases concerning marriage, divorce, and guardianship, and in those lawsuits which can be decided only by the formal rules of evidence of the Shari'a; but all these cases must first be referred to them by the secular courts. Cases concerning the personal status of non-Moslem minorities are subject to their own religious laws and tribunals; those of strangers are decided by the secular tribunals according to the laws of their home countries.

Pakistan.—As regards personal status and all other institutions sanctioned by religion, the Shari'a (in its Hanafite form for the great majority of Moslems, in its Shi'ite forms for the Shi'ite communities) has remained valid through the period of British rule. It was, and is, however, not administered by cadis but by British trained judges, and though most judges in the Moslem parts of British India were themselves Indian Moslems, English legal concepts and rules invaded the Shari'a to a considerable extent, and an independent variant of Mohammedan law, called Anglo-Mohammedan law, came into being.

The non-Moslem communities follow their own personal laws. The other branches of law are ruled by modern codes of British inspiration.

Greece.—The legislation of Greece is a modernized and simplified adaptation of Roman Byzantine law (essentially Justinian's *Corpus Juris Civilis* and the *Basilica* of Leo the Sage). There is no jurisdiction of orthodox ecclesiastical tribunals, but the remaining Moslems have retained their personal status under Hanafite law.

Turkey.—The Turkish Civil Code is based on a Swiss model, and the Penal Code on an Italian model; both date from 1926. In both fields, the Shari'a has been eliminated, but certain traces of it have inevitably remained in the legislation concerning *waqf*.

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21. THE ARTS: REACTION AGAINST HELLENISM. The conquest of Asia by Alexander the Great in the 4th century B.C. destroyed the political power of the Achaemenid Empire and introduced into Iran (Persia) and other parts of Asia the principle of Greek art. As a result of this Hellenistic influence, Iran and the rest of the Middle East developed a hybrid art. The various Seleucid satrapies became independent and developed provincial forms of Hellenistic art. One of these, the Graeco-Bactrian Empire of central Asia, was entirely under Hellenistic influence: its rulers were Greek and its population was to a great extent of Greek origin. This Hellenized Bactrian civilization, its art and coins, spread over central Asia and northern India. Although we find common features between the Hellenistic art of the West and that of the East, the latter soon developed forms which were peculiar to the East only. In the 1st century of the Christian era, the Hellenistic influence affected the Buddhist art of Gandhara and of Chinese Turkestan, creating a form of art known generally as Graeco-Buddhist.

Parthian Art.—In the middle of the 3d century B.C., eastern Iran was conquered by the Parthians, who became independent from the Seleucid Empire. The Parthian kingdom soon comprised not only all of Iran, but also Babylonia and Mesopotamia. Parthian art reveals a mixture of Hellenistic and Oriental elements. A reaction against Hellenistic thought and art began in the 1st century A.D. The Arsacids, the Parthian kings of Iran and Mesopotamia, felt themselves more and more as successors of the Achaemenids. On the coins they appear as true Iranians with long beards and national dress.

Art monuments of the Parthian period are not numerous. In Mesopotamia there are ruins at Assur, Erech (now Warka), Seleucia-Ctesiphon, Dura-Europos on the Euphrates, and the palace at Hatra (about the 2d century A.D.). The Hatra palace was an imposing structure, built in Oriental style with several large barrel-vaulted halls and arched doorways richly decorated with carved ornament. A door lintel, decorated with a pair of griffins, one of the finest examples of Parthian sculpture, is now in the Metropolitan Museum of Art. From Iran proper there are remains of rock sculptures of Mithridates II and Gotarzes II at Behistun (Bisutun), which show the Parthian style with very little Greek influence. Other Parthian ruins are at Istakhr, Kangawar, and Khurha.

Of great importance in the evolution of the art of painting in Iran and in the whole Middle East are the Parthian ruins of the Kuh-i-Khwaja in Seistan (Sistan), the region where modern Iran, Afghanistan, and Baluchistan meet. These ruins, dating back to the 1st century A.D., consist of a palace and a temple. The walls of many rooms of the palace were decorated with monumental paintings, both figural and ornamental, which show both Hellenistic and Iranian styles, the latter a survival of the Achaemenid era.

Sassanian Art.—The reaction of the Oriental mind against Hellenism and the renaissance of neo-Iranian art continued under the rule of the Sassanian dynasty (226–641 A.D.) founded by Ardashir I. It was during this dynasty that Iran experienced one of the greatest periods of its history. Once more, as under the Achaemenid kings, Iran became a world power rivaling Rome and Byzantium. The Sassanian Empire comprised not only modern Iran but the Mesopotamian Valley as far south as the edge of the Arabian desert. The capital was Ctesiphon, not far from the modern city of Baghdad, where the great arch of the palace of the Sassanian kings is still standing. Under royal patronage arts and crafts flourished and the Sassanian epoch was one of the most brilliant periods of Iranian art.

The most complete manifestation of Sassanian art is found in the magnificent rock sculptures glorifying the Sassanian kings and depicting their triumphs over the Romans. Many of these rock carvings are still preserved in various parts of Iran but chiefly in the province of Fars. There was more than one style in Sassanian sculpture. In the 3d century the figures are rendered in high relief gradually changing into the lowest relief. Fluttering drapery and use of different planes are features derived from Hellenistic art. In the 4th century the style of sculpture changes, as in the two reliefs of Ardashir II and Shapur II at Taq-i-Bustan near Kermanshah. The high and round relief is replaced by a flat plane and the figures are only lightly modeled. These forms were no doubt strongly influenced by contemporary painting which replaced the Hellenistic sculpture. At the same time, the sculptors of Sassanian rock reliefs revived many artistic conventions used in the Achaemenid era of Persian art. As in the reliefs of the palaces of the Achaemenid kings at Persepolis, symmetry and rhythmic repetition are important artistic principles. The pictorial character of Sassanian sculpture is best known from two great hunting reliefs in the grotto at Taq-i-Bustan, which date from the time of Khosrau II Parvez (r. 590–628 A.D.). Such hunting scenes were derived from ancient Oriental art and are known to us chiefly from Assyrian sculpture.

The Sassanian style of the rock sculptures is also apparent in a number of silver dishes decorated with figure subjects, mostly royal hunting scenes. These silver vessels, most of which are in The Hermitage in Leningrad, are among the finest products of Oriental metalwork. They belong to several periods and represent Sassanian kings, who can be identified from their distinctive crowns. In hunting scenes, which are miniature reproductions of Sassanian paintings and sculpture, the king, mostly on horseback and dressed in rich garments, is glorified as the supreme hunter. The crescent and the celestial globe surmounting the crown symbolize the divinity of the king. Two important silver dishes with hunting scenes are in American collections. In the Freer

Gallery in Washington, D.C., is a dish representing Shapur II (r. 309–379 A.D.) hunting wild boars. Another silver dish in the Metropolitan Museum of Art, New York City, dates from a century later and represents Firuz or Peroz II (r. 457–484 A.D.) hunting ibexes. In spite of a certain approach to realism in the rendering of human figures and animals, several Oriental artistic conventions are apparent. Contrary to the naturalistic principle of Hellenistic art, and ignoring all the rules of perspective, the scenes are represented simultaneously from several points of view.

Sassanian art must be credited with the creation of a new style of abstract, pseudo-floral ornament based on traditions of Oriental art. As in Assyrian, Babylonian, and Achaemenid art, the palmette became the integral motif of Sassanian ornament, best known to us from stone and stucco carvings. Excavations at Ctesiphon and Kish in Mesopotamia, and Damghan in Persia brought to light a rich stucco decoration of palaces and private houses. Many stucco panels from Ctesiphon, excavated by the German State Museum and the Metropolitan Museum, are now in the Metropolitan Museum of Art. Palmettes of various types are combined into ornamental devices forming an all-over pattern. Some of the abstract palmettes created by Sassanian artists are quite elaborate, being composed of several elements. Such composite palmettes continued to be used by Persian artists for centuries and later appear in 16th and 17th century rugs.

Iranians of the Sassanian era held the monopoly of the silk trade between China and the West and early established their own looms for the manufacture of silk stuffs, which soon became famous all over the East and also in the West. At Shushtar, Susa, and Gundeshapur various types of fine silk fabrics were woven, both for home consumption and for export. The Sassanid weavers created a new style of silk decoration which influenced the medieval silk weaving of Syria, Egypt, Byzantium, and even of the West. A typical Sassanian silk pattern shows large circular medallions with hunting scenes, animals, and birds separated by palmette devices.

Islamic Art.—The reaction against Hellenism and the rise of the Oriental spirit in thought and creative art did not stop in the Sassanian era but continued under Islam, a religion founded by the Prophet Mohammed, born in the Arabian town of Mecca. The Moslem or Mohammedan era began in 622, the year of Mohammed's flight (hegira) from Mecca to Medina. The Arab armies of the caliphs conquered Syria, Palestine, Mesopotamia, Egypt, North Africa, and Iran. In the time of Mohammed the Arabs, having little or no art of their own, adopted the highly developed culture and art of the conquered countries. The caliphs of the Ommiad (Umayyad, 661–750) and Abbasid (750–1258) dynasties requisitioned not only materials but also craftsmen from all the provinces for the construction of new cities, palaces, and mosques. Byzantine and Syrian mosaicists were employed to decorate the great mosque at Damascus, where the chief architect was an Iranian. Christian Copts worked in Jerusalem, Damascus, and Mecca. Coptic weavers were liberally employed in the state manufactories established in Egypt.

An Islamic style was derived chiefly from two artistic sources, the East Christian and the Sassanian. Coptic influence on Islamic art of Egypt continued for several centuries and is evident as late as the 11th century. From the Christian art of Syria the Moslem artists borrowed the Greek acanthus and the vine ornament, but rendered them in a purely decorative fashion only remotely related to the Hellenistic prototype.

The Sassanian style did not end in 641 A.D. with the conquest of Iran by the Arabs, but continued for several centuries. It had a great influence on the formation of Islamic art. In a number of early Islamic monuments we find East Hellenistic and Sassanian motives and styles side by side. The most important early Islamic building is the famous stone façade of the 8th century palace at Mshatta, in the Syrian desert, now in the German State Museum in Berlin. Here one part of the carved decoration (at the left of the entrance gate), of vine scrolls and acanthus with animals and birds, is derived from Hellenistic and East Christian art of Syria. In the other part of the decoration (at the right of the gate) there are no representations of living beings and the ornament is treated in abstract fashion based on artistic traditions of Sassanian Iran. At the same time there is evidence in Mshatta and other early Ommiad monuments of a birth of a new Islamic style.

The evolution of the Islamic style continued under the Abbasids. The intense artistic activity of the Abbasid period is closely connected with the rise of Baghdad, which became a center of Islamic culture and art. At the courts of the Abbasids the Iranian influence was predominant. Evidence of this influence is apparent in the Abbasid decoration and the art of painting. In the 9th century wall paintings of the palace of Samarra, the temporary residence of the caliphs, the figure subjects and the ornament are based on the traditions of Sassanian painting. Stone and stucco decoration of the Abbasids shows the beginnings of the arabesque, a purely abstract ornament which in its fully developed form appears not before the 11th century. Another characteristic of Islamic art, which must be regarded as an invention of Moslem artists, is the decorative use of Arabic writing, at first in its angular or Kufic form, later in the round or Naskhi characters.

While the caliphate was losing its political and spiritual importance, the Seljuks, a Turkish tribe of central Asia, conquered the Iranian province of Khurasan in 1037 and marched westward. They crushed every dynasty in Persia, Mesopotamia, Syria, and Asia Minor and injected new life into the dying Arabic empire (11th, 12th, and 13th centuries). The Seljuks and their followers, the atabeg rulers, were great patrons of art. At their courts at Merv (now Mary), Herat, Rhages (Rai; Rayy), Mosul, Amida (Diyarbekr), and Konya (Konia) gathered famous calligraphers, painters, potters, metalworkers, jewelers, and architects. The most popular ornament of the Seljuk period was the arabesque which was extensively used for the exterior and interior decoration of buildings, prayer niches (mihrabs), and tombstones. The arabesque is composed of curving scrolls, crossed or interlaced, bearing several types of palmettes (full palmettes and half palmettes). There is no beginning or end to the arabesque design. Together with the arabesques, Kufic writing was extensively used in Seljuk decoration. Writing became now an essential part of Islamic art. Calligraphy flourished and magnificent Korans, on

parchment and later on paper, were prepared for the Moslem rulers.

Under the Seljuks the potters of Persia and Mesopotamia created magnificent ceramic ware, which must be classified among the most beautiful ever produced. The Persian potters of Rhages, Kashan, and other centers during the 12th and 13th centuries perfected many ceramic techniques such as luster decoration, monochrome and polychrome painting, and openwork.

Seljuk metalworkers developed and perfected the technique of inlaying objects of bronze and brass with copper and silver. The beginnings of this technique can be localized in the province of Khurasan in eastern Iran. The inlay style created by 11th century Seljuk metalworkers of Herat, Nishapur, Merv, and Seistan, was adopted by the whole Middle and Near East. By the 13th century, Mosul, a city in northern Mesopotamia and the capital of the Seljuk Zangids, became a great center of inlaid metalwork. Mosul metalworkers frequently migrated to Syria and Egypt and introduced the Seljuk style in Damascus, Aleppo, and Cairo.

The Seljuk period was of great importance in the history of Islamic painting. Books on medicine like the *Materia Medica* of Dioscorides Pedanius, al-Hariri's *Maqāmāt,* or *Assemblies,* and al-Jazari's *Automata* or *Treatise on Inventions* were richly illustrated by 13th century artists of the Baghdad school, and also at the Seljuk courts of Amida and Mosul. These painters evolved a style of miniature painting which was followed by Persian artists for several centuries. Many conventions, including rich color schemes, known from Persian paintings of the 14th and 15th centuries, were already used by Mesopotamian artists.

All the characteristic features of Islamic art were fully developed in the Seljuk era. Islamic art is a composite art. It did not originate in any one country. The Arabs, Persians, and Turks, bound together by a single faith, contributed equally to the formation of the Moslem art. The Islamic art of all periods was essentially a decorative art. To the Moslems an empty space was intolerable. Every inch of available space was decorated according to artistic principles developed by Moslem artists. Walls of buildings and objects of daily use were covered with ornament or figure subjects rendered two-dimensionally without any indication of roundness or perspective. See also MOHAMMEDAN ART; PERSIAN ART.

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22. AMERICAN ARCHAEOLOGY IN THE NEAR AND MIDDLE EAST.

American archaeological work in the Near and Middle East areas began late in the 19th century and has been continued on a wide scale since that time. In some lands schools have been established under whose auspices much, if not all, of the excavation is done. However, in most areas individual institutions—universities or museums—play a large part in the work; in some instances joint international enterprises have been organized. The major American archaeological achievements in the Near and Middle East are here summarized.

Greece.—American archaeological work in Greece is sponsored by the American School of Classical Studies in Athens. Founded in 1881, the school promptly began a program of systematic collecting and publishing of inscriptional material. The earliest excavation was that of the sanctuary of Hera near Argos, which was investigated from 1892–1895, with another campaign in 1925. The early temple, almost completely destroyed, probably dated to the late 7th century B.C., but the one whose remains are visible dates from the late 5th century. However, settlement on the site long antedated the foundation of the temple; there seems to have been a flourishing village all through the Bronze Age (called the Helladic Age in Greece), and traces of Neolithic settlement have been found.

In 1896 work began at Corinth in the Peloponnesus and has continued since that time. Most of the work has been devoted to the excavation of public buildings of the Roman period, which are the most conspicuous monuments. However, the walls of the classical Greek city have been established, as well as various buildings of Greek date, including the theater, structures in the marketplace, and the foundation of the Temple of Apollo. Remains of pottery and other objects in the debris indicate that settlement on the site goes back to Early Helladic times. Further excavations were made at several sites in the vicinity of Corinth, which yielded material covering the entire range of the Helladic Age. In 1930 excavations were begun on the north slope of the Athenian Acropolis, and the following year in the Agora (marketplace); the Athenian projects are expected to be of long duration, and the careful investigations are gradually unraveling the complex history of Greece's greatest city. Many Roman and Byzantine buildings have been found, and it is known that settlement began as early as the 2d millennium B.C. (Middle Helladic period). The Agora assumed a monumental character in the 6th century B.C., and its greatest building activity was in the 5th century. One of the most important results of this excavation is the opportunity afforded to identify buildings mentioned by classical writers with the actual remains.

Shorter and more recent are the excavations of the School at Olynthus in Macedonia from 1928–1938. Although remains of the Neolithic period, early in the 3d millennium B.C., have been found, the city as a whole dates from the late 5th century to 348 B.C., when it was destroyed by Philip of Macedon. Here we are fortunate in having a picture of the complete town with private houses, public buildings, and a cemetery, the whole complex yielding a wealth of objects of the classical period.

Egypt.—The earliest American work in Egypt, under the auspices of the University of

California, began in 1899 and consisted of surveys and digging in southern Egypt in both town sites and cemeteries. Three years later the expedition commenced what proved to be over a generation's work at Giza, site of the Great Pyramids, which are the nucleus of a large Old Kingdom cemetery. The enterprise was taken over by Harvard University and the Boston Museum of Fine Arts in 1905 and continued until 1939. This careful investigation has given us a detailed picture of the development of tombs and has yielded a large number of fine works of art. The Metropolitan Museum of New York began working in Egypt in 1906 and pursued various investigations until 1931. Perhaps most valuable of its tasks has been the copying and publishing of the pictures and inscriptions in many Empire period tombs at Thebes. The Temple of Queen Hatshepsut at Deir el-Bahri was investigated, as were also the temples of 11th dynasty kings at the same site, a Persian period temple in northern Egypt, and a group of monasteries founded in early Christian times. One of the last yielded a large series of texts, including apocryphal Gospels and other religious documents. The Oriental Institute of the University of Chicago instituted a series of large-scale works in 1924, devoted chiefly to the copying of reliefs and inscriptions from several temples of the Theban area, and a survey of the Nile River valley to determine its geological origin and the dates of the traces of prehistoric men found in its terraces. Between 1924 and 1931 the University of Michigan excavated two town sites of the Roman period, giving us for the first time some knowledge of the domestic life of that era in Egypt.

Palestine and Transjordan.—In Palestine, American archaeological work began in 1838 with the topographical survey and surface exploration of Edward Robinson, who succeeded in identifying scores of ruin mounds with their Biblical names. Much 19th century work was done jointly with the British, especially in the city of Jerusalem. The year 1900 saw the founding of the American School of Oriental Research in Jerusalem, which has sponsored numerous excavations and has been a training school for Palestinian archaeologists in general. In 1908, Harvard University began excavating at Samaria; after three campaigns the site was abandoned until 1931, when for four years an American-British expedition dug there. This work gave a good picture of a city in the time of the Israelite monarchy and in the Hellenistic period. From 1921 to 1933 the University Museum of the University of Pennsylvania dug at Beth-Shan (Bethshean; now Beisan), which revealed a sequence of cultural levels beginning in the 4th millennium B.C., as well as a fine series of forts of the Egyptian garrison dating from the 14th to the 12th centuries B.C. From 1925 to 1939 the Oriental Institute carried on intensive excavations at Megiddo (the Armageddon of *Revelation*), in which the entire Late Iron Age city and substantial parts of the earlier Iron Age and Late Bronze Age levels were uncovered; among other notable buildings, a group of stables, which may have been the Stables of Solomon, were found. Remains of earlier cities on the Megiddo mound were found in small areas, and settlement clearly began well back in the 4th millennium and continued without noticeable break into Hellenistic times.

In 1926 the American School in Jerusalem began the excavation of Tell Beit Mirsim, and in six campaigns of meticulous work provided the basis of our knowledge of Palestinian culture from the Middle Bronze to the Late Iron ages (c.2000–500 B.C.). An excavation by the school at Tell en-Nasbeh (perhaps Biblical Mizpah), beginning in the same year, revealed an Israelite period city; and a contemporaneous city, Beth-Shemesh, was excavated by the school from 1928 to 1933. Finally the school was also responsible for the systematic survey of the Transjordan carried on from 1933–1943, during which ancient sites over the whole area were recorded and approximately dated by the types of pottery found on the surface.

An important American-British expedition dug at the great city of Gerasa (now Jerash) in Transjordan from 1925 to 1934. Most of the remains are of Roman times and include a majestic colonnaded street bisecting the city, monumental gateways, temples to pagan gods, Christian churches, and various other public buildings. Excavations of Palestinian caves to find and record the traces of Stone Age man were undertaken from 1928 to 1934 by another joint American-British expedition, and yielded skeletal remains of early types of human, as well as the tools which they had used.

Syria.—The earliest American work in Syria was an extensive survey in 1899–1900 by the American Archaeological Expedition, continued by Princeton University in 1904–1905 and 1909. The expedition concerned itself chiefly with standing architectural monuments, providing accurate drawings of buildings, mainly of Roman and early Christian date, plus some Nabataean and a few Hellenistic buildings. Princeton also sponsored excavations from 1932–1939 in Antioch-on-the-Orontes (now Antakya, Turkey), chief city of Roman Syria. Probably the most significant finds are an excellent series of mosaic floors, often depicting mythological scenes and constructed with great skill. In 1928, Yale University joined the French Academy in the excavation of Dura-Europos, a fortress on the Euphrates River which was founded in Hellenistic times, but whose remains come chiefly from the period when it was a Roman garrison post. Ten seasons of excavations have revealed the block plan of the city, as well as the course of the city walls, the marketplace, blocks of private houses, large mansions of officials, army barracks, and public baths. The chief interest of the city is probably in its many religious edifices, which include temples to various pagan gods, a synagogue with elaborately painted walls, and a Christian chapel. The Oriental Institute of Chicago began to dig at several sites near Antioch in 1932. The excavations yielded no great cities, but their importance lies in the fact that they provide a well documented sequence of Syrian cultures from the Chalcolithic Age (4th millennium or before) to Roman times.

Turkey.—The Oriental Institute also undertook the excavation in Turkey of an Anatolian city, Alishar, in the central plateau, from 1927 to 1932. Again the greatest significance lies in the dated building levels and the sequence of objects which they contain, ranging from Chalcolithic to Byzantine times. In 1932 the University of Cincinnati began excavations at Troy on the northwestern tip of the Anatolian Peninsula. Concentrating on small areas left untouched by the 19th century excavations there, the ex-

pedition in six campaigns has unraveled the very complex stratigraphy of superimposed cities from around 3000 B.C. to the Roman period and has established with certainty which city was the Troy celebrated by Homer. An expedition sponsored by Bryn Mawr College and other institutions worked at Tarsus in southeastern Anatolia intermittently from 1934 to 1949. The major remains are Hellenistic-Roman, but investigations in the earlier levels of the city revealed that it was inhabited as early as the Neolithic Age.

Iraq.—In Iraq, ancient Mesopotamia, the first American excavation was at Nippur in southern Babylonia from 1889 to 1900 under the auspices of the American Oriental Society and other institutions; in 1948 work was begun again by the University Museum of the University of Pennsylvania and the Oriental Institute. The site contains material dating from around 2000 B.C. to the early Christian era. The large number of clay tablets inscribed in the Babylonian cuneiform writing are the most valuable finds, but the building remains, especially the Temple of Enlil, are also notable. From 1922 to 1934 a joint expedition of the University Museum and the British Museum dug at Ur of the Chaldees, famed as the original home of Abraham, a site whose remains range from early prehistoric times down to the period of Hellenistic rule. Most important are the ziggurat, or stepped temple-tower, first built before 2000 B.C. and remarkably well preserved, and the 3d millennium cemetery containing the "royal tombs," whose treasures rival those of Tutankhamen in both value and scientific interest. From 1923 to 1933 the Field Museum of Chicago joined with Oxford University in digging the city of Kish near Baghdad, first settled in prehistoric times and apparently remaining important well down into the Christian era. In 1925 an expedition sponsored by several institutions began work at Nuzi near Kirkuk. The city of the 2d millennium B.C. was laid bare and offers a good example of a complete town plan, with many private houses, a large palace, and its associated temple. The 3d millennium city beneath it was partially revealed, and pits dug into earlier levels show that settlement began in prehistoric days. Numerous cuneiform tablets are yielding much information regarding domestic and international affairs around 1500 B.C. Seleucia-on-the-Tigris, just north of Baghdad, was investigated in several campaigns between 1927 and 1937, and shows a city of the Hellenistic period and the time around the dawn of the Christian era. From 1928 to 1935 the Oriental Institute worked near Mosul in the palace of King Sargon II at Khorsabad, trying to complete work begun in the 19th century on this unfinished capital city of the Assyrian Empire. From 1929 to 1938 excavations were pursued by the Oriental Institute and other institutions in four sites on the Diyala River in central Mesopotamia. Together they have yielded material from prehistoric and early historic times down to around 1800 B.C.: public buildings, private houses, fortification walls, cemeteries, and a wealth of objects. The University Museum and the American School in Baghdad worked at two sites near Mosul from 1930 to 1938. Tell Billa was excavated only in part, and showed levels dating from the early 3d millennium to the Persian period. Tepe Gawra was quite thoroughly examined; its settlement apparently began in Neolithic times and lasted until about 1500 B.C. The layout of the major part of the 3d millennium town is known, and the dating of the many superimposed layers of the late prehistoric period has been carefully worked out and forms a basis for comparative chronological work in the area.

Iran.—The site of the major American excavations in Iran, ancient Persia, is Persepolis, the capital city of the Achaemenid kings, which was burned by Alexander the Great; here the Oriental Institute worked from 1931 to 1937. The great terrace which held the palaces, audience halls, and other public buildings has been largely excavated, and we have not only the building remains, but a wealth of relief sculpture which ornamented them. A small village near the city was investigated by the same expedition and proved to contain remains of a very early prehistoric settlement, notably some very beautiful painted pottery. From 1931–1933 the University Museum of Pennsylvania dug at Tepe Hissar in the Iranian plateau, revealing levels of prehistoric and early historic date with numerous houses and graves, and also remains dating from the Christian era. See also ORIENTAL ARCHAEOLOGY (NEAR EAST).

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MIDDLE ENGLISH, a term now usually designating the epoch in the development of the English language intermediate between Anglo-Saxon or Old English and Modern—from about 100 to 1500 A.D. It was characterized by leveling and loss of inflection, by much diversity or orthography, and most importantly, by the French influence. See also ENGLISH LANGUAGE.

MIDDLE EUROPE, in German, **MITTEL-EUROPA,** is the name applied to one of the alleged policies that were to be pursued by Germany in the process of carrying out the Pan-German program of "World Empire or Downfall." Briefly stated, the scheme consisted of absorbing a number of European states into a German confederation either by treaty agreements or conquest. Thus, Norway and Sweden were to be absorbed; Holland with her colonial possessions was to become an ally of Germany; in order to establish Germany's position as a naval power, naval stations would be necessary at Dover and Malta; the western portion of Russia down to the Black Sea was to be conquered; according to Friedrich von Bernhardi, Denmark was "of great military importance to us"; the command of the Straits leading to the Baltic would be imperative for operations against England; according to some exponents, Holland, Belgium, Luxembourg and Switzerland were to be annexed and all foreign influence eliminated; while Livonia, Trieste, Venice and the north of France from the Somme to the Loire were to be included. Germany, Austria-Hungary and Italy were to be firmly united by an economic union. The items represent the Mittel-Europa plan, beyond which lay other necessary acquisitions, such as Egypt, central Africa, Asia Minor, India and sundry South

American republics. See also PAN-GERMANISM.

MIDDLE TEMPLE. See INNS OF COURT; TEMPLE (London).

MIDDLEBORO (officially MIDDLEBOROUGH), unincorporated village, Massachusetts, situated in Plymouth County, at an altitude of 110 feet, 35 miles south of Boston, on the New York, New Haven and Hartford Railroad. It is in a cranberry-growing area. Manufactures of importance are shoes, hospital supplies, varnishes, fire apparatus, brass products, plastics, and caskets. The village has a high school and a public library.

Middleboro forms part of the town of Middleboro, settled in 1660 and incorporated in 1669. One of the oldest towns in the county, it was called Nemasket by the Indians, who were friendly toward the townspeople until the outbreak of King Philip's War in 1675. Burned by the Indians it was soon rebuilt. An excellent supply of waterpower favored the growth of industries in the 19th century. Pop. (1950) 5,889.

MIDDLEBURY, town, Connecticut, situated in New Haven County, six miles west-southwest of Waterbury. The town is largely residential but has some dairy farms and a plant manufacturing watches and clocks. To the west is Quassapaug Pond. In the town are the Westover School for Girls and the Chauncey Judd House, scene of an incident in the American Revolution. Middlebury was settled early in the 18th century and incorporated in 1807 on land taken from Waterbury, Woodbury, and Southbury. Pop. (1950) 3,318.

MIDDLEBURY, village, Vermont, seat of Addison County, on the Rutland Railway, 33 miles north-northwest of Rutland. Located in the town of Middlebury at an altitude of 365 feet on both sides of Otter Creek and under the shelter of Chipman Hill, it is a noted cultural center, the seat of Middlebury College and the Women's College of Middlebury (q.v.).

Among its historic buildings are the Wainwright House (1807), the Congregational Church (1806–1809), the Community House (1816) and the Sheldon Art Museum (1829). The village is also the center of a winter and summer resort region.

Midway between Salisbury and New Haven, Vt., Middlebury received its name and charter in 1761 as one of the New Hampshire Grants (q.v.). By edict of George III, it became part of New York in 1764, and for some 20 years its town meetings were held in Salisbury, Conn., home of most of the early proprietors. The first land was cleared in 1766, with settlements undertaken in 1773 and 1778 and renewed, after Indian Tory raids, in 1783. The town was organized in the independent state of Vermont in 1786, and the village was incorporated in 1832. Middlebury College was founded here in 1800. In 1807, Emma Hart (later Emma Willard) of Connecticut, author of *Rocked in the Cradle of the Deep,* began here a pioneer project for women's education; in 1814 she opened the Middlebury Female Seminary as a private institution to demonstrate the capacity of women to master subjects studied by men.

Early industrial developments at Middlebury include the discovery (1799) of a practical method of welding cast steel; development of the use of sand, water, and toothless saws in quarrying marble, and the invention of the first machine for manufacturing doors and window sashes. Paper, cotton, woolen, and lumber mills were established in the 19th century. Dairying, poultry raising, and fruit growing are the chief farming activities. Pop. (1950) 3,614.

MIDDLEBURY COLLEGE AND THE WOMEN'S COLLEGE OF MIDDLEBURY, an accredited, private, nonsectarian institution of higher learning in Middlebury, Vt., chartered by the state legislature on Nov. 1, 1800. The founders were prominent citizens of Vermont, several of whom lived in Middlebury and adjacent towns. They were counseled by President Timothy Dwight (q.v.) of Yale College. The oldest college in the state in point of service, Middlebury was opened on Nov. 5, 1800, and graduated its first class in 1802, at which time the first academic degrees conferred in Vermont were bestowed. Its first building was shared with the Addison County Grammar School, and it was 1815 before the college acquired its first permanent structure, Painter Hall. Its growth was interrupted by the Civil War, but was steady thereafter. Women were admitted in 1883; in 1931 a separate women's college was established. Middlebury was a pioneer in the direct method of teaching foreign languages. The Château, built in 1925, houses the French school, and there are schools of other modern languages. At nearby Bread Loaf there is a school of English and a writers' conference is held annually. The degrees of B.A. and M.A. are offered, as well as a doctorate in modern languages and a B.S. degree for courses taken in cooperation with the Massachusetts Institute of Technology. The main campus covers 250 acres, and there is a mountain campus of 13,000 acres. The library has a fine French collection. The average yearly enrollment is 1,200.

MIDDLEMARCH (in full MIDDLEMARCH, A STUDY OF PROVINCIAL LIFE), a novel by George Eliot (q.v.), first published in 1871–1872. To many critics, *Middlemarch* is the greatest novel George Eliot ever wrote. Its scope, its variety, its maturity and insight are indubitable. Yet to others it lacks something of the charm and spontaneity of the author's earlier works, and its very inclusiveness and scope lead to a certain confusion of plan and blurring of outline that mark it as artistically imperfect. Whichever view is correct, the novel is admittedly great. Written late in George Eliot's career, it is at once weighty with her considered evaluation of the essential factors in life and rich in her observation and experience of human nature. The plot is the most involved of any that the author presented, and the characters are numerous even for a Victorian three-decker. In general there are two main groups of characters, not, it must be confessed, as closely interrelated as artistically they should be. Dorothea Brooke may be regarded as the center of one group, and Dr. Lydgate of the other. Both represent the tragedy of high aims that fail to take fully into account the actualities of life. Dorothea sentimentally pines to be the helpmate of a genius; but as the wife of the Rev. Edward Casaubon, who is writing a *Key to All Mythologies,* she is disillusioned, and her misery is ended only by the

death of her husband. Dr. Lydgate comes to Middlemarch with excellent training, determined to push forward in biological research. However, he marries the attractive but unpractical Rosamond Vincy, is overwhelmed in debts, and his possible career fades into nothingness. But George Eliot's view of life is not distortedly pessimistic. Over against the somber recognition of the inadequacies and weaknesses of humanity must be placed her portrayal of the fine and strong elements. Dorothea herself is genuine and charming fundamentally; the Garths are sterling, and full of vitality. For all its wavering and crowded plot, *Middlemarch* is permanently valuable because it represents a realism that endeavors to reflect in just proportions the good and bad in life; a realism, moreover, that does not content itself merely with presenting life, but does not shrink from the task of interpretation and evaluation.

MIDDLEPORT, village, Ohio, situated in Meigs County, at an altitude of 565 feet, on the Ohio River, 51 miles southwest of Marietta. It has freight service via the Chesapeake & Ohio and the New York Central railroads. There are coal mines and gas and oil wells in the vicinity, and the village has railroad shops and plants processing food and manufacturing cement blocks. After a disastrous flood in 1937, Middleport was moved back from the river front. Pop. (1950) 3,446.

MIDDLESBOROUGH or **MIDDLESBORO,** city, Kentucky, situated in Bell County, at an altitude of 1,135 feet, near Cumberland Gap, 110 miles southeast of Lexington. It is served by the Louisville & Nashville and the Southern railroads. In a coal and iron mining region, it produces mining equipment, foundry and machine shop products, leather, elastic webbing, coke, wood products, and overalls. Just south of the city is Fern Lake, and nearby are the ruins of Fort Lyon. Middlesborough was founded in 1889 by English interests and named for the English town of Middlesborough. Incorporated as a city in 1892, it is governed by a commission and owns its airport. Pop. (1950) 14,482.

MIDDLESBROUGH, mĭd"lz-brŭ, county borough, England, situated in the North Riding of Yorkshire, on the south bank of the Tees River, 34 miles south of Newcastle. It dates from 1829–1830, with the development of the coal and iron mines of the neighboring Cleveland Hills and Durham fields. It is distinguished for its municipal enterprises; it has handsome public buildings, including a fine Roman Catholic cathedral; and extensive and commodious docks. Its chief industries are connected with iron manufactures. It has numerous blast furnaces and rolling mills, foundries, engineering works, potteries, chemical works, and shipyards; salt is extensively worked.

The borough was incorporated in 1853 and received a county charter in 1888. One member is returned to the House of Commons. The chief public utilities are municipally owned. Pop. (1951) 147,336.

MIDDLESEX, mĭd"l-sĕks, county, England, located in the Thames basin, adjoining London, bounded on the north by Hertfordshire, on the south by Surrey, on the east by Essex and London, and on the west by Buckinghamshire. The chief towns are Brentford (the capital) and Chiswick, Willesden, Uxbridge, Ealing, Hornsey, Harrow, Tottenham, and Hampton. The county is drained by the Thames, Colne, and Lea rivers. It is chiefly residential, with market gardening. The area is 232 square miles.

Middlesex, so named because it was between the east and the west Saxons, is one of the older English counties. Pop. (1951) 2,268,776.

MIDDLETON, mĭd"l-tŭn, **Arthur,** American colonist: b. Charleston, South Carolina, 1681; d. Sept. 7, 1737. He was conspicuously engaged in public affairs as a member of the council as early as 1712; and exerted his political influence in favor of popular claims, opposing the lords proprietors, and finally heading the revolution which threw off the whole proprietary government and placed the colony under the immediate protection of the Crown (1719). In 1725 he succeeded Gen. Francis Nicholson as acting governor of the colony, which office he held till 1731, when the royal governor arrived; he then retained his position in the governor's council. His administration as governor was partly occupied by war and negotiations with the Spaniards of Florida and the French of Louisiana.

MIDDLETON, Arthur, American patriot, signer of the Declaration of Independence: b. Middleton Place, near Charleston, South Carolina, June 26, 1742; d. Goose Creek, South Carolina, Jan. 1, 1787. He was educated in England at the University of Cambridge, then returned to South Carolina for a time and was a member of the legislature, but went abroad again for two years' travel on the Continent. On his final return to America, he established himself as a planter, and soon became one of the leaders of the Revolutionary party. He was one of the most efficient members of the first council of safety, and in 1775 was sent to the Provincial Congress. In 1776 he was sent as a delegate of the state to the Continental Congress, and as such affixed his signature to the Declaration of Independence. He held his seat in Congress until 1777, declined the governorship of South Carolina in 1778, and took the field for the defense of Charleston in 1779. His plantation was devastated by the British and he was made a prisoner after the fall of Charleston in 1780, and was one of the leading citizens who were kept in confinement as hostages. His estate was sequestered, and he was shipped to the castle of St. Augustine, and thence transferred to the *Jersey* prison ship. Exchanged in the latter part of 1780, he served until the close of the war as a delegate in the Continental Congress, and was afterward elected to the state senate. He was a skillful stenographer, and reported many of the debates in which he participated.

MIDDLETON, Conyers, English divine: b. York, or Richmond, Yorkshire, Dec. 27, 1683; d. Hildersham, near Cambridge, July 28, 1750. He was educated at Cambridge and was elected a fellow there in 1706. He married soon afterward, thus losing his fellowship, and for a short time was rector of Coveney in the Isle of Ely, a rectory in the gift of his wealthy wife. He received his D.D. at Cambridge in 1717. He was appointed university librarian in 1721, and was in Italy in 1724–1725. His *Letter from Rome* (1729) dealt at some length upon the adaptation

of pagan beliefs and ceremonies in the Roman Catholic Church and was highly praised by the orthodox English clergy, and occasioned great indignation among the Catholics. His controversy with Daniel Waterland, in which he urged the then heretical theory that theologians should not attempt to maintain the historical accuracy of the Bible in all instances, brought a storm of criticism and he was obliged to make some qualifications regarding his statements in order to retain his Cambridge degrees. He next engaged upon a life of Cicero, which to a great extent was related in the statesman's own words, and which gained a high reputation as a model of style, but was later found to be largely plagiarism from a rare book of William Bellenden's *De tribus luminibus Romanorum.* He then returned to the field of theological controversy, publishing his *Introductory Discourse* (1747), and his *Free Inquiry* (1748), attacking the miraculous powers supposed to have been inherent in the Church from early times. While this controversy was in progress Middleton died.

MIDDLETON, George, American playwright: b. Paterson, New Jersey, Oct. 27, 1880. After receiving his A.B. degree at Columbia University in 1902 he embarked on a literary career. The same year his first play, *The Cavalier,* written in collaboration with Paul Kester, was produced. Other successful play collaborations were *The Sinner,* with L. Westervelt (1907); *Hit-the-Trail-Holliday,* with George M. Cohan and Guy Bolton (1915); *Polly with a Past,* with Bolton (1917); *Accused,* with E. H. Southern (1925); and *The Big Pond,* with A. E. Thomas (1929). He was also sole author of several other plays including *Rosalind at the Gate* (1910) and *The Prodigal Judge* (1913).

In 1911 Middleton married Fola La Follette and the following year became literary editor of *La Follette's Weekly Magazine.* After serving as president of the Dramatists Guild of the Authors' League of America (1927–1929), he was for two years an associate producer of Fox Film Corporation. In 1942 he joined the staff of the Alien Property Custodian as copyright and trade expert.

MIDDLETON, Henry, American patriot, son of Arthur Middleton (1681–1737, q.v.): b. South Carolina, 1717; d. Charleston, South Carolina, June 13, 1784. He was elected to the South Carolina House of Commons and in 1745–1747 was its speaker. Appointed commissioner of Indian Affairs in 1755, he also served as a member of the council in 1755–1770. Elected a delegate to the Continental Congress in 1774, he was its president from October 1774 to May 1775. He was president of the Provincial Congress of South Carolina in 1775–1776. Re-elected to the Continental Congress in 1776, ill health obliged him to surrender his seat to his son Arthur (1742–1787, q.v.).

MIDDLETON, Henry, American politician and diplomat: b. London, England, Sept. 28, 1770; d. Charleston, South Carolina, June 14, 1846. Elected to the South Carolina legislature in 1801, he served until 1810, when he began a two-year term as governor of the state. A vigorous supporter of the war policy in 1812, he was elected to Congress in 1815 and served for four years. In 1820 he was appointed minister to Russia, in which capacity he negotiated a treaty regulating trade and fisheries in the Pacific (1824). After his return to the United States in 1830 he retired from public life.

MIDDLETON, Thomas, English dramatist: b. probably in London, England, 1570?; d. Newington Butts, England, July 1627. Little is known of his life, but his writings testify to the excellence of his education before his entry at Gray's Inn in 1593 or 1596.

Several minor prose works preceded what seems to be his first play, *Old Law* (1599), written with William Rowley. From that time on he wrote constantly for the stage, now alone, now with Rowley, Philip Massinger, or Thomas Dekker. Among these works are several masques, of which the best and most dramatic is *The World Lost at Tennis* (1620). Middleton's *The Witch* (1778) is his best known work. His most successful play was *A Game at Chess* (1624), which satirized the wooing of the Spanish Infanta and was stopped by the Privy Council; it packed the playhouses because of its political and Protestant tone.

Among his other plays are *Michaelmas Terme* (1607), *A Trick to Catch the Old-One* (1608), *The Roaring Girle* (1611), *The Spanish Gipsie* (1653), and *Women Beware Women* (1657).

His works were edited by Alexander Dyce, 5 vols. (1840), and by A. H. Bullen, 8 vols. (1885).

MIDDLETON, municipal borough, England, in Lancashire, 5 miles northeast of Manchester. Its industrial establishments include cotton and silk factories, dye and print works, ironworks, chemical works, and aircraft plants. Coal is extensively mined in the vicinity.

The Church of St. Leonard dates from the 12th to the 16th century; the grammar school was founded in 1572. Gas and electric lighting plants are municipally owned. Pop. (1951) 32,602.

MIDDLETOWN, city, Connecticut, Middlesex County seat, on the Connecticut River, altitude 50 feet, about 14 miles south of Hartford, on the New York, New Haven and Hartford Railroad, and modern highways.

The city is the business center of a rich agricultural region producing tobacco, fruits, and dairy products. Manufactures include metal products, elastic webbing, textiles, hardware, automobile parts, asbestos, chemicals, machinery, cigars, and rubber goods.

It is the seat of Wesleyan University (q.v.), founded in 1831. Two state institutions, Connecticut State Hospital for the insane, and Long Lane Farm, an industrial school for girls, are located here.

The town was settled in 1650 by colonists from Hartford and Wethersfield, and was incorporated in 1651 under its Indian name of Mattabeseck. In 1653 it was given the name Middletown because of its location midway between Hartford and Saybrook. A company recruited here by Col. Return Jonathan Meigs, at the outbreak of the Revolutionary War, fought at Bunker Hill and was cited for bravery by Washington. During the latter half of the 18th century it was one of the most prosperous towns in the state and is still a thriving industrial, commercial, and educational community. It was

once a port of entry and carried on a flourishing trade with the West Indies in lumber and farm products. Silver and lead were mined in the vicinity, gold was found there, and valuable deposits of freestone, feldspar, and columbite became commercially important.

Incorporated as a city in 1784, it obtained a new charter in 1882 providing for a mayor and council. The water supply is municipally owned. Pop. (1950) 29,711.

MIDDLETOWN, city, New York, in Orange County, on the Walkill River; altitude 559 feet; about 21 miles southwest of Newburgh on the Erie; New York, Ontario and Western; Middletown and New Jersey railroads; and state and federal highways.

It is the business and industrial center of a fertile agricultural region in the foothills of the beautiful Shawangunk Mountains, producing poultry, fruit and garden truck, onions, celery, and potatoes. The city has railroad shops, foundries, a tannery, and silk mills, and manufactures of saws, shirts, leather goods, footwear, underwear, wrapping and printing machinery, hats, handbags, and fur. The Orange County Community College was opened here in 1950.

The town was settled in 1796, and named as a halfway point on the Minisink trail from New York City to western New York. Incorporated as a village in 1848, it obtained a city charter in 1888. It has mayor and council, and municipally owned water supply. Pop. (1950) 22,586.

MIDDLETOWN, city, Ohio, in Butler County; altitude 666 feet; on the Great Miami River, about 33 miles north of Cincinnati; on the Baltimore and Ohio; Big Four; and Pennsylvania railroads; state and federal highways.

In the heart of the rich Miami Valley, it is the industrial center of a fertile agricultural region producing wheat, corn, hay, and oats. Manufactures include sheet and corrugated steel, paper, paper bags, boxes, and steel paper-making machinery.

The town was laid out in 1802 and named for its location midway between the mouth of the Great Miami River and its most northern navigable point. On one of Ohio's early canals, it was a shipping point for hogs during the mid-19th century. Later it turned to the manufacture of paper and tobacco. During World War I it grew in importance for the manufacture of steel.

Middletown was incorporated as a city in 1833, and adopted the commission type of municipal government in 1913. In 1949 the city charter was amended to provide for the commission-manager type of government. It has municipally owned water supply, and an airport. Pop. (1950) 33,695.

MIDDLETOWN, borough, Pennsylvania, in Dauphin County; altitude 355 feet; on the Susquehanna River; about 8 miles southeast of Harrisburg; on the Reading and the Pennsylvania railroads.

Founded in 1755 on the site of an Indian village, Middletown was incorporated in 1828. A market center for a farming region its principal local manufactures are infant's shoes, work clothing, boilers and stoves. A boat-building center during the Revolutionary War, it was one of the first towns in the United States to make steel. During the early 19th century it was a canal shipping center. Nearby is Emaus Orphanage, founded in 1837, one of the oldest orphanages in the United States. St. Peter's Lutheran Church was built here in 1767. Olmsted Air Force Base is located here. Pop. (1950) 9,184.

MIDDLETOWN, town, Rhode Island, in Newport County, 5 miles north of Newport, on Narragansett Bay. It is on the New York, New Haven, and Hartford Railroad (for freight only), and on state highways. Predominantly agricultural, it is also a resort town. St. George's School, a private boys' school, is located here. The town was incorporated in 1743; government is by town meeting. Pop. (1950) 7,382.

MIDEWIN, mĭ-dā'wĕn, or **MIDEWIWIN,** mĭ-dā'wĕ-wĕn, or **MIDE,** mē'dĕ, or **MEDA SOCIETY,** a secret religious organization of the Ojibway Indians and neighboring tribes. The aim of the society was to prolong life by the use of herbs and magic.

MIDGARD, mĭd'gärd, in Scandinavian mythology, the dwelling place of the human race, formed from the eyebrows of Ymir, one of the first giants, and joined to Asgard, the abode of the gods, by the rainbow bridge.

MIDGE. See GNAT.

MIDGLEY, mĭj'lĭ, **Thomas, Jr.,** American research chemist: b. Beaver Falls, Pennsylvania, May 18, 1889; d. near Columbus, Ohio, Nov. 2, 1944. He was educated at Cornell University, and received his M.E. in 1911. From 1912 to 1914 he did research work on automobile tires, and from 1914 to 1916 he was superintendent of the Midgley Tire and Rubber Company of Lancaster, Ohio. He worked with Charles F. Kettering and the General Motors Research Corporation until 1923 when he was appointed vice president of the Ethyl Corporation, a position he retained until his death. He was a vice president of Kinetics Chemical, Inc. from 1930, and director of Ethyl-Dow Chemical Company from 1933. From 1940 he was vice president of the Ohio State University Research Foundation, and vice chairman of the National Inventors Council.

His most noteworthy contribution to science was the discovery of tetraethyl lead as a gasoline anti-knock compound; also certain organic fluoride compounds for refrigerants which are noninflammable and nontoxic.

He was awarded the Nichols Medal of the American Chemical Society in 1923, the Perkins Medal in 1937, the Longstreth Medal of the Franklin Institute in 1925, the Priestly Medal of the American Chemical Society in 1941, and the Willard Gibbs Medal in 1942.

MIDHAT PASHA, mĭd-hät'pä-shä', Turkish statesman: b. Constantinople, 1822; d. Arabia, May 8, 1884. He entered the Turkish government service, was made pasha in 1860, was governor successively of Uskup, Bulgaria and Salonica, and distinguished himself by his wise administration. In 1873 he was for a short time grand vizier. He aided in deposing the sultans Abdul-Aziz and Murad V in 1876, was grand vizier under Abdul-Hamid (Dec. 1876-Feb. 1877), and was then banished by the suspicious monarch. Later, however, he was governor of Smyrna, then of Syria. He was tried with other pashas

for the murder of Abdul-Aziz, was found guilty and was sentenced to death; but this sentence was commuted to life imprisonment.

MIDIANITES, mĭd'ĭ-ăn-īts, an Arab tribe, descended, according to Scripture, from Midian, the son of Abraham by Keturah. They occupied most of the country between the Arabian Gulf and the Plains of Moab. The Midianites were very troublesome neighbors to the Israelites till Gideon's victory over them. Midian ceased to be Egyptian and became Turkish in 1887. It is now part of Saudi Arabia.

MIDLAND, city, Michigan, and Midland County seat; altitude 620 feet; on the Chippewa and Tittabawassee rivers; 19 miles west of Bay City; served by the Michigan Central and Chesapeake and Ohio railroads. It is the home of one of the nation's largest chemical companies; it also derives revenue from petroleum wells in the vicinity. Midland was incorporated as a village in 1869, and as a city in 1887. Pop. (1950) 14,285.

MIDLAND, town, Province of Ontario, Canada, in Simcoe County, on Georgian Bay, about 90 miles north of Toronto by Canadian National and Canadian Pacific railway lines. It is in a good farming district and has a fine harbor which is a port of call for shipping on the upper lakes. With its elevators of a total capacity of 12,800,000 bushels, the town's main industrial activities are flour milling and three large shipbuilding and repair yards. Lumber, planing and woolen mills, foundry and machine shops are located there. Hydroelectric power is obtained from the Severn River to the east. There are five public schools and a collegiate institute, a weekly newspaper, a public library, a fine park, a hospital, and three banks. Midland is annually visited by many pilgrims to the shrine of the Jesuit martyrs of early Canada nearby. Pop. (1951) 7,206.

MIDLAND, borough, Pennsylvania, in Beaver County, 28 miles west-northwest of Pittsburgh, on the Ohio River; served by the Pennsylvania Railroad. Manufactures include coke by-products, steel and iron. Settled around 1820, the borough has a mayor-council form of government. Pop. (1950) 6,491.

MIDLAND, town, Texas, Midland County seat; 20 miles north of Odessa, and midway between Fort Worth and El Paso; altitude 2,760 feet; on the Texas and Pacific Railroad, with bus service, and three airlines; on federal and state highways.

Situated in the center of the vast Permian Basin oilfields of western Texas and southeastern New Mexico, Midland is the headquarters of more than 300 oil companies and affiliate offices operating in the area. It is also an important center of the cattle industry in a region comprising the greater part of 12 counties of Texas and New Mexico. In the vicinity, cotton, grain sorghum, fruits and vegetables are the leading crops. Business enterprises include carbon black plants, natural gasoline and extraction plants, refineries, and numerous pipeline companies.

History.—A cow town on the trail from Pecos to Fort Worth in the late 19th and early 20th century, as recently as 1921 Midland had only 1,400 inhabitants. The oil strike made that year brought sudden wealth to the townsfolk and ranchers, also a rapid increase in the population. The unsightly oil derricks which mar the appearance of so many oil towns are not in evidence, the city fathers having decreed that no well may be drilled within the city limits. Though trees do not grow easily here, the Chinese elm, with its feathery leaves, lines the streets and open spaces.

The town has a theater and a music association, a branch of the American Association of University Women, a chapter of the League of Women Voters, and the Petroleum Club.

Settled in 1885, Midland was incorporated in 1906. Pop. (1940) 9,352; (1950) 21,713.

MIDLOTHIAN, mĭd-lō'thĭ-ăn (formerly EDINBURGH or EDINBURGHSHIRE), county, Scotland, on the south shore of the Firth of Forth. The northern portion is flat; the Pentland Hills cross the county from the southwest, and the Moorfoot Hills are in the southeast. The Gala, Esk, Almond, and Tyne rivers flow through the county. Agriculture, livestock raising, dairying, fisheries, shipbuilding, manufactures of paper, iron products, and carpets, and distilling of whiskey are carried on. Edinburgh is the capital city. Area of county 366 square miles; pop. (1951) 565,746.

MIDNAPORE, mĭd'nà-pōr, or **MIDNAPUR,** mĭd'nà-pōōr, town, Indian Union, administrative district of Bengal. The town is the capital of the district and is 68 miles west of Calcutta. It is the center of an important indigo and silk industry, and has manufactures of brass and copper goods. The district forms the southern part of the Burdwan division of Bengal. It has an area of 5,274 square miles. Pop. (1941) 3,190,647.

MIDNIGHT JUDGES, or **APPOINTMENTS,** a term applied to executive appointments or nominations made by President John Adams, the last night of his administration. Congress had passed a bill authorizing the appointment of 18 new United States judges, and Adams with the consent of the Senate appointed judges to fill these newly created vacancies. They were known as Adams Midnight Judges. The new law was repealed early in Jefferson's term and the judges lost their offices. The suit of one of these judges, William Marbury, resulted in an important legal decision. See also MARBURY v. MADISON.

MIDNIGHT SUN, is the appearance of the sun above the horizon at midnight. It may be witnessed at any point on the Arctic Circle on June 21, and on the Antarctic Circle on December 21. Within these circles the length of time the sun is in the sky without setting gradually increases, being 65 days in latitude 70°, and 134 days in latitude 80°, while the sun does not set for six months at the poles. Tourists visit the north of Norway about midsummer to witness the phenomenon. This phenomenon of the midnight sun is due to the inclination of the earth's axis, and to the fact that the axis points in the same direction during the whole period of the earth's yearly revolution round the sun.

MIDRASH (Hebrew, from *darash,* to make research), among the Jews, is the general name given to the exposition or exegesis of the

Scriptures. When such writings first arose is not known, but the most flourishing period of midrashic exegesis was from about 100 B.C. to 200 A.D. The term midrash expressed "any and every ancient exposition on the law, psalms and prophets, disquisitions that took the form of allegorical illustration, homiletics or practical commentary." Thus in its most general meaning it expressed the whole uncanonical Jewish literature, including the Talmud, down to the compilation of the book Jalkuth in the 13th century, since which time the term gradually ceased to be applied to rabbinical writings.

MIDRIFF (A.-S. *mid,* middle; *hrif,* abdomen), the diaphragm (q.v.).

MIDSHIPMAN, in the United States Navy, is the designation of a student taking the four-year course of study at the U.S. Naval Academy, Annapolis, Md.; upon graduation he is commissioned ensign. In the British Navy, a midshipman holds the intermediate rank between a naval cadet and a sublieutenant.

MIDSHIPMAN, a California coast-fish of the genus *Porichthys.*

MIDSHIPMAN EASY, Mr. See **MR. MIDSHIPMAN EASY.**

MIDSUMMER EVE. See JOHN'S, EVE OF SAINT.

MIDSUMMER NIGHT'S DREAM, A, is a comedy by William Shakespeare, first printed in 1600. Probably written in 1594, or even earlier, it was doubtless written for some wedding festival as it has many of the characteristics of a masque. The incidents connected with Theseus and Hippolyta were taken from Plutarch's *Life of Theseus* and perhaps Chaucer's *Knights Tale,* while the fairy story which makes up such a large part of the play was Shakespeare's transformation of the somewhat crude elements of mediaeval folklore. The first and last acts take place in Athens at the palace of Theseus, and the other three acts in the forest near Athens. Theseus and his queen fit into the story insofar as they celebrate their nuptials, and as they are interested in the love affairs of Demetrius and Helena, Lysander and Hermia; they are brought into the forest only by their love of the chase, which is realistically portrayed. The well-known words of Theseus upon "the lunatic, the lover, and the poet, as of imagination all compact," are in striking contrast with the fantastic fairies that really dominate the play. Even further removed from fairyland are the prosaic mechanics who represent, with all the characteristics of low comedy, the story of Pyramus and Thisbe. By their rehearsal in the forest they are caught for a moment in the magic web of Oberon, Titania, and Puck. Under the same influences fall the Athenian lovers, who after unfortunate experiences are brought to the happy conclusion of their dreams. The title of the play, as indeed the major part of the story and the background, suggest the tone, the atmosphere, of the play. It is the magical midsummer night with the moon in the sky that forms the appropriate setting of the mystery, the fantasy, and the unreason of fairyland. Oberon, Titania, and Puck, along with the other incarnations of the beauty and magic of nature, have fixed in the popular imagination the principal elements of fairyland. The fact that they were represented by boys on the Elizabethean stage gave to these creations the spirit of childhood that has been lost in the modern stage representation. No analysis can suggest the delicacy, or the beauty, or the charm of these airy nothings to which Shakespeare has given a local habitation and a name.

The comedy was also the inspiration for an overture, and music to accompany the play, composed in 1826 and 1843, respectively, by Felix Mendelssohn-Bartholdy. This work, incorporating one of the composer's most celebrated scherzos, beautifully recreates the elfin delicacy of Shakespeare's fairyland.

MIDWAY ISLANDS, a coral atoll in the North Pacific, a possession of the United States. Situated 1,300 miles northwest of Honolulu, the atoll, some six miles in diameter, contains two coral islands—on the western side Sand Island (1¾ miles long and ¾ miles wide, with an average elevation of 8 to 10 feet); and Eastern Island (1¼ miles long and ½ mile wide, with an elevation of 6 to 12 feet). The total area of the atoll is about 28 square miles, and the population in 1940 numbered 437. Both islands are partly covered with coarse grass and bushes, and are a breeding ground of the tern. Fish of many varieties, turtles, crabs, and crawfish, abound in the lagoon. Good water is obtained by sinking wells.

Midway was known as Brooks for several years after its discovery in 1859 by N. C. Brooks, commander of the Hawaiian vessel *Gambia,* who found it uninhabited. During 1887–1889 a shipwrecked crew lived on the atoll for 14 months; several of the men died from scurvy before rescue came. By Executive Order No. 199A, of Jan. 20, 1903, administration of Midway was made a responsibility of the United States Navy Department, and the same year it became a station site of the transpacific cable system. In 1935 the atoll became a stopping point on the Pan American Airways service between Honolulu and the Philippines, a hostel and other facilities being erected on the north side of Sand Island; and in 1939, on the eve of World War II, the United States government commenced construction of submarine and air bases on Eastern Island. In 1941 Midway was proclaimed a national defense area, and when Japan entered the war on December 7 her warships shelled the American installations on Eastern Island the same day. Thereafter the Japanese made occasional air attacks, and on June 7-8, 1942, an air battle was fought between American and Japanese large carriers some 700 miles west of Midway; this engagement, known in history as the Battle of Midway, resulted in a severe defeat for Japan and proved to be one of the decisive naval victories of the war.

MIDWIFE TOAD, a European representative (*Alytes obstetricans*) of the family Discoglossidae, noteworthy on account of its unusual breeding habits. Pairing of this widely distributed species occurs throughout spring and summer, the female being capable of spawning from two to four times during the year. When she is ready to lay, the male, approaching from behind, grasps her about the waist and aids in the extrusion of the yellow ova. These, numbering from 50 to 100 and strung together by elastic filaments, are expelled explosively into a receptacle formed by the mother's closely pressed hind

limbs, bound behind and beneath by the feet of the male. At the moment of extrusion the male shifts his hold to a point in advance of the forelimbs and proceeds to fertilize the eggs. After this is accomplished he repeatedly thrusts his feet into the sticky mass until the strings of eggs are wound about, and adhering to, his thighs. Releasing his mate, the male midwife toad slowly hops or crawls away to the retreat where he is accustomed to spend the day. When he emerges in search of food, nocturnal dews assist in keeping the eggs moist; during exceptionally dry weather the nursing father may even resort to brief immersions. After about three weeks, which is the time taken by the tadpoles to develop, the toad seeks out a pool in which he remains while the pollywogs liberate themselves by biting through the tough envelope. Then, and not until then, does the two-inch father toad discard his burden.

MIDWIFERY. See OBSTETRICS.

MIELATZ, mē'läts, **Charles Frederick William,** American etcher: b. Breddin, Germany, May 24, 1860; d. New York, N. Y., June 2, 1919. Taken to the United States in childhood, he studied drawing at the Chicago, Ill., School of Design and Painting; from 1903 he maintained his studio in New York City. He was an instructor at the National Academy of Design, in that city, and became widely known for his etchings, dry points, aquatints, and lithographs. He is best known for his large number of views of New York, but he also executed rural, woodland, and marine scenes.

MIERES, myā'rās, town, Spain, located in Oviedo Province, 9 miles south-southeast from Oviedo, on the Lena or Caudal River. It is situated in a mountainous region with heavy forests and fertile land. The center of an important industrial area, it has coal, iron, sulphur, and cinnabar mines, and iron and chemical works. Pop. (1940) town, 9,616; municipality, 51,967.

MIEREVELT or **MIEREVELD,** mē'rĕvĕlt, **Michiel Janszoon van,** Dutch portrait painter: b. Delft, Netherlands, May 1, 1567; d. there, June 27, 1641. As court painter to the house of Orange he did portraits of William of Orange and other princes of that house and of Nassau. He worked mainly in his native city and at The Hague.

His son PIETER VAN MIEREVELT (b. Delft Oct. 5, 1596; d. there, Jan. 11, 1623) followed his father's style and devoted himself similarly to portraits.

MIERIS, mē'rĭs, **Frans van** (THE ELDER), Dutch painter: b. Leiden, Netherlands, April 16, 1635; d. there, March 12, 1681. The leading master of a family of painters, he was remarkable both for refinement of handling and elegance of design. His portraits and genre pictures are not conspicuous for striking and original characterization. Only two or three figures appear in most of his genres, and his compositions of this kind are delicate and smooth to a degree that renders them almost inanimate. Both his sons—JAN (1660–1690) and WILLEM (1662–1747)—became well-known painters.

His grandson, FRANS VAN MIERIS (THE YOUNGER): b. Leiden Dec. 24, 1689; d. there, Oct. 22, 1763; painted genre and portraits, but did more service perhaps as a historian of his native country.

MIES VAN DER ROE, mē'ĕs văn dĕr rō'ĕ, **Ludwig,** German-born American architect and industrial designer: b. Aachen, Germany, March 27, 1886. Although he had no formal architectural education, at 15 he was doing apprentice work for local designers and architects and at 19 worked as a furniture designer with Bruno Paul in Berlin. During 1908–1911 he was an assistant to Peter Behrens, one of Germany's leading architects. Influenced by Frank Lloyd Wright, Mies experimented with original conceptions, and as early as 1919 had designed a steel skyscraper sheathed wholly in glass, and other structures—both office buildings and homes—making use of open, untrammeled spaces along strictly functional lines. Among his most notable achievements in Europe were the German pavilion for the International Exposition at Barcelona (1929) and the Tugendhat house at Brno, Czechoslovakia (1930). Meantime (1927) he had designed a cantilevered, tubular steel chair.

Mies went to the United States in 1937 and a year later became director of design at Armour Institute of Technology, Chicago, until it merged with the Lewis Institute to form the Illinois Institute of Technology in 1940, when he headed its department of architecture. He designed a group of buildings of extreme simplicity, with immense glass areas, rectangular panels of brick, and exposed steel structure; the 100-acre site was said to be the first American campus planned as an architectural unit. He became a United States citizen in 1944. In 1948–1949 and again in 1950–1951 he built two towering apartment houses characterized by himself as "skin and bones architecture."

MIESZKO I, myĕsh'kô, Polish ruler: b. ?921; d. 992. Duke of Poland from 962 until his death, he is considered the historic head of the Piast dynasty. Uniting a number of principalities, he began their conversion to Christianity in 963 (or 966, according to some authorities). About this time, threatened by German encroachment, he signed a pact with Otto I, king of Germany and Holy Roman emperor. Under Mieszko I the Christian faith spread through Poland, and he has become known as the founder of the Polish state. His eldest son Boleslav I (q.v.), who succeeded him, was the first king of Poland.

MIESZKO II, king of Poland: b. 990; d. May 10, 1034. The son of Boleslav I, he was assailed by neighbors on all sides and ruled amid strife for less than 10 years (1025–1034), part of that time under the sovereignty of the German emperor. He was followed by his son, Casimir I (q.v.).

MIFFLIN, Thomas, American Revolutionary officer and politician: b. Philadelphia, Pa., Jan. 10, 1744; d. Lancaster, Jan. 20, 1800. He was by birth a Quaker; was graduated at Philadelphia College in 1760; entered public life in 1772 as a member of the Pennsylvania assembly; and in 1774 was elected a delegate to the Continental Congress. In 1775 he entered the army with the rank of major, and as colonel and first

aide-de-camp to George Washington accompanied him to Cambridge, Mass. He subsequently held the appointment of adjutant general, and in the spring of 1776 was commissioned as brigadier general. He fought in the Battle of Long Island, and by his energy succeeded in the latter part of 1776 in raising considerable reinforcements in Pennsylvania to recruit Washington's army. He was present at the Battle of Trenton, and did good service in driving back the enemy's line of cantonments from the Delaware. In 1777 he was made a major general, and in the same year became an active member of the faction organized for the purpose of placing Horatio Gates instead of Washington at the head of the Continental Army, and known in history as the Conway Cabal (q.v.). The project failing, he resigned his commission, and in 1782 was elected to Congress, of which body he became president during the following year. In this capacity he received from Washington the resignation of his commission as commander in chief. In 1785 he became speaker of the Pennsylvania legislature, and in 1787 was a delegate to the Constitutional Convention. In October 1788, he succeeded Benjamin Franklin as president of the Supreme Executive Council of Pennsylvania, which position he filled for two years; and from 1790 to 1799 he was governor of the state. In 1794, while holding this office, he rendered important assistance to Washington in quelling the Whisky Rebellion (q.v.).

MIFFLIN, Warner, Quaker reformer: b. Accomac County, Va., Oct. 21, 1745; d. Camden, Del., Oct. 16, 1798. For many years he worked for the abolition of slavery, manumitting his own slaves in 1774–1775. Because of Quaker principles, he refused to support the Revolutionary War, and was consequently dubbed a Tory.

MIFFLIN, Fort. See Fort Mifflin.

MIGDOL, mĭg′dŏl (Hebrew, a tower), Biblical place mentioned in Jeremiah 44:1; 46:14, as in lower Egypt; in Ezekiel 29:10; 30:6, as the northeastern limit of the country; and in Exodus 14:2 and Numbers 33:7 as a station on the route of the Israelites to the Red Sea.

MIGNARD, mē-nyär′, **Pierre,** French painter and engraver: b. Troyes, France, Nov. 1610; d. Paris, May 1695. In his middle twenties he went to Italy, working mostly in Rome, whence his surname "the Roman." He painted likenesses of Popes Urban VIII and Alexander VII and of other Roman notables. In 1654 he went to Venice where his success as a portrait painter continued. Summoned to Paris by Louis XIV, he did portraits of the young king, of ladies of the court, and of Cardinal Mazarin, and afterward decorated the cupola of the church of Val-de-Grace with over 200 figures of prophets, martyrs, etc. He subsequently produced some paintings for the palace of Versailles and was made court painter and director (1690) of the Gobelin tapestry works.

His brother, Nicolas Mignard (b. Troyes, 1606; d. Paris, 1668), also was a noted portraitist. He did paintings of Louis and other court dignitaries, and decorations for the Tuileries.

MIGNE, mēn′y′, **Jacques Paul,** French Roman Catholic priest and publisher: b. Saint-Flour, France, Oct. 25, 1800; d. Paris, Oct. 24, 1875. He was educated at Orleans, was ordained in 1824, and in 1833 went to Paris and founded *L'Univers religieux,* which later became *L'Univers.* In 1836 he disposed of his interest in that publication and established a publishing house for the production of religious books in inexpensive editions. Perhaps most important was the *Patrology,* published as *Patrologiae cursus completus* (Latin series, 221 vols., 1844–1864; Greek series, in Latin, 81 vols., 1856–1861; Greek series, with Greek text and Latin trans., 166 vols. 1857–1866).

MIGNET, mē-nyĕ′, **François Auguste Marie,** French historian: b. Aix, France, May 8, 1796; d. Paris, March 24, 1884. He was educated at Avignon; studied law in Aix and was admitted to the bar in 1818; went to Paris in 1822 after winning a prize for his essay on French institutions of the 13th century. In 1830, with Armand Carrel and his lifelong friend Louis Adolphe Thiers, he founded the liberal, anti-Bourbon journal *Le National.* He was elected to the Academy in 1836; and after the Revolution of 1848 lost the place he had held for 18 years as archivist of the Foreign Office. His most important work was *Histoire de la Révolution française* (1824). Besides this he wrote biographies of Benjamin Franklin (1848), of Mary Stuart (1851), and of Charles V (1854).

MIGNON, mē-nyôn′, **Abraham,** Dutch painter: b. Frankfurt am Main, Germany, 1640; d. there or at Wetzlar, ?1679. Going to Holland when he was about 20, he studied under Jan Davidsz de Heem, the still-life artist whose style he followed. With a delicate touch, Mignon concentrated on flowers, fruits, birds and other small animals, achieving great finish in his work.

MIGNON, French term of endearment (darling, favorite, pet), sometimes used as a given name. 1. The elflike Italian girl, daughter of an aged harpist, who dies in despair through unrequited love in Goethe's *Wilhelm Meister's Apprenticeship.* 2. Opera by Ambroise Thomas, founded on *Wilhelm Meister,* with words by Michel Carré and Jules Barbier, first produced in Paris in 1866, in London in 1870, and in New York in 1871. 3. A term of opprobrium applied to certain favorites of Henry III of France, youths of frivolous habits and effeminately fashionable dress, popularly charged with dissolute morals and generally hated because of the king's lavish generosity to them.

MIGNONETTE, mĭn-yŭn-ĕt′, a genus (*Reseda*) of annual and perennial herbs of the family Resedaceae. The species, of which there are about 50, are natives of western Asia and the Mediterranean region. They have simple or compound leaves, and terminal spikes of small, pale, usually greenish flowers. Less than half a dozen species are cultivated, the most important being the common mignonette (*R. odorata*), a universal favorite both in gardens and in greenhouses because of its fragrant flowers. It is a branching annual herb of decumbent habit when in its prime, and will thrive in any cool, moist, fairly rich soil, when partly shaded from the noonday sun. For outdoor blooming the seeds are sown successionally from early spring to midsummer, and for winter blossoming from that time forward at intervals of three or four weeks.

MIGRAINE, OPHTHALMIC MIGRAINE, or **SICK HEADACHE,** a very widespread affection, also known as megrim, hemicrania or bilious headache. It is a vaso-motor disturbance; in other words, one in which the nerves which expand or contract the arteries and blood vessels are affected, thus restricting the flow of blood. The number of happenings which may cause this malady is exceedingly great, including such diverse causes as the merely physical ones of severe blows, falls, fast movements, sudden alteration of temperature or of atmospheric pressure. Migraine may also be caused by chemical stimuli such as nicotine, and by the secretions of various glands of the body such as the thyroid. It is often, too, caused by some other deep physiological alteration, such as that experienced in extreme fatigue, or that coming from some other disease such as meningitis or tumors. It may also have as chief cause some undue emotional strain as in great anger, in fear (which produces important changes in metabolism, q.v.), in disappointment or in chagrin. The vital point about the mental causes is that they may not always be in consciousness, but may be solely in the unconscious, and will therefore be quite unknown and unknowable to the average person, unless he can receive treatment at the hands of an experienced psychoanalyst. (See PSYCHOANALYSIS). If the causes act through the cerebral sympathetic nervous system, they may produce spasms of the vaso-motor muscles such that the blood pressure is increased in the brain.

The study of the worst forms of the disease alone has enabled investigators to correlate the multiform symptoms into a consistent picture. Fortunately the worst forms are not the commonest, which may be termed abortive forms. In these abortive forms now one and now another of the symptoms appear in individual cases, some having many or most of the symptoms, but in different attacks. One patient, for instance, is on record who in 15 years had at different times all the variations of the disease which have been reported.

The commonest abortive attacks of migraine begin with chilliness, sometimes accompanied by cold feet and pinched face. Apprehension, depression and general wretchedness then follow, sometimes accompanied by a peculiar defect of sight which is known as scotoma. This is a spot in the visual field, quite distinct from the quite ordinary "blind spot," but one which interferes with the sight to a varying extent, and goes through different phases, sometimes within the short space of 20 minutes, constituting, in the cases where it does occur, the prelude to the actual pain in the head. The scotoma begins only as a slight blurring, noticeable especially when reading. The attention directed to it shows a cloudy spot which shifts with the eye, as it changes its direction. Gradually the spot expands into more or less crescent shape, usually being found in the left eye. The interference in vision is however sometimes found to affect only the upper half of the field of vision, while in rarer instances a temporary total blindness occurs.

Another important disturbance associated with migraine is that of speech. Not only is the ability to pronounce certain words affected, but the comprehension is also sometimes interfered with. Inability to write is not unknown and also a disturbance of the auditory images used in singing. A case has even been described in which unsteadiness of gait was coupled with a sensation that the body or particular parts of it were doubled.

The headache itself is, however, the most important symptom and has an infinite variability as to its location, its quality, its duration and its intensity. The commonest form appears a quarter or a half an hour after the appearance of the other phenomena including the scotoma, and is generally confined to one side of the head, hence its name: migraine (from *hemicrania,* Greek for "half head"). But cases occur where it involves both sides or may be in the front or back of the head. In many cases the eyes alone are the seat of the pain, while in others the pain may be in the neck. The quality of the pain is described generally as lancinating. Some sufferers become hysterical, rolling on the floor and holding their heads with both hands, and shrieking with pain. Others with less acute suffering describe the pain as beating or thumping, particularly when stooping or requiring to do any violent exercise. All the phenomena of the pain indicate a change in pressure of blood within the brain, a change which may be either an increase or a decrease. The pain is aggravated in diverse ways in different patients, sometimes increasing on the taking of alcohol, on smoking, on eating, which sometimes on the contrary helps, on being subjected to sudden and loud noises, or to strong light. It has been found, too, that certain odors increase the pain, such as that of cooking and of certain drugs like chloroform or ether. The vaso-motor disturbances which accompany all cases of migraine are manifested in the coldness, paleness and gooseflesh, evidences of constriction in the calibre of the blood vessels, or in the redness of skin and even discharge of blood from various parts of the body. The secretions are frequently affected.

The connection between migraine and the mental factors which are above enumerated as among its causes is a matter which is being investigated at the present day through the technique of psychoanalysis (q.v.), which has unearthed much material going to show that the left sided headache represents an unconscious conflict relating to some love affair, while those on the right side are associated with fantasies concerning the nutritive libido. As a preliminary to the onset of the sickness the general conscious situation of the patient may show a slight or almost unnoticeable or even a profound change, varying from violent agitation to mild depression. In the observation of one specialist 25 per cent of the patients showed psychical symptoms, and while others show a smaller proportion, the presence of the purely mental element indicates that an important if not exclusive factor in the causation of the malady is the unconscious conflict. Treatment consists in removing as far as possible all the physical causes known to produce migraine, such as eye-strain, adenoids, diseased turbinates, constipation, dysmenorrhea, etc., or gastro-intestinal disorders, and if the migraine still persists, there is very good reason to believe that the condition is the result solely of the

unconscious conflict. In this case the patient should receive analysis from an experienced psychoanalyst.

SMITH ELY JELLIFFE.

MIGRATION. The term migration is often used very loosely in popular writings about animals, so that it seems wise to define it as limited in the present article to: (1) The annual change of residence by a species with the change of seasons from winter to summer or the reverse; (2) irregular mass-movements of a species under pressure of famine, over-population of a locality, or some more obscure influence. While these classes have been enumerated in the order of their prominence to our eyes, especially in the behavior of birds, it will be well to consider the second sort of migrations first, as these sporadic cases may throw light on the more regular phenomena, and how they came to be habitual.

Insects.— An eminent entomologist tells us that certain butterflies, as our milkweed frittilary (*Anosia plexippus*) and the cotton moth (*Aletia argillacea*), pass northward in the United States for hundreds of miles in spring, and again in huge swarms southward in autumn; but whether the individuals are the same is not determined. (See MILKWEED BUTTERFLY). Among other butterflies periodical migrations occur, as in movements of vast columns across the Isthmus of Panama out to sea, and flights miles in breadth have been observed to cross Ceylon, the individuals occupying several continuous days in their passage. Wallace observed the swarming of pierid butterflies in the Indian Ocean, and Clark in Venezuela, the vast throng composed of males moving steadily eastward for several days in the face of the trade winds.

The late Dr. A. S. Packard, whose special studies of the habits of the Rocky Mountain locust about 1880 were so valuable, reported that that destructive insect is migratory in certain seasons favorable to the species when overproduction occurs; the young on hatching, after having devoured every green thing at hand, are forced, when becoming winged, to rise in enormous swarms and sail on the wings of the wind for hundreds of miles to other regions where they lay their eggs. The next year's brood sometimes returns to the original spawning ground to lay their eggs. The same thing is characteristic of similar locusts in Syria and central Africa.

Crustacea.— The members of several families of crabs, mostly tropical, have acquired the power of living out of water, and even of wandering extensively inland, but regularly return to the sea, sometimes in marching hordes, to deposit their eggs in the water, after which they go back to the highlands. See LAND CRABS.

Fishes.— Many kinds of fishes are regular migrants; the anadromous families, such as those of the shad, herring and salmon, annually ascend the rivers to spawn, whence in some cases they return to the sea, in others never get back, but their young, after the succeeding winter, go back to salt water. Certain fishes retire to the deeper or warmer parts of the ocean during the winter, but in early summer travel toward the shore-shallows, or to the cool north, in vast swarms; and the same is true of a large variety of other marine creatures, including some of the humblest and most minute forms, in which cases the direction of the mass-movements are largely determined by the ocean currents. Moreover there occurs in the ocean a regular movement of deep-sea forms toward the surface in the night, the animals sinking again as daylight approaches. Fishermen in the north Atlantic and on the coast of Norway are familiar with the vast influx in the spring of such fishes as herrings, cod, plaice and capelan. The eminent Norwegian naturalist, G. O Sars, concluded that some of these fish-migrations were undertaken in order to obtain food, and others for the purpose of reproduction. «When the capelan gathers in millions on the coast-banks of Finmark or Labrador, when countless numbers of cod approach the banks of Lofoten, and when the herrings flock to western Norway, they migrate to spawn. The fat-herring collecting off the coast of Nordland, and the cod gathering around the shoals of capelan in the Barents Sea, are examples of feeding-migrations.»

Sea-turtles have a similar history, going regularly toward shore in the breeding season to deposit eggs in the beach sand.

Mammals.— The reader will have perceived that most of the foregoing cases are not examples of true migration because the element of habitual return is absent, or at best a very few survive to return; or else the movement, when seasonal and regular, is purely local, such as going to the nearest shore for spawning; or is merely the pursuit of traveling prey. In this class must be put most of the so-called migrations of mammals. From time to time certain small animals, as lemmings, field-mice, squirrels and the like, develop enormous numbers in some region (or formerly did so, before civilization was so worldwide) and overflow in great «armies» into neighboring parts of the country, where they gradually expire. In the plains regions of the world a lack of good pasture in one place will often cause movement of antelopes, bisons, etc., to some better district in great herds; and in other situations the wild animals are accustomed to go up into the hills in summer and come down to the shelter of the valleys in winter, but these are local movements. The only examples of real migration afforded by the mammals are the case of certain bats that regularly journey every year between the tropics and more northern climes, and the case of the caribou and, to a less extent, the reindeer. These deer do make a real fall migration from the barren Arctic coast to the margin of the forested region southward and go back in the spring. It is to the birds then, that we must turn for a study of migration in the stricter sense of the term, and even here it is only partial as regards many species and groups.

Migration of Birds.—This subject is so large that we can give no more than a superficial sketch, following in general the lines of investigation conducted by the late Wells W. Cooke, of the United States Biological Survey who devoted almost his whole life to a study of this phase of ornithology as exhibited especially in North America.

The motive or cause of the periodical migration of birds has excited inquiry since ancient times, and at present two different methods of explaining it are in vogue. The opinion is general that in Pleistocene times, just previous

to the advance of the cold climate and finally to the great accumulations of ice and snow over the northern parts of the world, the whole of the northern hemisphere possessed a mild climate, and birds of every sort dwelt comfortably all the year round throughout virtually its whole extent. The coming of the Glacial Period so affected the north, as to limit more and more the residence in winter of birds there, although in summer they might venture somewhat toward it, when vegetation and insect life annually revived. As the ice advanced very gradually, now and then receding, but on the whole enlarging itself, these enforced northward and southward movements of the birds increased both in distance and duration, until migration became a fixed habit with all birds whose life was affected by the change of climatic conditions. Finally most northern birds were restricted all the year to middle America and the Mediterranean region and southern Asia. But the habit of migration had been formed, and when the glacial ice began to retreat toward its present position, the birds annually followed its receding margin, until at last they had established their present long and diversified migration routes.

Thus far all theorists are in substantial agreement. The divergence is as to the prevailing motive. One school argues that a longing to continue their inherited habit of residence in the north, and individually to return to their birthplaces, is the incentive that compels them to leave the tropics and make a journey, often of surprising length, every spring. The other school maintains that «the birds' real home is in the Southland»; that that region becomes overcrowded, and the birds in annually flying northward are seeking a region where there is less crowding and less competition for food. The truth perhaps lies in a combination of these influences, varying in intensity with different kinds of birds. It is an important circumstance, especially with reference to the second theory, that no similar migration occurs southward from the tropics to Bolivia and Argentina, whose plains and mountains offer a poor supply of bird-food, and not much more from the equatorial to South-African districts. «The conclusion is inevitable,» Cooke believes, «that the advantages of the United States and Canada as a summer home, and the superb conditions of climate and food for successful rearing of a nestful of voracious young, far overbalanced the hazards and disasters of the journey thither. It must be remembered too that the migratory species have acquired various adaptations relating to their migrating habits that tend to fit them more and more to endure the exertion and danger required; also that the regular routes followed by each species are the products of thousands of generations of experience, and presumably represent the easiest way in each case.

Phenomena of Bird-Migration.— In the restricted space of this article it is impossible to go into detail as to the general subject, and attention must be confined mainly to what appears in North America. Australasia and the South Pacific islands share to some extent in the annual movements of continental species, but have an inter-insular migratory system of their own. "In Europe," says a recent reviewer, «and central Asia there are numerous routes, at least nine, according to Palmen. Of these one begins on the Siberian shores of the Polar Sea, Nova Zembla, and the north of Russia, and passes down the western coast of Norway to the North Sea and the British Isles; another arising in Spitzbergen follows much the same course, but is prolonged past France and Spain to the west coast of Africa. Many migrants wintering in North Africa (Algeria, etc.) have flown there from northern Russia, by way of the Baltic Sea, Holland, passing up the Rhine Valley, and crossing to the Rhone, the column splitting on reaching the Mediterranean, one line of migration passing along western Italy and Sicily, a second crossing by way of Corsica and Sardinia, the third by southern France and eastern Spain. Egypt receives its winter visitors from the Russian river-valleys of the Obi and Volga, the line crossing the Black, Bosporus and Ægean seas to the Nile Valley. One important migration-route is to and from India along the Danube Valley and across Persia.»

An important fact to consider at first is that the migratory habit is possessed in its completeness by comparatively few birds, and these belong almost wholly to a single order, that of the *Passeres,* or insect-eating song-birds. The exceptions are mainly seafowl and certain water-birds. Even in these groups two classes are to be found, one of species that are resident the year round in the regions they severally occupy; and the other whose migrations are of slight extent. Even in the northern half of the United States many birds are present in winter, some of which are those that retreat from the North only so far as driven by deep snow and excessive cold; while the Southern States have a longer list of resident birds, supplemented in winter by many kinds that moved only a little way southward to escape the dearth of food at that season in the snowy parts of the country. This shows that in respect to distance, migration varies from a distance almost as great as the breadth of the globe (the Arctic tern passes annually from Patagonia to Alaska, and back again) to no change of residence at all, even on the Arctic coast and islands.

Northward Movement in Spring.— Let us now consider the actions of the real migrants, who have been spending the winter in tropical America, on the arrival of spring. Nothing that we can see compels them to move, yet they abandon the delights of their winter home and proceed northward as soon as the proper time comes. This «proper time» seems to have no relation to the weather or to food-conditions there in the tropics, which are almost changeless, but is determined by the weather and food conditions the bird will find when it arrives at its northern destination, if the season there be an average one. This varies with the requirements of different birds, so that some start much earlier than others. Thus the ducks and geese, which ask only that the rivers and ponds in the north shall be free from ice, come to us much earlier than do the warblers and flycatchers that must wait until flowers are in bloom and insects numerous. As the last are the most numerous they come in crowds soon after the leafing-out of the northern woods and orchards.

Not all, however, pursue the same route, although each species keeps to its traditional path until it arrives in the district suitable to it, when it scatters. The configuration of continents, narrowing into a mere isthmus between North and South America, permits only a very narrow land-path for the migrants between their winter and summer resorts, yet most of those who winter south of Panama crowd along this narrow neck. Certain shore-birds, confident of their strength, strike straight north from Brazil to Nova Scotia, and a few species follow the line of the Antilles from Venezuela to Florida. Birds whose destination is California and northward follow the western coast of Mexico, and those aiming at summer homes in the Rocky Mountain region pass straight north through central Mexico and across the desert, or skirt the eastern coast of Texas and the plains. All these are habitual routes for certain species. The great body of migrants, whose songs are later to be heard in the eastern United States and Canada, fly straight across the Gulf of Mexico from Yucatan to landings on the northern shore all the way from eastern Texas to Florida. Arrived there — and as a rule this is about daylight, the journey from Yucatan having taken but one night — they spread northward along two main channels, one up the coast eastward of the Alleghanian Mountains (diverging into these uplands at each river valley); and two up the Mississippi Valley, separating into bands that ascend every tributary, and rapidly cover the whole country, while those bold species, surprisingly many in number, who are content only in the subarctic zone, hasten on to Alaska and down the Mackenzie Valley. The point to keep in mind in this general sketch is that every species pursues the same route every year, and sometimes it is far from the most direct one. The speed of travel is not great as a rule. The birds must feed by the way, and this food must be found as a rule by daylight; therefore, most species travel during the night, and are often delayed by foggy, rainy nights or by cold storms. The swallows, swifts, night-jars, hawks and some others that capture their prey on the wing feed as they go and probably rest at night. Those bound for the far north must and do move more rapidly than the southern breeders; and Cooke has gathered some very interesting statistics on this matter.

Autumnal Migration.— The autumnal return of the birds presents some very different features. It begins in the far north before any change in weather or food suggests the necessity of departure, and is led by male birds, after whom the mothers and young follow as soon as they have strength to travel. The movement is far less direct and hurried than the spring flight. They make a long stage by night, flying sometimes a mile or more above the earth, and drop down at dawn to feed and rest, then loaf along. The members of each species gather gradually into the regular route, which in many cases is quite different from that followed northward in May; and those that are inclined to flocking at this season form large companies that go on together, striking out at last from the Gulf shore to cross in a night that space of dark water, or disappearing in the Mexican forests.

How do Birds in Migration find Their Way?— We have seen that they follow definite routes; also that these in places lead across wide spaces of water; also that the routes in some cases differ according to season; and had we been able to give more details it would appear that often these routes are very eccentric. Moreover, they travel mostly at night; and finally certain species cross areas of ocean hundreds of miles wide, and far from land, as when golden plovers fly from Nova Scotia to the Middle and South Atlantic States and in the case of the curlews that migrate between Australia and New Zealand. It is also pleasingly evident that birds return year after year to the same grove, dooryard and nesting-place. How do they do it?

It was formerly taught that they followed landmarks, such as coast lines, ranges of mountains and large river-courses, which are visible even on clear nights from a great height, and doubtless these are aids to the day-fliers and when the sky is clear. But many lines of migration cut across such landmarks, instead of follow them, and others stretch across wide plains and vast water-spaces. Other theories, as of magnetic influences, etc., are without value. It appears plain that birds are guided by an innate sense of direction. This need not be esteemed miraculous, for in a lesser degree it is possessed not only by various other animals, but by wild men, especially those who dwell in a forested region, where in following game they would become lost daily had they not a faculty for orientation. The direct testimony to such a faculty in savage mankind, and comparison of the evident ability of many animals in this direction, makes its presence in the minds of birds easily credible, the more so as the sense is by no means infallible, since birds sometimes become completely bewildered when buffeted about at sea by high winds. Add the elements of observation and memory and a sufficient explanation is at hand of how migratory birds find their way.

Bibliography.— An early treatise on this subject of much value is by Alfred Newton in his 'Dictionary of Birds' (London and New York 1893–96). See also introduction to Chapman's 'Handbook of Birds' (1912); articles by W. W. Cooke in Bulletin 185, U. S. Department of Agriculture (1915); National Geographic Society, 'Book of Birds' (1927); Howard, 'Introduction to the Study of Bird Behavior' (1929); Wetmore, 'Migrations of Birds' (1930); Berg, 'To Africa with the Migratory Birds' (1930); and Allen, 'Book of Bird Life' (1931).

ERNEST INGERSOLL.

MIGUEL, mē-gĕl', DOM **Maria Evaristo,** Portuguese pretender, son of John VI of Portugal: b. Lisbon, 26 Oct. 1802; d. Castle Bronnbach, Baden, 14 Nov. 1866. He was brought up in Brazil, and upon the accession of his father repeatedly raised rebellion as head of the Absolutists. In 1826 after his father's death he was made regent, but proclaimed himself king, attempted to keep Maria de Gloria, the real heir to the throne, who had been offered to him in marriage, out of the kingdom, and was successful until Dom Pedro of Brazil came to the aid of his daughter Maria, defeated Miguel and forced him to leave Portugal. Miguel is usually described by the

faction hostile to him as ignorant, vicious, and drunken, but his coreligionists make him a model prince.

MIHAJLOVIC, mē-hī'lô-vēt'y', **Draža,** Balkan guerrilla leader, b. Shumadija, near Belgrade, Serbia, 1893; d. by execution, Belgrade, July 17, 1946. He fought in both Balkan Wars and World War I, attended staff schools and became colonel in 1940. When the Nazis overran Yugoslavia the next year, Mihajlović retreated to mountains near Belgrade, picking up stragglers whom he organized into *chetniks,* guerrillas in the old Serb tradition. He was effective against the invader and was made war minister by King Peter II in 1942. But his Serbs fell into conflict with the Croat and Communist forces of Joseph Broz, or Tito (q.v.); they and their leader were accused of collaboration with the Axis against their countrymen. The *chetniks* were deprived of Allied support, Mihajlović himself being dismissed as minister of war in May 1944. His following diminished to a handful before Tito captured him in hiding, March 13, 1946. His subsequent trial for treason and collaboration was widely condemned by world opinion as political.

MIKADO (Japanese *Mi,* exalted, *Kado,* gate), an ancient and poetic title of the Japanese emperor, similar to the Sublime Porte title of the Ottomans; probably transferred to the ruler and judge from the gateway to his palace, where he did justice. It was never a separate title for a spiritual ruler; this incorrect idea results from the historical fact that much of the mikado's or emperor's temporal power was usurped before 1867 by shoguns or generals, who, however, always admitted that they derived their power from him. The present mikado, Emperor Hirohito (r. Dec. 25, 1926–) is the 124th of his line, which legend dates back to 660 B.C.; of him the title mikado, essentially a foreign solecism, is much less used than *Dai Nippon Teikoku Tennō,* "Imperial Son of Heaven of Great Japan." *Tennō* corresponds to the English word emperor.

MIKADO, The, or **THE TOWN OF TITIPU,** a comic opera in two acts, libretto by W. S. Gilbert, music by Sir Arthur Sullivan; first production, Savoy Theatre, London, March 14, 1885; first American performance at the Museum, Chicago, July 6, 1885. The plot is simple burlesque, without the infusion of any Eastern imagery. The Mikado, a highly moral ruler, has issued an edict condemning to death every man found guilty of flirtation "unless connubially linked." To evade this stern sentence the citizens of Titipu appoint one thus condemned (Ko-Ko the tailor) to the office of executioner, with the result that he could not behead the next man until he had first executed himself. It being necessary eventually to execute someone, Ko-Ko, who is engaged to Yum-Yum and is also first on the list of the condemned, finds a substitute in Nanki-Poo, (the Mikado's son in disguise), who had gone into temporary hiding to avoid marrying the elderly Katisha. Nanki-Poo agrees to suffer execution in a month provided he can be married to Yum-Yum for that period. In the end Nanki-Poo is forgiven and weds Yum-Yum, and Ko-Ko saves himself by marrying Katisha. An amusing character is Poo-Bah, "Lord High Everything Else."

MIKANIA (also known as WILLUGBAEYA; both neo-Latin from the names of J. C. or J. G. Mikan and Francis Willughby respectively), a genus of composite plants of the tribe *Eupatorieae* and the subtribe *Agerateae.* It is widespread throughout tropical and temperate America and grows either in an erect shrub or in twining vines. The genus numbers about 150 recognized varieties, all natives of the warmer regions of America, except one species which grows in Asia and tropical Africa. The plant is characterized by opposite leaves, heart-shaped or triangular, toothed at the base and with petioles. The flowers are small and white, pinkish or yellowish. The tropical types, *M. amara, M. cordifolia* and *M. guaco* have a high reputation in South America as snakebite cures and a medicine made from them is also supposed to make one immune from snakebite.

MIKKELSEN, Ejnar, Danish polar explorer: b. Vester Brønderslev, Jutland, Dec. 23, 1880. A son of Aksel Mikkelsen, he was a member of the Amdrup expedition to Christian XI Land, East Greenland, in 1900, and in 1901–1902 served with the Baldwin-Ziegler expedition to Franz Josef Land. With Ernest de K. Leffingwell he organized an Anglo-American expedition to the north of Alaska and determined the position of the continental shelf of the Arctic Ocean (1906–1908). His expedition to the north coast of Greenland in 1909–1912 resulted in his recovery of the records of the lost explorers Mylius-Erichsen and Höeg-Hagens. In 1925 he led an experimental fishing cruise to West Greenland. In 1933 he became inspector general of East Greenland, retiring in 1951. Governor of the Arctic Institute of North America in 1948, he was made chairman of the Danish Arctic Institute in 1954.

MIKLOSICH or **MIKLOSIC,** mē'klô-shĭch, **Franz von,** or **Franjo,** Slavic philologist: b. Luttenberg, Styria, Austria, Nov. 20, 1813; d. Vienna, March 7, 1891. Taking his degree in philosophy at Gratz and in law at Vienna, for a time he taught philosophy at Gratz, then in 1838 commenced a law practice in Vienna. There the famous Slovenian scholar Bartholomäus Kopitar (q.v.) roused his interest in Slavic philology. He first gained scholarly note by a review of Bopp's *Comparative Grammar,* in 1844, and the same year obtained a post in the Imperial Library. Thenceforth he devoted himself exclusively to philology. In 1850 he was appointed professor of Slavic philology at the University of Vienna, a post he retained until 1886. He was also government censor of Slavic, Rumanian, and Greek publications. A man of profound scholarship, he not only revolutionized modern Slavonic philology but made important contributions to the knowledge of the Albanian, Gypsy, modern Greek, Hungarian and Rumanian languages. He was a member of the Academy of Vienna and a corresponding member of the French Academy of Inscriptions. He published a number of works, all of high importance; among the most notable are *Vergleichende Grammatik der Slavischen Sprachen,* 4 vols. (Vienna 1868–1879); and *Etymologisches Wörterbuch der Slavischen Sprachen* (Vienna 1886).

MILAN, mĭ-lăn (Ital. MILANO mē-lä'-nô), province, Lombardy Region, north Italy, comprising part of the fertile Po plain, between the Adda and Ticino rivers. Area, 1,065 square miles.

The province is the most highly industrialized in Italy, as not only its capital, Milan, but also such centers as Monza, Sesto San Giovanni, Legnano, Rho, and Abbiategrasso have a variety of industries: textiles, machinery, metallurgical products, chemicals, shoes and furniture are among the province's products. The chief crops are cereals, rice, fruit and vegetables. Silkworms are grown and stockraising is also important. Lodi and Gorgonzola are the centers of a flourishing dairy and sausage manufacturing industry. Pop. (1951) 2,500,228.

MILAN (ancient MEDIOLANUM), city and commune, northern Italy, the capital of Milan Province and of the region of Lombardy, is located in the fertile Po plain, midway between the Po River and the Alpine foothills, 300 miles northwest of Rome. The second city of Italy in population and the country's chief industrial, financial and commercial center, it is the seat of an archdiocese. The climate is continental, with cold winters and hot summers; fogs are frequent in winter and fall.

Economic and Cultural Life.—The importance of Milan is largely due to its geographic situation, at the intersection of communication lines connecting all parts of Europe and the Mediterranean. Highways, rails and airlines radiate in all directions from the city and canals connect it with the Po. Milan is the headquarters of great import and export firms, and for the major industries and banks of the country; its stock exchange is the leading one in Italy. The commercial fair held in April is one of the most important in Europe. The chief industries are textiles (Milan being, with Lyon, the leading European silk manufactory), machinery and metal products (aircraft, automobiles, railroad equipment, agricultural machinery), printing and publishing (especially music), electrical appliances, chemicals, pharmaceuticals, furniture and food products. Recently it has also become a world fashion center. The most progressive city in Italy, it has long been the center of the trade union movement.

The cultural traditions of Milan are ancient. It is the seat of many societies such as the *Istituto lombardo di scienze e lettere,* founded in 1797, and the *Accademia scientifico letteraria.* Art exhibitions are held in the modern Palazzo dell'Arte, including the Triennale of decorative arts. Milan is also a music and drama center with numerous theaters and concert halls including the famous La Scala Opera. Educational facilities are excellent: the main institutions of higher learning are one state and one Catholic university, the Luigi Bocconi school of commerce, an engineering school, the Brera Academy of Fine Arts and the Giuseppe Verdi Conservatory of Music. There are also important libraries, especially the Ambrosiana. Besides the museums mentioned below there are the Poldi-Pezzoli Museum, one of the finest art collections in Europe, the Natural History Museum, a numismatic collection in the Castello and a gallery of modern art. In the Brera Palace is the astronomical observatory (1763).

The City.—The general appearance of Milan is that of a modern metropolis. The rise after World War I was spectacular both in the economy and in population. The same expansion took place after World War II; despite very heavy damage from Allied air raids, especially in 1943, the city

Ewing Galloway

The Duomo or cathedral of Milan.

recovered swiftly. Whole quarters have been redeveloped and others planned. The old part of the city, polygonal in shape, still has many narrow winding streets but the main thoroughfares have been enlarged to handle the increasing traffic. The center of the city is the Piazza del Duomo, from which radiate a number of streets leading to the suburbs; Milan has spread well beyond its former walls and new residential and industrial quarters are expanding in every direction. The most notable structure is the cathedral on the east side of the Piazza del Duomo, the most important Gothic structure in Italy. Started by an unknown architect in 1386, who was inspired by the Gothic cathedrals of northern Europe, it was continued by French, German, and Italian master masons; although consecrated by St. Charles Borromeo in 1577 it was completed in the 19th century. The exterior is adorned with a profusion of pinnacles, statues, and other ornaments, and the highest pinnacle (354 feet) is topped by a gold-covered statue of the Madonna. On the north side of the Piazza is the Galleria Vittorio Emanuele, lined with cafés and elegant shops, which leads to the Piazza della Scala, with its world-renowned La Scala Theater built by Piermarini in 1778. Damaged during the war, it was modernized and reopened in 1946. Opposite is the Palazzo Marino, seat of the municipal government, which also suffered severely in World War II. West of the Piazza del Duomo is the Piazza dei Mercanti, medieval center of Milan, surrounded by old buildings including the Palazzo della Ragione (1223–1238) and the Loggia degli Osii (1316). Farther west is the Ambrosiana Palace (1603–1609) containing the library, an art gallery with works of the Lombard school, and a special exhibition dedicated to Leonardo da Vinci who lived and worked in Milan for several years. One of his most famous paintings, *The Last Supper,* is in the refectory adjacent to the Church of Santa Maria delle Grazie. The fresco is now undergoing a delicate work of restoration. In the Brera Palace, also war-damaged, is one of the finest art collections of Italy, recently reorganized and modernized: among its treasures are the *Marriage of the Virgin* by Raphael and the *Dead Christ* by Mantegna. Northwest of the Piazza del Duomo is the Castello Sforzesco, an imposing Renaissance moated castle, built by Francesco I Sforza in 1450 as the residence and fortress of the lords of Milan. It was enriched by Leonardo and Bramante but later became a barracks. It now contains a number of collections and libraries. In the ducal chapel is Michelangelo's uncompleted *Pietà*

Rondanini. The other great Renaissance structure of Milan was the Ospedale Maggiore, founded in 1456. Virtually destroyed in World War II, it is being rebuilt. Milan's oldest church is the Basilica di Sant'Ambrogio, founded in 386 by St. Ambrose, the bishop of Milan and its patron saint, who is buried in the crypt. Rebuilt early in the 12th century, it is one of the most typical examples of Romanesque-Lombard architecture; the main altarpiece is a splendid example of medieval goldsmithing. The Basilica of San Lorenzo Maggiore, originally of the 6th century, was restored in the 16th. Also worthy of mention are San Satiro, designed by Donato d'Agnolo Bramante (1476–1514) and Sant' Eustorgio, with a fine Renaissance chapel (1462–1468).

History.—Originally a Celtic settlement, Milan was seized by Rome in 222 B.C. Diocletian made it an imperial residence and in the 4th century A.D. it became a religious center; the Edict of Milan, granting religious tolerance to all sects throughout the empire, was issued in 313 A.D. by Constantine. Ambrose was bishop from 374 to 397. In the 12th century it was a free commune, and although sacked by Frederick I in 1158 and 1162, it rose again and contributed with the Lombard League cities to Frederick's defeat at Legnano in 1176. At the Peace of Constance (1183) the emperor recognized Milanese independence; in spite of internal strife between Guelphs and Ghibellines (q.v.) and struggles with neighboring cities Milan continued to grow. The Torriani, leaders of the popular party, gained control, and Martino della Torre became lord of Milan in 1259, but one of his successors was beaten in 1277 by the aristocratic leaders, the Visconti (q.v.).

Ottone Visconti, archbishop since 1262, became lord of Milan in 1277 and Matteo Visconti imperial vicar in 1311. Under Gian Galeazzo Visconti, made duke of Milan in 1395 by Emperor Wenceslas, the family reached its peak. When in 1447 Filippo Maria Visconti died without male issue, the Ambrosian Republic was proclaimed, but three years later Francesco Sforza, husband of Filippo's daughter Bianca Maria Visconti, succeeded in gaining power. Under the Sforza (q.v.) the Duchy of Milan became one of the most powerful states in Italy, playing a leading role in the peninsula's politics. Rival claims to Milan, however, brought Louis XII of France to Italy in 1499.

Milan changed hands several times, a pawn in the rivalry between France and Spain. After the death of Francesco II Sforza in 1535, Milan came under Spanish domination. Ruled by incompetent Spanish governors, the city had a long period of decline, but at the end of the War of the Spanish Succession, the Treaty of Utrecht (1713) assigned it to Austria, and a recovery took place. It fell to the troops of Napoleon in 1796, as described in Stendhal's *The Charterhouse of Parma,* and was part of Napoleon's puppet Italian republics and kingdom (1797–1814). In 1805 Napoleon was crowned with the Iron Crown of Lombardy in Milan Cathedral. Austrian rule was restored in 1815, but political repression soon became intolerable. In 1848, during the Risorgimento, the people chased the Austrians from the city, but they returned a few months later. Only in 1859 was Milan liberated from foreign rule and incorporated in the kingdom of Sardinia, which in 1861 became the kingdom of Italy. Milan has prospered ever since. After World War I it was the center of the Fascist movement; Benito Mussolini left Milan for Rome in 1922 to assume the premiership. Pop. of the commune (1951) 1,268,994.

MILAN, town, Tennessee, in Gibson County, altitude 420 feet; 21 miles north of Jackson; on the Louisville and Nashville and the Illinois Central railroads. It is in a diversified farming area. Manufactures include fruit and vegetable containers and cottonseed oil. There is a United States arsenal here. Incorporated in 1868, Milan has a mayor and council government. Pop. (1950) 4,938.

MILAN DECREE, an order issued by Napoleon I from Milan, Italy, on Dec. 17, 1807, to check British use of neutral shipping; the British were thus attempting to get their goods onto the continental market, from which Napoleon's Berlin Decree (Nov. 21, 1806) and other edicts had nominally barred them. The Milan Decree fell with particular force on American shipping. (See CONTINENTAL SYSTEM.)

MILAN OBRENOVICH IV and **I,** ô-brĕn'ô-vĭch, prince and king of Serbia: b. Jassy, Rumania, Aug. 22, 1854; d. Vienna, Feb. 11, 1901. He was cousin to Michael Obrenovich III, prince of Serbia, by whom he was adopted on the death of his parents. He was educated in Paris at the Lycée Louis-le-Grand and upon the assassination of Michael in 1868 he succeeded him as Milan Obrenovich IV, prince of Serbia, under a regency headed by Ristić. In 1872, aged 18, he took over the government, retaining, however, the services of Ristić. He carefully balanced political relations between Serbia and Austria and Russia, so strengthening his position that after the Russo-Turkish War (1877–1878) he was able to have Serbia's independence declared and himself proclaimed as Milan Obrenovich I, king of Serbia (1882). He then entered a secret pact with Austria, which increasingly influenced affairs in Serbia, to the rage of the patriots gathering about Milan's hereditary rivals, the Karageorgevich (q.v.) family. He tried to modernize Serbia, but taxes, burdensome conscription laws, the failure of his attack on Bulgaria (1885) turned the public against him, as did his private life and quarrels with Queen Natalie. On March 6, 1889, he abdicated and lived in Paris (1889–1894), his son Alexander succeeding under a regency. Milan returned to Serbia, without resuming the throne, in 1894; officially reunited to the queen, he was given the army as his special charge, and was commander in chief from 1897 to 1900, when his son's marriage to the commoner Draga Mašin caused an estrangement between them. Milan resigned his army post, left the country, and died in Vienna.

MILANES Y FUENTES, mē-lä-nās' ē fwān'tās, **José Jacinto,** Cuban poet: b. Matanzas, Aug. 16, 1814; d. there, Nov. 14, 1863. He was self-taught, working as a clerk and blacksmith's helper; his tragedy *El Conde Alarcos* (1838) made him famous. His best play was probably *Una Intriga Paternal.* He broke down as a result of early hardships and a long tour in 1848–1849 failed to help him. In his last years he showed only flashes of lucidity. Milanes was the best Cuban writer of his time, with José Maria Heredia (q.v.).

MILAZZO, mē-lät'sō, or **MELAZZO,** Sicily, a fortified seaport city in the province of Messina, on a promontory 21 miles by rail west of Messina. It has a good harbor and carries on a trade in fruit, wine, cattle, fish and sulphur. It has a theatre, a technical school, a library containing over 10,000 volumes, a city hospital; and the building now used as a jail was originally a 13th century castle. Milazzo is the ancient Mylæ off which in 260 B.C. the Romans won a great sea-fight over the Carthaginians. Here also Garibaldi, 20 July 1860, with 2,500 men, defeated 7,000 Neapolitans and compelled the garrison to evacuate the fortress. Pop. of commune about 20,000.

MILBANK, Joseph, American philanthropist: b. New York, 1848; d. 7 Sept. 1914. He was the son of Jeremiah Milbank, the millionaire organizer and builder of the Chicago, Milwaukee and Saint Paul Railroad, and at an early age became a director of the road. He inherited, with his sister, Mrs. Elizabeth Milbank Anderson, a fortune of great extent, which he further augmented by his own efforts in banking and railroad enterprises. With his sister he gave the Milbank Memorial Chapel to Teachers' College, and Milbank Memorial Hall to Barnard College, Columbia University; the Jersey City People's Palace; founded a Social Welfare Bureau at a cost of $650,000; and contributed $500,000 to the Children's Aid Society. Their benefactions totaled $5,000,000.

MILBURN, William Henry, American clergyman: b. Philadelphia, 26 Sept. 1823; d. Santa Barbara, Cal., 10 April 1903. At five he suffered an accident which caused partial and finally complete loss of sight. He was educated at Illinois College (Jacksonville, Ill.); in 1843 became a Methodist itinerant preacher; was largely active in the South; and for a time had charges at Montgomery and Mobile, Ala. In 1845 he was elected chaplain of the House of Representatives, and he served as such in 1853, 1885 and 1887. In 1893 he was made chaplain of the Senate. He lectured with success throughout the United States and in 1859 in Great Britain. He was generally known as the "blind preacher." Among his writings are 'Rifle, Axe and Saddle-Bags' (1857); 'Ten Years of Preacher Life' (1859); and 'Pioneers and People of the Mississippi Valley' (1860), all based on his Western experiences.

MILCOM, national god of Ammon (1 Kings xi, 5, 33; 2 Kings xxiii, 13). Other references occur in Jeremiah xlix, 1, 3, and in 1 Kings xi, 7, where the spelling varies slightly but the identity is clear. The name appears to be derived from the West Semitic word *melek,* "king"; although *melek 'am,* "king of the people," is also considered. The name of the deity has not been found in inscriptions and nothing is known of the religion. There is no base for the supposition that human sacrifice was practised by the Ammonites, as it was by the Moabites to their god Molech, which deity is often confused with Milcom. The Ammonites worshiped on the Mount of Olives while the Moabites performed their religious rites in the valley of Hinnom. The Ammonites and their religion disappeared in the migrations and political upheavals which occurred in the districts to the east of the Jordan shortly prior to the Christian era.

MILDEW, specifically, any fungus belonging to the group *Erysiphaceæ,* the powdery or true mildews, and *Peronosporaceæ,* the downy or false mildews; loosely, many plant diseases, especially the rusts and smuts of cereals, and some not of fungous origin; vaguely, molds of any kind upon preserved fruit, clothing, walls or other materials, the origin of which is more or less organic. The powdery mildews develop mostly upon the outside of the host plants, which they enter only by means of their sucking organs of attachment (haustoria). In warm weather they develop innumerable spores upon erect branches and later produce thick-walled resting spores which germinate in the spring. Upon the host plants they usually appear as a sort of bloom, but later they often cause distortion of the leaves and not infrequently the death of the host. Being mainly upon the surface they may be combated with any fungicide (q.v.), and often with sulphur, either in the form of powder or vapor (not burned) evaporated without flame. This method is widely practised in greenhouses. Some of the best known are rose mildew (*Sphærotheca pannosa*), gooseberry mildew (*S. mors-uvæ*), hop mildew (*S. castagnei*), cherry, pear and apple mildew (*Podosphæra oxycanthæ*), wheat mildew (*Erysiphæ graminis*) and grape mildew (*Unicinula spiralis*).

The downy mildews all live within the tissues of the host plant, appearing outside the surface only when producing summer spores (conidia) which usually give a downy appearance to the infected spots. The resting spores are produced internally and make their escape in the following season when the tissues of the host (leaf or other part infected) have decayed. They cannot be combated like the preceding, because of their habit of feeding internally. Fungicides (q.v.) may be applied to prevent attacks, however, and this, together with the destruction of leaves in autumn and general cleanness of the premises, are believed to be the only safeguards. Among the best known and most destructive are Potato rot, blight, or mildew (*Phytophthora infestans*), lettuce mildew (*Bremia lactucæ*), damping-off fungus (*Pythium debaryanum*), downy mildew of the grape (*Plasmopara victicola*), radish mildew, also found on other members of the *Cruciferæ* (*Cystopus candidus*), melon and cucumber mildew (*Plasmopara cubensis*) and onion mildew (*Peronospora schleideniana*).

The rusts and smuts which are sometimes called mildews are discussed elsewhere. The mildews, so-called, which appear upon leather, wall-paper, cloth, etc., belong to various other groups. Since they are generally seen only where dampness prevails, especially in cellars and closed rooms or houses, they may be prevented more or less effectually by the adequate ventilation of such places. And having gained a foothold in these places they may be destroyed by liberal applications of whitewash, in which copper sulphate or sulphur have been mixed, or where this cannot be applied, by burning sulphur in the closed quarters. This last remedy may also be used where cloth is attacked. Awnings, sails, etc., should be thoroughly dry before being stored or folded for any considerable time. They may also be soaked in a solution of copper sulphate and then dried. Until this is washed out by rain it will act both as a pre-

ventive of attack and will often save fabrics if not too far gone.

MILE (Latin *mille*, a thousand, a Roman mile being 1,000 paces), a measure of length or distance. The English statute mile, fixed in the reign of Queen Elizabeth, is 1,760 yards. The geographical mile, which is commonly used by the navigators of all nations, is one-sixtieth part of a degree at the equator. In many countries the kilometer now holds the same position as the English statute mile in Britain. The following are some of the principal standards of miles or leagues which are or have been in use in the principal countries of Europe:

Kilometer	1,093.6 yards.
Ancient Roman mile	1,614 "
Modern Roman mile	1,628 "
English statute mile	1,760 "
Tuscan mile	1,808 "
Ancient Scottish mile	1,984 "
Geographical mile	2,028.4 "
Italian mile	2,028.4 "
Irish mile	2,240 "
French posting league	4,263 "
Spanish league (judicial)	4,635 "
French league	4,860 "
Portuguese league	6,760 "
German short mile	6,859 "
Flanders league	6,864 "
Spanish league (common)	7,416 "
German geographical mile	8,113.6 "
German (new imperial)	8,202 "
Old Prussian mile	8,237 "
Danish mile	8,244 "
Swiss mile	9,153 "
German long mile	10,126 "
Swedish mile	11,700 "

The English statute mile is generally used in the United States.

MILEAGE, a term used in the United States, for fees paid to certain officials, such as members of Congress, of State legislatures, special commissioners and others, for their traveling expenses, at so much per mile. The system has led to gross abuses, each senator and representative estimating for himself the distance he had traveled. There is now a fixed table of mileage. The term mileage was formerly applied in the United States to railroad transportation, sold in tickets good for 1,000 miles of travel. These tickets were issued in book form, convenient for the pocket, and known to travelers as mileage books. In 1903 a system of interchangeable mileage tickets was issued, good for transportation on any one of eight different railroad lines in the Eastern States. Early in 1919 this mileage system was changed, all partly used books recalled and instead there was issued what is known as script, the coupons representing different amounts of money rather than miles. This system was an advantage to the traveler as the script could be used on any of the roads then under control of the Federal government.

MILELLI, Domenico, dō-mā'nē-kō mē-lĕl'lē («Conte di Lara»), Italian poet: b. Catanzaro, Italy, 1841; d. 1905. He was educated for the priesthood, but finding literature more to his liking turned his attention to writing, which is in subject of a paganish character. He was one of the leaders of the class called *Veristi*. Among his works are 'In giovinezza' (1873); 'Odi pagane' (1879); 'Il rapimento di Elena' (1882); 'Verde antico' (1885).

MILES, George Henry, American dramatist: b. Baltimore, Md., 31 July 1824; d. Thornbrook, Md., 23 July 1871. He was graduated from Mount Saint Mary's College, Emmitsburg, Md., and practised law in Baltimore for several years, after which he devoted himself to literature. In 1850 his 'Mohammed' was awarded the $1,000 offered by Edwin Forrest for the best drama by an American author. In 1859 he was appointed professor of English literature at Mount Saint Mary's College, where he remained until his death. His works comprise 'Señor Valiente' (1859); 'Christine, a Troubadour's Song' (1866); 'Abu Hassan the Wag' (1868), etc.

MILES, Nelson Appleton, American army officer: b. Westminster, Mass., 8 Aug. 1839; d. Washington, D. C., 15 May 1925. At the outbreak of the Civil War in 1861, he left his business to raise a company of volunteers, and enter the army as lieutenant in the 22d Massachusetts regiment. In 1862 he was promoted to the rank of colonel, commanding the 61st New York regiment. He was engaged in the battles of the Peninsula, before Richmond and at Antietam, and in every battle of the Army of the Potomac, with one exception, until the surrender of Lee at Appomattox Court House. He was distinguished in the battles of Chancellorsville, Wilderness, Spottsylvania Court House, Reams Station, Richmond campaign of 1864 and many other important battles of the war; and, at one time, at the age of 25, was in command of the Second Army corps, numbering 25,000 men. He was wounded three times, most severely at the battle of Chancellorsville. In May 1864 he was promoted brigadier-general and in 1865 major-general of volunteers.

At the close of the war he entered the regular army and was commissioned colonel of the 40th United States Infantry, and attained the rank of brigadier-general in 1880 and of major-general in 1890. He successfully conducted several important campaigns against the Indians and did much to open up for civilization large portions of the West. In 1874 and 1875 he defeated the Cheyennes, Kiowas and Comanches in the Staked Plains country; he also subjugated the hostile Sioux and other Indians in Montana, driving Sitting Bull across the frontier and breaking up the bands that were led by him and other chiefs. In December 1877, after a forced march over a distance of more than 160 miles, he captured Chief Joseph and his tribe of Nez Perces after a hard-fought battle of four days in northern Montana; in 1878 he intercepted and captured Elk Horn and his band on the edge of the Yellowstone Park. In 1886 he subjugated and forced to surrender Geronimo, Natchez and the band of Apaches that had made a large portion of the Southwest uninhabitable, thus restoring peace and prosperity to Arizona and New Mexico. For his services up to this time he received the thanks of the legislatures of Kansas, Montana, New Mexico and Arizona. Later he settled the Indian troubles in the Dakotas, saving the country from a serious war that had threatened it for years. In 1894 he was in command of the United States troops sent to Chicago at the time of the railroad strike; and in October 1895 succeeded to the command of

the United States Army. In 1898 he conducted the brief campaign in Puerto Rico with ability, taking possession of the island with trifling loss, and in 1901 was promoted to the rank of lieutenant general. In December 1901 he was officially reprimanded for publicly expressing his approval of Adm. George Dewey's report on the charges against Adm. Winfield S. Schley. In 1902 he made a tour of inspection to the Philippines and on his return filed a report which called forth considerable controversy by its denunciation of some of the abuses he had found in the conduct of military affairs there. In August 1903 he was retired from active service. He wrote *Personal Recollections and Observations of General Nelson A. Miles* (1896); *Military Europe* (1898); *Serving the Republic* (1911).

MILES CITY, city, Montana, and Custer County seat, situated on the Yellowstone River, at the mouth of the Tongue River, at an altitude of 2,364 feet, 140 miles east-northeast of Billings, and served by the Northern Pacific and the Chicago, Milwaukee, St. Paul and Pacific railroads and a municipal airport. Formerly a rough cow country center, the city still carries on an extensive trade in cattle, sheep, and horses. It has gas wells nearby and manufactures flour, leather goods, and saddles.

It has a Carnegie library, and a small museum with relics of range days. Fort Keogh, rebuilt in 1877 and now used as a livestock experimental station, is nearby. Settled and incorporated in 1876–1878, the city was named for Gen. Nelson A. Miles. Pop. (1950) 9,243.

MILES GLORIOSUS, mī'lēz glō-rĭ-ō'sŭs (Lat., braggart soldier). (1) A comedy by Titus Macius Plautus. (2) The name slyly applied by Ferdinand I of Bulgaria at a banquet when toasting Kaiser Wilhelm II of Germany who mistook it for a compliment.

MILESIAN TALES, a form of anecdotal satire current in Miletus and Asia Minor about one hundred years B.C. The original tales were written by Antonius Diogenes and were of an erotic and obscene character. They are important in so far as they form a link in the chain of the development of satirical romance, exemplified in Gaius Petronius' *Trimalchio's Supper* and Lucius Apuleius' *Story of Cupid and Psyche.* Six volumes of the tales were collected by Aristides of Miletus and were later translated into Latin by Lucius Cornelius Sisenna (120?–67 B.C.), but of these only fragments remain. They have been compared to the French *fabliaux* and the tales of Giovanni Boccaccio.

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MILESIANS, mī-lē'shănz, (1) the inhabitants of Miletus; (2) *in Irish mythology,* the early colonists of Ireland, a portion of whose inhabitants, according to Irish tradition or legend, are descended from Mileadh, a fabulous king of Spain, whose three sons, Heremon, Heber, and Ir, conquered the island about four hundred years before Christ, establishing a new nobility. This was the fourth and last of the traditional prehistoric colonizations of Ireland.

MILETUS, mī-lē'tŭs, ruined city, Asia Minor, now in the vilayet of Aydin, opposite the mouth of the Menderes on the Latmic Gulf. The Ionians are said to have taken forcible possession of the town about 1100 B.C., massacred the Carians living there and taken the women as their wives. The extent of the four harbors of Miletus, one of which could contain a large fleet, soon raised the town in the hands of the Ionians, to a place of importance, and it became one of the first cities and republics of the 12 Ionian Cities, in Asia Minor. Its commerce covered the Mediterranean and extended to the Atlantic. It had upward of 75 colonies, most of which were on the approaches to the Black Sea. It was also distinguished as a seat of literature.

On the rise of the Lydian kingdom repeated attempts were made to conquer Miletus. It finally recognized the sovereignty of Croesus, and paid tribute. A similar arrangement was made with Cyrus in 546 B.C., which saved it the calamities of a contest with the Persians. The city revolted against the Persians in 499 B.C., and was taken by storm five years later, plundered, and the inhabitants massacred or transported. It recovered its independence in 479 B.C., after the Persian defeat at the Battle of Mycale. It yielded for a time to the supremacy of Athens but ultimately threw off the yoke in 412 B.C., only to fall under the Persians again.

Miletus was conquered by Alexander the Great in 334 B.C., but he did not interfere with its government. From the time of its subjugation by the Persians it had never recovered its early importance, but it still continued to enjoy some commercial prosperity under the Romans until the time of St. Paul, who visited it during its final decline, as recorded in Acts 20:17 and II Timothy 4:20. It was finally taken and destroyed by the Turks.

MILFOIL. See YARROW.

MILFORD, mĭl'fĕrd, town, Connecticut, in New Haven County, at an altitude of 10 feet, on the Housatonic River and Long Island Sound, about 9 miles southwest of New Haven, served by the New York, New Haven and Hartford Railroad and state and federal highways. The town is in an agricultural area engaged in oyster growing, seed raising, and dairy, poultry, and truck farming, and has manufactures of brass fittings, automobile and boat hardware, electric motors, garters, suspenders, earmuffs, rubber substitutes, locks and novelty jewelry, rivets, screws, and machine products. Known since the 17th century for its shellfish, it has thousands of acres of undersea oyster beds. The site was purchased from the Indians and settled in 1639, and the town was incorporated in 1640. It has council-manager type of government. Pop (1950) 26,870.

MILFORD, city, Delaware, in Kent and Sussex Counties, situated on the Mispillion River at an altitude of 20 feet, 18 miles south of Dover, on the Pennsylvania Railroad and modern highways. It is in a fertile truck and fruit farming area, has canneries, a poultry processing plant, boat yards, and manufactures of dental supplies, fertilizers, bricks, wood products, and woolen yarns. The town was established in 1787 on the site of plantations settled in 1680 and was incorporated in 1867. It has a mayor, council and city manager. Pop. (1950) 5,179.

MILFORD, town, Massachusetts, in Worcester County, at an altitude of 257 feet, 16 miles east-southeast of Worcester, on the Boston and Albany and the New York, New Haven and Hartford railroads. It is in an agricultural region, but has industrial interests. There are shoe factories here, and granite quarries are located nearby. The local pink granite has been used in the Boston Public Library, the Corcoran Art Gallery in Washington, and the Grand Central and Pennsylvania stations in New York City.

Milford was originally settled in the 1660's and was part of the town of Mendon. In 1780 it was separated from Mendon and incorporated as a municipality. Town meetings, held usually twice a year, administer the government. Pop. (1950) 15,442.

MILFORD, town, New Hampshire, in Hillsboro County, situated on the Souhegan River at an altitude of 271 feet, 11 miles west-northwest of Nashua, and served by the Boston and Maine Railroad. It is in a fertile agricultural region producing apples, peaches, grain, timber, and granite. It has woodworking and stonecutting plants, and manufactures woolen goods, cotton and jute, and paints. There are granite quarries nearby. The district was settled in 1738 and the town was incorporated in 1794. It was formed from tracts ceded by several other towns in its vicinity. Its government is by a board of selectmen. Pop. (1950) 4,159.

MILFORD, borough, Pennsylvania, seat of Pike County, situated on the Delaware River at an altitude of 503 feet, 47 miles east of Scranton and 7 miles southwest of Port Jervis, N. Y., where it is served by the Erie Railroad. It is located in a portion of the Delaware Valley noted for its beautiful and picturesque scenery, with mountains, woods, and river. First settlement on the site was made in 1733 by Tom Quick. Some years later Quick was killed by an Indian in sight of his son, who spent the rest of his life avenging his father's death, killing indiscriminately a total of 99 Indians. There is a monument to Tom Quick in Milford. The town was laid out in 1796 and incorporated in 1874. Its government is administered by a borough council. Pop. (1950) 1,111.

MILFORD, Engagements at. Milford, Va., on the east bank of the south branch of the Shenandoah, was the scene of several skirmishes and three cavalry engagements during the Civil War. On June 24, 1862, detachments of the First Maine and First Michigan cavalry attacked about 300 mounted Confederate infantry at the place, without decisive result, and withdrew.

When Gen. Philip N. Sheridan, after the Battle of the Opequon (q.v.), followed Gen. Jubal Early up the valley, he ordered Gen. Alfred T. A. Torbert, commanding the cavalry, up the Luray Valley, to get past Early's right and cut off his retreat. Gen. James H. Wilson's division advanced and on Sept. 21, 1864, attacked Gen. Williams C. Wickham's cavalry division of two brigades and drove it from Front Royal (q.v.) and up the valley to Milford, where Wickham took up a strong defensive position on the south side of Milford Creek. When Torbert came up on the 22d he concluded that the position was too strong to be attacked, and fell back to near McCoy's Ferry, again advancing, and on the 23d occupying Milford, which had been abandoned by Wickham. Sheridan was greatly disappointed by Torbert's failure to carry the place on the 22d.

After the battle of Cedar Creek (q.v.), Oct. 19, 1864, Milford was occupied by Gen. Lunsford L. Lomax's Confederate cavalry division, and its defenses strengthened. On October 24, Gen. William H. Powell's cavalry division, two brigades of about 1,100 men, with six guns, moved up the Luray Valley to reconnoiter. Powell skirmished with Lomax's outposts on the 25th, and on the morning of the 26th attacked Lomax in position at Milford, using his artillery freely, and continuing the contest until 2 P.M. when, finding the defense so stubborn and the position too strong to be carried, he withdrew.

MILFORD HAVEN, Marquis of. See Battenberg, Louis Alexander.

MILFORD HAVEN, urban district and seaport, Wales, in Pembrokeshire on the celebrated Milford Haven, one of the safest, deepest, and most capacious harbors in Britain, forming a deep indentation in the southwest coast of Wales. The haven stretches about 12 miles from east to west, with a breadth of from one to two miles, and branches off into numerous bays, creeks, and reaches. The largest vessels can enter and put to sea in any wind or at any tide more expeditiously than from almost any other large harbor in Great Britain, and it has long been proposed to make Milford the eastern seat of the transatlantic trade, as bringing London nearer by several hours. The haven is defended by fortifications.

Henry II embarked at Milford Haven in 1172 on his way to the conquest of Ireland, and here Henry Tudor (later Henry VII) landed in 1485 in his successful effort to dethrone Richard III. The town of Milford Haven on the north shore, eight miles northwest of Pembroke and six miles from the mouth of the haven, has extensive modern docks. It is a fish-curing station, and the headquarters of a trawler fleet. Pop. (1951) 11,717.

MILHAUD, mē-yō′, **Darius,** French composer: b. Aix-en-Provence, Sept. 4, 1892. He entered the Paris Conservatory in 1910, studying under Vincent d'Indy, André Gedalge, and Charles M. Widor, and as a student, besides winning prizes in violin, counterpoint, and the fugue, composed numerous pieces for a string quartet, sonatas, ballet, incidental music to the *Orestes* trilogy of Aeschylus, and a musical novel, *La Brebis Égarée,* with the text by Francis Jammes. In 1917–1919, as an attaché in the French legation at Rio de Janeiro, he made the acquaintance of the poet Paul Claudel, who later was the librettist of most of his operas. Milhaud returned to Paris in 1919 and there associated with Arthur Honegger and others who came to be called "Les Six." He came to the United States in 1922 where he gave recitals and lectured at Harvard, Columbia, and Princeton. In 1940, after the fall of France, he came to the United States again and taught at Mills College, Oakland, Calif. In 1947 he was made professor of the Conservatory of Paris.

A prolific composer, Milhaud has used numerous thematic motifs in his work, achieving effects through the use of jazz and South American rhythms, and through polytonal passages. His works, though brilliant, are uneven, some being

too purely intellectual in approach and others too trivial for critical appreciation. His great works, such as the opera *Christophe Colombe* (1928; libretto by Claudel) and the incidental music for Claudel's drama *L'annonce fait à Marie* (1934), show a deep religious feeling and a rich polytonal harmony. His other important works include the ballets *L'Homme et son Désir* (1918; performed 1921), *Le Boeuf sur le Toit* (1919), *La Création du Monde* (1923), *Salade* (1924), and *Le Train Bleu* (1924); the operas *Les Malheurs d'Orphée* (1926), *Pauvre Matelot* (1926), and *Medée* (1938); music for the films *Madame Bovary* (1934) and *Mollenard* (1938); and many other pieces for orchestra, voice, pianoforte, and violin. He also introduced the *opéra à la minute,* a short dramatic scene, in the 1927 compositions, *L'Enlevement d'Europe, L'Abandon d'Arian,* and *La Délivrance de Thesee.*

MILIARIA, mĭl-ĭ-ā'rĭ-à (variations Military Fever, Millet-seed Rash, Prickly Heat), a very common fine papular or papulovesicular eruption. It is caused by too profuse sweating attended by undue congestion of the skin. Hot weather, excessive clothing, vigorous exercise, and alcoholic dissipation commonly evoke the disease, especially in those who are debilitated or who have a delicate skin. It may appear and disappear rapidly without any apparent cause. Its appearance is attended by pricking, burning, or itching sensations. It is generally limited to a portion of the trunk, but may appear upon the face, neck, and extremities.

MILIC, mĭ'lēch, **Jan** (known as Milíč of Kremsier), Moravian reformer: b. Kremsier, Moravia; d. Avignon, France, June 29, 1374. He entered the Roman Catholic priesthood in 1350 and in 1360 became canon at the cathedral in Prague. Becoming convinced of the hollowness of court and church life, in 1363 he resigned and began to preach to the lower classes in Prague in their own tongue, instead of the usual Latin, and gained over them a wide influence. Convinced that Antichrist had arrived and that the day for reform was at hand, he went to Rome in 1367 that he might consult the pope and was instead arrested by the Inquisition. He was released and well received by Urban V, and upon his return to Prague resumed his preaching, but in 1372 he was accused of heresy by his brother priests and summoned to Avignon for trial. He proved his innocence, but died before the verdict was rendered. He is regarded as one of the immediate forerunners of John Huss and the Reformation.

MILITARISM, mĭl'ĭ-tà-rĭz'm, a term applied to the policy of giving to military training and exploits disproportionate prominence in a nation's affairs and the resulting subordination of civil authority; or the maintenance of a government by military force. The term is used chiefly in connection with the vast armaments maintained by European countries; and has come in particular to mean the preparation, as in the case of Germany prior to the beginning of World Wars I and II, of a vast force maintained not for purposes of national defense but for those of imposing at pleasure the will of the powerful nation upon those weaker and less well armed. It carries in its train the extremist theories of war as a necessity to the proper development of a nation's material and spiritual welfare.

MILITARY. See Army; Army, Department of the; Army of the United States; Army Organization.

MILITARY ACADEMY, Royal. See Military Education—*England.*

MILITARY ACADEMY, United States. See United States Military Academy.

MILITARY AERONAUTICS. Ever since the early days of aeronautics, which began with the development of the old spherical balloon, the use of aircraft in time of war has been a fruitful theme for discussion. Lighter-than-air craft began to figure prominently in warfare soon after their invention in the latter half of the 18th century. The French used a military balloon at the Battle of Fleurus on June 26, 1794, and from that date until after the South African War, over a century later, the aerial machines employed for purposes of observation were either captive balloons attached to winches, or man-lifting kites, or they were free balloons which drifted at the will of the winds that blew. In the Franco-Prussian War, during the siege of Paris alone, as many as 66 balloons left the stricken city, carrying 60 pilots, 102 passengers, 409 carrier pigeons, 9 tons of letters and telegrams and 6 dogs. Gaston Tissandier (1843–1899) at the time went over the German lines and dropped 10,000 copies of a proclamation addressed to the soldiers, asking for peace, yet declaring that France would fight to the bitter end. In the American Civil War an aeronaut named La Fontaine went up in a balloon over an enemy camp, made his observation, rose higher into the air and succeeded in getting into a crosscurrent, which carried him back to his own lines. The first cross-channel flight was made by balloon in 1785, by François Blanchard (1753–1809), who had with him an American doctor named John Jeffries (1744–1819), together with a large supply of provisions, ballast and oars. With the development of dirigible balloons in the closing years of the 19th century and the advent of the airplane a few years later, the spherical type of balloon fell into disfavor as an auxiliary in war, even for observational purposes. Captive balloons, however, were used with some success in this capacity by the French in the colonial campaigns, and also on the western front during World War I. In World War II captive "barrage" balloons were used chiefly in aerial defense, especially in London, where considerable numbers of them supported cables designed to intercept bombing squadrons (see *Military Lighter-than-Air Craft.* In the article Aeronautics are described the development, construction, advantages and limitations of the several types of aircraft—the spherical balloon, kite balloon, dirigible, nonrigid, semirigid, and rigid types, the airplane, and the helicopter. This article deals only with the development of special military types and their adaptability to the tasks for which they were designed.

Uses and Types.—The use of aircraft in World War I began with the exchange of harmless revolver shots between French and German aviators on reconnaissance. At the end of the First World War, the airplane's military uses had grown far beyond reconnaissance and included the bombing of cities, the strafing of ground troops, and formation combats instead of isolated dog fights. World War II

saw multiplication of the duties of military aircraft as well as a great increase in the airplane's effectiveness and importance. The United States Army Air Forces (AAF) grew to tremendous proportions, and the country soon became the greatest air power in the world. By Jan. 1, 1945, the AAF included 2,359,500 officers and enlisted personnel. Besides increasing in size, the AAF now operated a large number of aircraft types which merged into one another, making only approximate classification possible:

(1) The heavy bomber for strategic operation undoubtedly dealt the Germans the heaviest blow of the war and paved the way for the invasion of Normandy. While the British Royal Air Force (RAF) specialized in night attacks, the AAF undertook daytime precision attacks on German oil plants, aircraft and aircraft engine plants, industrial targets generally (which gave Germany its war potential), and on airdromes, railroads, bridges, canals and other means of communication. During 1944 American squadrons, mostly heavy bombers, such as B-17 Fortresses and B-24 Liberators, dropped 937,698 tons of bombs over Germany. In the war against Japan, the heavy bomber remained supreme, only now the aircraft employed were much larger, of greater bomb-carrying capacity, and had longer range. By the middle of 1945 loads of more than 4,500 tons of bombs were being dropped on Tokyo and other Japanese cities in the course of single attacks made by fleets of 550 Superfortresses or B-29's, which made nonstop flights of 15 hours to reach their distant targets. The master plan of wrecking Germany from the air was followed and developed in attacking Japan with increasing intensity. It should be noted, however, that whereas in attacking Berlin and the Ruhr, the heavy bombers unloaded for the most part heavy penetration or fragmentation bombs, with incendiaries to follow; in the war on Japan the emphasis was on lighter but much more numerous incendiaries.

(2) In addition to the heavy bombers, the AAF employed medium and light bombers and attack bombers, whose duties vary between the semistrategic and the tactical. Bomber designations changed as the war progressed. Thus the Fortresses and Liberators, once classified as heavy bombers became medium bombers with the advent of the Superfortresses. The lighter bombers whose objectives were railroad and canal traffic in northern France and Belgium carried the designation A. Army aircraft generally have both a letter designation and a striking name. Thus the Martin A-30 is termed the Baltimore and the Douglas medium or light bomber A-24 is designated the Dauntless.

(3) The letter P stands for pursuit, although pursuit planes were later called fighters. These machines, used for the protection of our own bombers, for attack on enemy bombers, or for combat with enemy pursuits, include such famous craft as the Lockheed P-38, or Lightning; the North American P-51, or Mustang; and the Republic P-47, or Thunderbolt, which supercharged heavily and proved most effective at high altitudes.

(4) Reconnaissance, whether visual, artillery or photographic, remained one of the most important functions of military aviation, and the AAF employed for this purpose such types as the Vultee O-49 or Vigilant, and the Lockheed O-56 or Ventura. Because their primary duties were in reconnaissance these planes were less heavily armed than the pursuits.

(5) The L- or liaison type came to the fore in the war in Taylorcraft, Aeronca and Piper machines, being small airplanes of the type previously used for private flying, converted to messenger or liaison service. They were lightly armed, but exceedingly useful in liaison work and in local or detailed observation.

(6) The symbol T stands for training. But it is impossible to take a man, give him introductory or elementary training on a small, rather slow airplane and expect him to be ready for training work in a heavy bomber or a fast pursuit. Therefore, training planes are now divided into PT- BT- and AT-types, that is to say primary, basic and advanced trainers.

(7) A category which was unknown in the First World War rendered great service in the Second World War, carrying medical supplies, ammunition, food, and even light tanks to distant fighting areas. Some of the C-type, or cargo aircraft, were converted civil aircraft which on conversion were given military initials or designations. Thus the Curtis CW-20 became the C-46 and was called the Commando. On army duty, the Lockheed Constellation, a gigantic and speedy transport aircraft, became the C-69. This system of nomenclature was adopted in the middle 1920's and stood the test of time, even though it had been strained by the development of so many new military functions. In addition to the above basic designations a number of other letters came into use, indication of the extent and variety of AAF equipment. G-craft were gliders, which towed in great number behind cargo or other large aircraft were instrumental in a new type of tactics. R stood for rotary wing aircraft, the helicopter having become a recognized military aircraft. It should be added that the symbol X indicated that the plane was experimental, and that Y denoted service test aircraft. The dropping of these letters indicated that the plane was in production, while a higher number following the letter designation generally indicated a more advanced or at any rate a later type.

Strategy and Tactics.—A remarkable account of the strategic and tactical operations undertaken by the AAF was given in the *Official Guide to the Army Air Forces*. It was shown, first, that our combat operations fell into two major categories—strategic and tactical. While it had been conclusively shown that strategic operations would not in themselves win the war, their contribution to victory was later universally recognized. Tactical operations were intended to achieve air supremacy, to destroy or disrupt enemy communications, and to work in co-ordination with ground forces. The efficacy of tactical operations was proved again and again in the invasion of France, in subsequent operations in northwest Europe, and earlier in Africa and Italy. However, as the devastating air assault upon Cassino, Italy, proved, even a complete local victory seemed unattainable by air power alone. In the First World War it was the Germans who first introduced formation flying, which proved effective and deadly until our own and allied aviators abandoned the notion that formation flying was unchivalrous. Formation flying became a science in itself, with a variety of well-tried formations in use. The components of formation became clearly defined:

an "element" consisted of 2 to 4 aircraft; a "flight" was composed of 2 or more elements; a "group" meant 2 or more flights; and a "combat wing" designated 2 or more groups. Heavy bombing from great altitudes has become possible partly because of improvement in engine supercharging, oxygen equipment, and the pressurization of cabins, and partly because of precision bombsights and automatic pilots. The Second World War evolved the synchronized bombsight, which with data inserted by the bombardier determines the point in space at which a bomb must be launched to hit a specific target. The American bombsights were the admiration of our British allies and the envy and horror of the Germans. Low-level bombing was also developed to a high degree of efficiency, and low-altitude and so-called skip bombing proved extremely effective in attacks on enemy shipping. Fighter-bombers proved versatile and effective in combining the functions of the bomber and the fighter as required. Formation fighting made it possible to concentrate an enormous fire power on the enemy. In air defense flexible and highly effective mobile defense systems were developed with interceptors for both day and night attack on the bomber. The Northrop Black Widow proved to be an excellent night interceptor, when specially equipped with radar for such work. A totally novel form of military aviation sprang up in the form of airborne warfare. In some cases paratroopers jumped from transports. On other occasions, towed gliders were released out of which numbers of men darted, fully equipped and ready to function as a unit, supported if necessary by a tank or a light field gun. Airborne troops, whether paratroops or men carried in gliders, proved highly useful. The Germans took the lead in this type of warfare, and in 1941 succeeded in landing many troops in Crete in spite of the fact that the British had almost complete command of the surrounding seas.

Military Lighter-than-air Craft.—In the First World War the captive balloon had great importance, and notwithstanding the supremacy of the airplane, still had many advocates. The great advantage of the captive balloon was that the observer remained constantly in direct telephonic communication with artillery commanders and could observe enemy positions and movements with the aid of powerful glasses. Captive balloons were placed from two to four miles behind the front, and were separated by intervals, the size of which depended upon the artillery activity in various sectors. These balloons, while they rendered real service, were particularly vulnerable, and they seem to have disappeared as a means of observation in the Second World War. On the other hand, barrage balloons, held captive by long wires and raised aloft over cities as a means of protection against enemy bombers were employed in great numbers over London and other cities, and undoubtedly proved highly useful as a defense measure. In the United States captive balloons of great size developed, capable of operating at enormous altitudes, well over 10,000 feet in some cases.

The military airship was formerly used extensively for night scouting, bombing, and to some extent for transportation of military personnel. Hundreds of airships, or dirigibles from small blimps about 180 feet long to the huge Zeppelins 700 feet long, were used in the First World War. The blimps were used mostly for coastal patrol and for convoying ships, while the large dirigibles were used primarily for bombing.

Three types of dirigibles were employed: (1) the rigid, (2) the semirigid, and (3) the nonrigid. Rigid dirigibles, which included all large types, had frame structures. The nonrigid type depended on gas pressure for maintenance of its form, and could be easily deflated and transported. The semirigid dirigible had an intermediate type of construction. The French found their semirigids useful for reconnaissance, while the Germans used their large rigid Zeppelins with real effect in raids on London during the First World War. But with the development of antiaircraft fire, and the attainment of far greater speed by the airplane, military airships became obsolete. Yet as indicated in the article on AERONAUTICS, small blimps played a very useful role in coastal patrol and submarine warfare off the shores of North America. There still remain advocates of the large airship who maintain that it would make possible long-range reconnaissance over the vast waters of the Pacific.

Equipment and Accessories in Military Aviation.—The growth of military aviation has not been due solely or even mainly to the development of the airplane itself. It owes much to a thousand and one devices or appliances or accessories or methods of armament. Some of these devices are described in the article on AERONAUTICS. The following may be said to have special military interest:

(1) Jet propulsion—perhaps one of the greatest single developments recorded during the Second World War. The introduction of jet propulsion and the elimination of the propeller gave the pursuit airplane an extra 100 miles an hour, with the ultimate possibility of flying faster than the speed of sound. Had the Germans been able to build their jet-propelled aircraft in greater numbers, they would have seriously challenged Allied air supremacy on the western front.

(2) Rockets, utilized both in military and naval aviation to facilitate the take-off of heavily loaded aircraft.

(3) The great development of the supercharger, the pressurized cabin, and other devices which permitted bombing operations at altitudes of well over 40,000 feet.

(4) Self-sealing and droppable fuel tanks which lessened the danger from enemy fire, and also greatly increased the range of fighters acting as escorts.

(5) Remarkable improvements in the electrical control of gunfire, which allowed the simultaneous firing of many guns located at various points of the airplane, with concentration on a single target when required.

(6) The Sperry mathematical gunsight and fire control, which proved to be one of the mechanical and electrical miracles of the war. In combat, during which the combined speed of two airplanes may exceed 1,000 miles an hour, correct aim by visual and manual methods became impossible. The Sperry device, by a combination of optics, electronics, and mathematical integrating and computing machinery, permitted far greater accuracy of fire, and shot at the point where the enemy would be a few instants later rather than at a point where it would not be when the bullet got there.

(7) Power-operated turrets, hydraulic or electrical, and remotely controlled, overcame the difficulty that was inherent in the manual operation of the turret because of the high velocity of the air that flows past an airplane.

(8) The 75 mm. cannon became standard equipment on some models of the B-25, being mounted in the nose of the fuselage with a complete round weighing 20 pounds, and an effective range of about 2,000 yards.

(9) Armor protection against gun fire in the form of steel armor plate, armored suits for men in bombers, and other such armored protection almost but not quite kept pace with the power of the offensive.

(10) In bomber work there was an enormous increase in the weight and size of bombs. The British were the first to introduce the 2-ton and 4-ton bombs, then the deadly 6-ton block busters, and finally an 11-ton bomb used for attacking submarine pens and other enormously strong targets.

(11) The development of radar led to advances in enemy interception, particularly at night, in attacks on submarines, and to other developments. Radar promised to become the civil as well as military solution for blind flying.

(12) The introduction of the rocket-propelled projectile added enormously to the power of the pursuit planes and proved invaluable in amphibious operations.

(13) The German robot bombs might have changed the whole complexion of the war by their deadly long-range operations, for which no defense could apparently be devised other than the destruction of their launching platforms.

(14) Flak, the German word for antiaircraft fire, reached such an intensity of fire during World War II that our aviators, when attacking Berlin, felt that they might be able to walk on the flak.

Post World War II.—The foregoing historical survey of military aeronautics was written after the surrender of Germany had ended the western phase of World War II, but before Japan's defeat was achieved by use of the atomic bomb.

In the decade after World War II military aviation was featured by a development of the use of jet propulsion for almost all types of craft. However, propeller-driven planes continued in production for special uses. Since the founding of the North Atlantic Treaty Organization in 1949 its members have been particularly active in developing their air armaments in competition with those of the USSR and its satellites. Most enterprising in constructing new models were the United States, Great Britain, and France.

Turbojet supersonic fighter aircraft of the U.S. Air Force in 1954 included the North American F-100, McDonnell F-101, Convair F-102, Republic F-103, Lockheed F-104, and Republic F-105. The military use of helicopters, demonstrated in the Korean War, caused production in 1953 of a new Bel Model 47G. The same year saw the launching of the Piasecki YH-16 Transporter, a helicopter with carrying capacity of 40 troops or 32 litter patients.

During the decade the Royal Air Force pioneered in jet development. In 1954 the F.4 Swift and the Hawker Hunter were among British fighters in the 700-mph. category. It was estimated in 1954 that the Soviet Union bomber strength included about 400 of the TuG-75 six-engine bombers, comparable to the American B-52.

The vast increase in compact, available power, due to development of the gas turbine principle, not only led to speeds in supersonic range but to realization of the old dream of vertical take-off (VTO). The military value of having aircraft which can dispense with airports, flight strips, and even the take-off areas of carrier decks is tremendous. Early in 1954 it was disclosed that in the United States two VTO prototypes were being tested: the XFY-1 by Corvair and the XFV-1 by Lockheed. Both were powered by the Allison T-40 turboprop, rated at 5,500 equivalent-shaft horsepower driving two contra-rotating propellers, and required rocket-assisted take-off. They stand at rest in an upright position, or nearly so. The XFV-1 is a straight-wing type, and the other a delta wing. Great Britain and the Soviet Union were also developing VTO prototypes.

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MILITARY CAMPS. Twentieth century military camps bear little resemblance to their prototypes of ancient times, when a main function of the installations was protection of troops against enemy attack. First to devote attention to the art of developing military camps, the Greeks adopted a circular layout, as best calculated to give the commanding general a view of his whole camp from the center and to dispatch assistance to any part of the camp that might be attacked. The Romans, during the whole period of their domination, used a square layout surrounded with a ditch (*fossa*) and a rampart (*vallum*) for protection against enemy attack, and this form was generally retained down to the time of the invention of gunpowder.

When entrenched camps lost significance because they provided no protection against gunpowder-propelled projectiles shot from long ranges, it became necessary to keep the mass of the army, when not actually engaged, at a considerable distance from the fighting line and to select sites beyond enemy reach. The selection of sites for the modern military camp assumes great importance largely for other reasons than protection against the enemy.

The large armies to be trained and the extent of land area required to support training in the use of modern weapons have a major impact upon local and national economies and upon natural resources which must be tapped to provide structures and facilities for the training of ground troops and airmen. The effect upon local economy can be imagined from the fact that the land acquired—and therefore re-

moved from the tax rolls—for some types of training runs to more than 100,000 acres, sometimes several hundred thousand acres. Thus, one modern camp in the southeastern United States, employed for the training, housing, and support of 70,000 troops during World War II, occupies more than three times the land area of Washington, D.C.

The necessary use of large quantities of lumber and other building materials, water from underground or surface supplies, and fuels of various kinds, requires detailed study by military authorities in the selection of sites and in the planning of camps with a view to rigid economy of original construction and ease of maintenance and operation. For these reasons, rigid site-selection criteria are established which must be met by survey teams in the selection of sites and with a view to avoiding areas where climatological conditions are such as to prevent daily, continuous, efficient use of the installations; where accessibility is inadequate due to deficient transportation facilities; where local labor supply and sources of construction materials are lacking or insufficient; where conflict with other military installations would occur (as where firing from an artillery range would endanger air traffic from a nearby air installation); where the provision of an adequate supply of water and electric power and of means of sewage disposal would be excessively costly; where land acreage adequate for the types of use to be made of the camp is not available at moderate expense; or where land acquisition would impose an inequitable burden on the community (as in the condemnation of dairies or profitable farm land).

Economy in continuing maintenance and operation is sought by means of careful site planning to provide the most compact layout consistent with operational efficiency. By this means, it is feasible to make the most economical use of available training time by avoiding traffic jams, circuitous routing of troops from housing to training areas, and excessive travel by service units responsible for the camp's "housekeeping." Military authorities provide standard layouts for various types of installation, based on the most economical arrangement of buildings, roads, and utilities, for use as a guide to planners and construction agencies. These standard plans are then carefully adapted to the topography of the site selected, so that costly grading operations and foundation difficulties due to ledge outcrop, swamp, or other unfavorable soil conditions will be avoided.

Uses to which military camps were put during World War II include divisional camps with populations from 30,000 to 70,000 men for the training of infantry, armored, and airborne troops; and airfields, antiaircraft firing centers, reception centers, replacement training centers, staging areas (up to 10,000 troops destined for overseas areas), prisoner-of-war enclosures (1,500 to 3,000 enemy prisoners), and Women's Army Auxiliary training centers. In support of the above, other kinds of installations required are various types of depots used in the packing, storing, handling, distributing, holding, and reconsigning of all kinds of food, clothing, equipment, and ammunition; and hospitals up to 1,250 beds at camps and up to 1,750 at separate sites.

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MILITARY COURTS-MARTIAL, special tribunals established as instrumentalities for the enforcement of military discipline within the armed forces of nations. The history of military jurisprudence may be traced back to a period earlier than the Christian era. Based on the practices of the Romans, the most powerful of the military nations of antiquity, court-martial systems suitable to the feudal era were adopted during the Middle Ages. By the time of the Norman Conquest such systems had been established on the continent of Europe, and in the 11th century a court-martial system was introduced into England by William the Conqueror.

The sources of the modern court-martial systems of the English-speaking nations, and to a limited extent of other nations, were a British code of regulations known as the Articles of War (q.v.), issued by James II in 1686, and the first Military Act of 1689 which was statutory in character. These two bodies of law, as amended, were in force at the time of the American Revolution and were well known to the colonists. Hence, at the outbreak of the revolution they were adopted by the Continental Congress for the government of the armies of the United States. From these two 17th-century English bodies of law have evolved, after many modifications, the present court-martial systems of the British Commonwealth of Nations and the United States.

United States.—The basis of military jurisdiction in the United States includes the Constitution and international law. International law includes the laws of war. The specific provisions of the Constitution relating to military jurisdiction are found in the powers granted to Congress, in the authority vested in the president, and in a provision of the 5th Amendment. While courts-martial have no part of the jurisdiction set up under the article of the Constitution which relates to the judicial power of the United States, they have an equally certain constitutional source. They are established under the constitutional power of Congress to make rules for the government and regulation of the armed forces of the United States, and they are recognized in the provisions of the 5th Amendment expressly exempting "cases arising in the land and naval forces" from the requirements as to presentment and indictment by grand jury.

The present court-martial system in the military establishment was prescribed by an act of Congress entitled "an act to unify, consolidate, revise, and codify the Articles of War, the Articles for the Government of the Navy and the disciplinary laws of the Coast Guard, and to enact and establish a Uniform Code of Military Justice," approved May 5, 1950 (64 Stat. 107); and under authority of this act, the president issued Executive Order 10214, which prescribed the *Manual for Courts-Martial, United States, 1951.* This system came into force and effect in the armed forces on May 31, 1951.

The American court-martial system has incorporated in it all the basic principles of Anglo-Saxon criminal jurisdiction, with emphasis on the protection of the rights of accused persons. Courts-martial are temporary bodies and in this respect contrast with civil courts which are created by statute and become permanent institutions of the state. They are appointed by military commanders from time to time as required. Whereas the civil courts operate independently of the executive power of the civil governments,

courts-martial are in the last analysis instruments of command, to be utilized only when necessary as one of the means of maintaining military discipline.

Classification and Composition.—Courts-martial are classified as general, special, and summary courts-martial. Any officer on active duty with the armed forces is eligible to serve on courts-martial. Any warrant officer on active duty with the armed forces is eligible to serve on general and special courts-martial for the trial of any person other than an officer. Any enlisted person on active duty with the armed forces is eligible to serve on general and special courts-martial for the trial of any enlisted accused who has personally requested in writing, prior to the convening of the court, that enlisted persons serve on it. General courts-martial consist of a law officer and any number of members not less than five. The law officer is not a member of the court. Special courts-martial consist of any number of members, not less than three. Summary courts-martial consist of one officer.

Jurisdiction.—The jurisdiction of courts-martial is entirely penal or disciplinary. They have no power to adjudge the payment of damages or to collect private debts. The jurisdiction of courts-martial does not, in general, depend on where the offense was committed nor is it usually affected by the place where the court sits. Courts-martial have exclusive jurisdiction of purely military offenses. But a person subject to the code is, as a rule, subject to the law applicable to persons generally, and if by an act or omission he violates the code and the local criminal law, the act or omission may be made the basis of a prosecution before a court-martial or before a proper civil tribunal, and in some cases before both. General courts-martial have power to try any person subject to the code for any offense punishable by the code. In addition, they have the power to try any person who, by the law of war, is subject to trial by military tribunals for any crime or offense against the law of war and for any crime or offense against the law of territory occupied as an incident of war or belligerency whenever the local civil authority is superseded in whole or in part by the military authority of the occupying power. Special courts-martial have the power to try any person subject to the code for any noncapital offense made punishable by the code and for capital offenses not carrying a mandatory punishment beyond the punitive power of a special court, when so directed by the officer exercising general court-martial jurisdiction. Summary courts-martial have the power to try persons subject to the code except officers, warrant officers, cadets, aviation cadets, and midshipmen for any noncapital offense made punishable by the code.

General Courts-Martial.—A general court-martial may be convened by the president of the United States, the secretary of a department of defense, and by commanding officers of large units, down to and including division commanders and commanders of corresponding units in the navy and air force. The authority convening a general court-martial is required to appoint as law officer thereof an officer on active duty who is a member of the bar of a federal court or of the highest court of a state of the United States and who is certified to be qualified for such duty by the judge advocate general of the armed force of which he is a member. The law officer is not a member of the court and has no vote in the findings or sentence. His duties are analogous to those of a trial judge in a civil criminal trial with jury, the duties of the members of the court being analogous to those of the jury. In addition to the members and law officer of a general court, one officer must be detailed as trial counsel and one officer as defense counsel with such assistant counsels as the convening authority deems necessary. A person who is appointed as trial counsel or defense counsel of a general court-martial must be a judge advocate of the army or the air force, or a law specialist of the navy or coast guard, who is a graduate of an accredited law school or is a member of the bar of a federal court or of the highest court of a state; or a person who is a member of the bar of a federal court or of the highest court of a state. In addition to this qualification, a person who is appointed as a trial counsel or defense counsel of a general court-martial must be certified as competent to perform such duties by the judge advocate general of the armed force of which he is a member. Also, the accused has the right to be represented in his defense by civilian counsel of his own selection if reasonably available.

The trial counsel's primary duty is to prosecute in the name of the United States; however, any acts on his part (such as the conscious suppression of evidence favorable to the defense) inconsistent with a genuine desire to have the whole truth revealed is prohibited. Immediately upon receipt of charges referred to him for trial he will serve a copy of the charge sheet on the accused and will inform the defense counsel that such copy has been so served. He will permit the defense to examine from time to time any papers accompanying the charges, including the report of investigation and papers sent with the charges on a rehearing. Prior to trial, he should advise the defense of the probable witnesses to be called by the prosecution, and the fact that the defense has not been so advised with respect to a witness who appears at the trial may be a ground for a continuance. He prepares the case for trial and attends to all administrative details such as giving notice for assembly of the court, providing a suitable place for the meeting of the court, and summoning witnesses for the prosecution and defense. Under the direction of the court, he prepares the record of trial.

The defense counsel guards the interest of the accused by all honorable and legitimate means known to the law. He represents the accused with undivided fidelity and cannot divulge his secrets or confidence nor tolerate any manner of fraud or chicane.

The charges against an accused, the equivalent of the civil indictment or complaint, may be signed by any person subject to military law. Charges are submitted under oath as to the truth of the matter set forth. No charge may be referred to a general court-martial until after a thorough and impartial investigation as to the truth of the allegations of wrongdoing and as to what disposition of the case should be made in the interest of justice and discipline. This investigation in military procedure has its counterpart in civil criminal procedure in the grand jury inquiry. At the investigation, full opportunity is extended to the accused to cross-examine witnesses against him if available and to present anything desired in his own behalf either in defense or mitigation. Before trial by general court-

martial, the appointing authority must refer the charges and the report of the investigation to his legal adviser, his staff judge advocate, for advice.

General courts-martial not only have jurisdiction to try any person subject to military law for any crime or offense made punishable by the code, but they also have the power to try any person for any violation of the law of war which may be punishable by military tribunal. An example is the power to try an enemy alien civilian who enters the lines of the United States Army for purposes of sabotage of military installations.

General courts-martial may adjudge any punishment not forbidden by the code, including the penalty of death when specifically authorized by the code. Authorized punishments include dismissal; dishonorable discharge; death; confinement at hard labor; forfeiture or detention of pay; fine; suspension from rank, command, or duty; reprimands or admonition; and restriction to limits. Any cruel or unusual punishments are forbidden. Dismissal is the form of punishment imposed in the case of an officer whose compulsory separation from the service in dishonor or disgrace is intended. Dishonorable discharge accomplishes the same purpose in the case of enlisted persons.

Special and Summary Courts-Martial.—Unlike general courts-martial, special courts-martial do not have a law officer or require trial and defense counsels with legal qualifications. Special courts-martial, which consist of at least three members and an appointed trial counsel and defense counsel, may not adjudge death, dishonorable discharge, total forfeiture or pay, or confinement in excess of six months. They may adjudge a bad conduct discharge. A summary court consists of one officer and no trial or defense counsels. Summary courts may not adjudge death, dishonorable discharge, bad conduct discharge, total forfeitures, or confinement in excess of one month.

Foreign Systems.—Systems of courts-martial in other countries are in many respects similar to that in the United States. With the exception of the Russian system, a basic characteristic of all systems is that the courts are appointed by and function under the responsible military commanders and are distinct from the local civil tribunals. In Russia military tribunals appear to be permanently functioning bodies independent of the military commanders and composed of permanently detailed professional judges. Codes of military law have existed in some form or other in practically all countries ever since armies were maintained and have gone through many revisions. For example, the first modern military courts in France were established after the revolutionary period in 1796. In 1806, Napoleon made many changes to strengthen military discipline, and for the next 50 years many commissions were appointed to revise the existing military code. It was not until 1857 that a comprehensive military code was enacted which provided for the *conseils de guerre* and *conseils de révision.* This code, in effect throughout the World War I period, was replaced in 1928 by the present *Code de justice militaire pour l'armée de terre,* modified in 1932. The court-martial systems of Germany, Switzerland, Italy, and many other countries have all gone through many revisions but still retain the common characteristics that the military commander must approve the sentence before the sentence can be executed and that the personnel of the court must be members of the military or personnel specially designated for that purpose.

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MILITARY EDUCATION AND TRAINING. Organized military education and training are as old as the art of war. That art came into being only after the great captains of ancient days discovered the means and methods for converting the armed mobs which had constituted the earliest armies into cohesive skilled instruments, responding as a unit to the commander's orders. The armies of ancient Sparta, of Macedon under Philip and Alexander, and of Hannibal in turn achieved primacy in their day. In each case, the handicap of relatively small numbers was overcome by the perfection of their development and by the schooled leadership of their commanders. For the great mass of such forces, the schooling was a matter of incessant and intensive training; for the leader it meant self-education, largely acquired in combat. By the time the Roman legion was evolved from the Macedonian phalanx, military training was a fully organized function of the state. Moreover, the writings of the military historians had become texts for ambitious young officers.

The general decadence which in time undermined the strength of the Roman Empire was felt no less by the soldiery than the soft-living civilians of Rome. It was the armed mob, the hordes of Teutonic invaders, that eventually ran over a deteriorated Roman military machine. It was only after the Huns and the Saracens had in turn pointed up the hazard of dependence on the armed mob that attention was again given to the need for sound military training as a safeguard of security. Actually, the efforts got no further for some centuries than the specialized and individual development of a small class of the elite. For this was the day of the mounted knight, supported in combat by a rabble in arms, the knight's retainers. The birth of nationalism and the growing appetite of rulers for other peoples' property were among the factors creating renewed interest in the development of well-trained, maneuverable combat units. Spain's land forces, "the best infantry in Europe," pointed up the issue with their repeated victories. Italy's *condottieri* and the indomitable Swiss levies provided the same kind of argument. In a way, they were the forerunners of the superbly trained forces of Sweden's two greatest captains, Gustavus Adolphus and Charles XII. Their biographers, lauding their genius, rarely take the trouble to point out how far their successes depended on the sound and intensive instruction given their troops before their first test in battle.

In the 18th century, Prussia's Frederick II carried the training principle to its extreme. The soldier was converted into an automaton, one unit in a military mass which functioned in perfect response to the commands of its officers. Even the straggler, overcome by fear, was provided for; the sergeant file-closers shot him down. Any system so stereotyped could be handled effectively only by a genius. There was no genius to lead and direct the Prussians who faced Napoleon at Jena, the Napoleon who had earlier discovered the value of giving free play to the aggressive initiative of his subordinates, even down to the

level of the private. None of his enemies except perhaps the British took counsel from their defeats to apply the Napoleonic principle. Wellington, as it happened, had learned the lesson earlier —and vicariously. Among his most valuable contingents was a special regiment, the King's Royal Rifles, *nés* the Royal American Rifles. Recruited from the North American frontier during the colonial wars, they knew every trick of Indian fighting. Moreover, they aimed at—and usually hit—a specific target, violating the European principle of mass volleys directed at an opposing mass, and thus acquiring the unenviable reputation of "murderers."

The argument of human robot versus trained individualist has continued to the present day. Generally speaking, the English-speaking nations have given greatest emphasis to the exploitation of individual initiative and abilities in the development of their armed forces. France has followed the same rule, though not to the same degree. The German armies which came near to overrunning France in 1914 operated largely on the robot principle of training and direction and never quite extricated themselves from the resultant handicap. The Russian troops of World War I, rarely well trained, were too weak in intelligence and education to exploit what little initiative the peasant-soldier boasted.

A new set of conditions came into play between 1914 and 1918, compelling all belligerents to give more and better attention to military training. Each new weapon produced by the technologists demanded a skilled crew for its operation and maintenance. World War II and the postwar years have given tremendous impetus to that trend. Its effect is in fact felt today by the entire civilian educational system, from the primary grades up. Modern airplanes, tanks, guided missiles, and the many varieties of atomic weapons can be utilized to fullest effect only by intelligent, highly skilled personnel. There is in consequence a premium on the alert high school graduate or college youth with something more than a "flair for gadgets." He must understand the scientific principles which make the gadget function, not only to employ it with maximum effect against a target, but in order to make repairs when it breaks down.

World War II, like its predecessor, produced a sweeping reorganization of military education and training in the belligerent nations. The threatened neutrals and certain other neutrals which avoided full involvement soon followed suit. In general, the highest level schools, designed to produce senior commanders and general staff officers, closed their doors; both faculty and student officers were needed for field and staff assignments. At the next lower level, where the regimental commanders and junior staff officers were trained, the length of courses was cut to a minor fraction of peacetime schedules, work hours were heavily increased and facilities were greatly expanded. In addition, officer candidate schools within the arms and services were opened to convert potential officer material into platoon commanders or their equivalent. So great was the demand for these neophytes that course length was held to the barest minimum, often no more than three months. The graduate was expected to absorb most of his military education and training from his exercise of command or in staff experience. In practice, that assumption proved reasonably sound in countries of high educational standards, proportionately less so in backward states like the USSR and China.

At the enlisted level this telescoping of peacetime training into the irreducible minimum of time went even further. The heavy casualties suffered in the 1939–1941 period by the countries opposing the Axis wiped out most of their professional forces. The need for replacements and the simultaneous expansion of the manpower base made it necessary to send into combat many thousands of inadequately trained men. The turn of the military tide in North Africa in late 1942 and the subsequent build-up for the Allied invasion of the Continent made possible the extension of the training period. United States combat units with the exception of a few National Guard elements in 1942 and thereafter were generally combat-ready. The same cannot be said for individual replacements shipped abroad to be absorbed by combat units. Most of their training was acquired at the front. German forces showed no serious dilution of combat readiness until the heavy fighting on the Eastern front had taken its toll. Deterioration increased in 1943, accelerated in 1944, and reached its climax in 1945. Italy's record followed the same pattern, reaching the point of collapse in 1943. Russia's possession of huge manpower reserves and vast areas beyond the reach of enemy attack enabled her to maintain a flow of unit and individual replacements sufficient first to stave off complete defeat and, after 1942, to permit her to take the offensive.

Canada.—The proven solidarity of the Commonwealth of Nations in facing the military crises of the present century, heightened in recent years by the global threat of Communist aggression, has enhanced the importance of military training in those countries. Canada, strongest in military resources and development except for the United Kingdom, is of special interest. The need for fittting Canada's forces into the joint Canada-United States system for detecting, intercepting, and destroying all types of enemy invasion via the polar routes, as well as for successful integration into the NATO military establishment, make the training problem extremely varied and complex. The sum of such demands is responsible for the great postwar expansion of Canada's peacetime military establishment, embracing three major components, army, navy, and air force, each designation carrying the Royal Canadian prefix. By 1953, the training system, like the weapons and equipment used, was identical with or closely analogous to that of United States forces.

Basic training is given the recruit at one of the camps maintained for that purpose. Having designated the corps (arm or branch) of his choice, he next receives specialized training, including practical work in one or more trades, usually at a corps school. Men who demonstrate high aptitude are trained to become instructors. Rapid advancement through the noncommissioned grades and the opportunity to qualify for a reserve commission are open to men of superior ability. Unit training occupies most of the summer period, culminating in the autumn maneuvers. The winter months regularly include exercises in the Far North, at times in cooperation with United States forces. In recent years they have provided ideal tests for personnel and equipment under extreme weather conditions.

Three schools are maintained to educate

cadet candidates for commissions: Royal Military College of Canada, Kingston; Royal Roads, Vancouver Island; and Collége Militaire Royal de Saint-Jean, St. Johns, Quebec. The Staff College at Kingston is comparable to the United States Staff and Command College, Fort Leavenworth. The National Defence College, also at Kingston, educates selected officers of all armed force components and civilian government officials in matters of national strategy. A student-officer exchange system with United States and British military schools is maintained.

The Royal Canadian Navy has been described as the most specialized among the world's navies in that it is intended to serve almost wholly as an antisubmarine and escort force. That limited but vital role leaves it to other naval forces, particularly those of the United States and Great Britain, to carry out the general purpose functions of the free world defense system. In 1954, some 100 naval craft were available to the RCN.

Basic training for recruits, including drill, seamanship, and the history, customs and traditions of the service, begins on shore. Most of the subsequent training is provided at sea. Ambitious and able youths are selected for training in gunnery, communications, antisubmarine warfare, navigation, radar, ordnance maintenance, engineering, and other specialties. Fleet exercises and training cruises are a standard feature. Participation in the United Nations naval effort in Korean waters and also in recent NATO maneuvers has provided an ideal postgraduate test of competence.

In the past Canada has depended heavily on Britain's naval schools for the training of its commissioned personnel. In the prewar period graduates of the Royal Military Academy could opt for career service in the navy. The best educated and most apt enlisted men are today permitted to qualify for reserve commissions. A comprehensive, indigenous system of officer procurement and education, comparable to that of the army, is undergoing study.

The experience of the Royal Canadian Air Force in operating the British Commonwealth's wartime Air Training Plan and the combat service of some 60 squadrons in World War II provided the base for the recent rapid expansion of the RCAF. Its personnel strength in 1953 was little below that of the army. Training was pushed to assure the early commitment of an air division to the NATO forces in Europe. Voluntary recruitment provides most of the annual intake of personnel. Training and education closely parallel the United States system. A special feature is the development of personnel for service in the Far North, including close cooperation with United States Air Force units in that region.

France.—The enormous task of rebuilding French armed forces from the fragments available in 1945, along with the bankrupt state of the national treasury, seriously handicapped the early efforts to re-establish a sound training program. United States assistance in the form of arms, equipment, and funds overcame the initial handicap. Other obstacles were the infiltration of Communist elements which had largely made up the wartime underground units and the Communist-led rebellion in Indo-China since 1945. Despite these difficulties, France has made notable progress since 1950.

Officer training in the army begins at the interarms school, L'École Speciale Militaire, at Coëtquidan. Officer cadets are accepted in approximately equal numbers from the ranks and from civil life. Graduated as commissioned officers, these subalterns round out their basic training in schools of application maintained by the separate arms. Advanced training becomes available to older officers whose records of performance, validated by competitive examinations, qualify them. The ladder of advancement to high command and senior staff positions is roughly comparable to that maintained in the United States, except that France moves faster in selecting, training and promoting outstanding young officers. The top rung is occupied by the Institute of Higher Studies of National Defense, designed to educate senior officers of all components of the military establishment and also outstanding civilian officials and statesmen.

Plans for the training of enlisted personnel are aimed at giving all prospective conscripts two years of preparatory military training, beginning at the age of 17, under the direction of the Ministry of National Education, and a further year under military direction. The latter year covers much of the content of normal basic training. The 18-month period of obligatory service begins at the age of 20. Individual regiments are responsible for the first six months of this training; thereafter the conscripts are assigned to various divisions in continental Europe and French North Africa. A small percentage of the best prospects are selected early for assignment to noncommissioned officer and specialist schools. Most of the men who complete the tour of compulsory service are placed in the active reserve. If qualified for advancement, they may continue in uniform as professional soldiers or become candidates for a commission.

France has long depended heavily on colonial troops to round out her metropolitan nucleus. Some levies, like those of North African peoples, are wholly native in their composition. Others are mixed, with French officers and noncommissioned officers providing needed leadership. Also, one finds special units made up wholly of French residents in colonial areas. Recruitment is on both a voluntary and a compulsory basis. For the most part colonial troops serve in their homeland areas in peacetime. Training, especially for the long service professionals, is rigorous, and has proven its merit on the European and Asiatic battlefields of two world wars.

Since 1948, annual maneuvers have been a standard feature of training. Insofar as funds have permitted, major elements of two or more of the army, air, and naval components have been included.

Both the navy and the air force were handicapped after 1945, even more so than the army, by lack of equipment. By 1953, the air force was overcoming this shortage; the navy, slated for a relatively minor role in the Western defense system, was still using reconditioned prewar shipping. Both of these elements depend in part on voluntary recruitment and in part on conscription for enlisted personnel procurement. Training standards for all ranks are comparable to those maintained by the army.

USSR.—No secrets of the Communist world are more closely guarded than those relating to the armed forces of Russia and her satellites. Enough information, much of it from refugees

escaping from the Iron Curtain area, has become public knowledge to permit sketching the major outlines of the military establishment. The universal military service law of 1939 established compulsory service for all classes of male citizens. Military service for women is not mandatory, but women previously trained along certain technical lines may be called up for military training and service. Physical standards are substantially lower than those prevailing in the Western World, but they are more carefully applied in determining the assignments of the conscripts. During World War II, the military establishment reached a peak strength of about 12,000,000. The quality of the manpower and its training, however, declined during the final two years of the war to the point where much of the army was no more than an armed mob, depending on "human wave" tactics of assault after heavy and prolonged artillery fire had been delivered against the German defenders.

Postwar demobilization provided the opportunity to screen out roughly two thirds of the least effective personnel, leaving a core of about 4,000,000 young, battle-trained men. That level has been substantially maintained since 1947. Extensive retraining of this initial nucleus to convert the ground forces into a modern, mechanized army was a first step. It was some years, however, before adequate equipment became available for the field forces and the training centers charged with development of new conscripts.

Officer material is derived almost wholly from two major sources. The Suvorov schools initiate the education and training of selected boys below the teen-age level, carrying on for seven or more years. Graduates are admitted to officer candidate schools, usually after a period of duty with troops. Enlisted men and civilians are likewise admitted after examination to these schools. Courses vary in length, depending chiefly on the technical requirements of the arm or service for which the candidate is preparing. Graduates are commissioned as junior lieutenants. After a few years of service with his arm, the young officer becomes eligible for admission to an advanced course, designed to prepare him for duties up to the battalion commander level. Thereafter, the selective principle is applied increasingly until only the ablest and best educated are eligible for admission to schools comparable to the various war colleges in the United States. At every level, full political reliability is a major criterion for selection.

Conscripts may be assigned to the army (including the air force), the navy and its air arm, or to the carefully picked MGB internal security troops. Possibly half of the group annually arriving at conscription age are inducted. Most of these have had some prior training, beginning at the age of 15, in the various youth organizations maintained by the government. Periods of compulsory active service range from two to five years, the longer periods being required for technical specialists and men promoted to noncommissioned grade. Men who are exempted or deferred usually receive enough training on a reservist basis to make them available for incorporation into reserve divisions.

The training period covers the entire year, is extremely intensive and realistic, and embraces all the conditions of terrain and climate which an armed force might expect to encounter within the areas controlled by Russia and its satellites. Combat conditions are closely simulated in all unit exercises, including the large-scale fall maneuvers. Particular effort is made to build up the strength and endurance of the individual and then to put him to extreme tests of his physical and mental reserves.

In the decade prior to World War II, Russia made strenuous efforts to develop an air force comparable to those of the Western powers. Performance during the war indicated that she was far short of that goal as late as 1945. Prospective pilots were largely recruited from paramilitary youth organizations and junior military schools operating throughout the Soviet Union. The greatest single obstacle to effective development was inherent in Russia's technical backwardness, affecting performance at all levels from ground crew maintenance to aircraft operations. Postwar efforts to eliminate these shortcomings through intensive and prolonged education appear to have had some success. Inasmuch as the air arm is divided into three sections, operating severally under the direction of the army, the navy, and the MGB, operational education and training are closely geared to the air support requirements of these separate components.

The development of the Russian navy has long been hampered by a tradition of ineffectiveness and a record of disastrous defeats. An opportunity to break away from that handicap occurred with Russia's seizure in 1945 of Germany's latest model submarines and the capture of German technical personnel skilled in the design, manufacture, and operation of such craft. How far she has capitalized on those assets is unknown. However, high pressure has been applied by Moscow in recent years to raise the standards of training, education, and morale.

Russia's European satellites are a potential, possibly a real, asset to her military power. Postwar reorganization of the several military establishments began with the wholesale elimination of personnel whose love for Russian dictatorship was in doubt. The build-up and training of new forces around a core of politically reliable men has continued to the present. Results have been mixed, judged by the continuing defection and escape of military personnel. Performance standards appear to be well below those of native Russian forces.

United Kingdom.—The British training system, like that of the United States, is closely geared to the separate and combined needs of the nation's varied composite of armed forces. The nucleus of the British Army, Royal Navy, and Royal Air Force is found in their career officers and professional, long-service, volunteer enlisted personnel. It is rounded out by the Territorial Army and reserves of the major components. A large fraction of the enlisted force of the army's active service units consists of conscripts inducted under the National Service Act of 1947, calling for two years of active service by youths who have reached the age of 18, and eight years in one of the reserves. Such reserve duty may be taken in the Territorial Army, comparable to the United States National Guard, which becomes available for overseas duty only when required by major emergency, as determined by Parliament. Voluntary premilitary training is made available to youths in the 14-18 year bracket. It provides an excellent source of potential noncommissioned and commissioned officer material. Since 1940 all premilitary and basic military ed-

ucation has devoted considerable time and effort to indoctrination in the obligations of citizenship. Women's services, maintained on a voluntary basis, were integrated into the three major components in 1949.

Army basic training for enlisted personnel is carried out by the separate branches of service and is continued in the unit to which the recruit is assigned. Recruits who demonstrate aptitude for leadership or technical abilities are early selected for special training. Unit training is made progressive during the spring and summer, leading up to combined maneuvers in the fall. Usually these are climaxed with exercises involving army, air force, and navy units.

Officer material is secured from a wide range of sources. Qualified candidates for a regular commission are sent to the Royal Military Academy, at Sandhurst. Graduates of the University Training Corps, similar to the ROTC in the United States, receive commissions in the Territorial Army, while several all-arms officer cadet schools provide officers for National Service commissions. Separate arms and services schools are responsible for the training of enlisted specialists and junior officers. General schools serve the needs of all arms and services in areas of endeavor ranging from command and staff duty to pure science and technology. Admission to the latter is by selection. The selective process is used also in making up the quotas for the highest level interservice schools, ending with the Imperial Defense College.

The Royal Navy, bearer of the oldest British professional service tradition, gears its program of training and education to that tradition. Also, every Britisher realizes the navy's life-and-death role of keeping open the sea lanes connecting an overcrowded island with all parts of the world. These factors make for standards of performance not surpassed by any other naval force. The standards are greatly furthered by the popularity of the navy, indicated in its ability to recruit nearly all its personnel on a voluntary basis for initial enlistments up to 12 years in length. Only a small quota of 24-month National Service conscripts is needed to keep personnel strength at peacetime levels.

Three routes to a commission are provided. Candidates for a line commission are admitted directly from civil life by examination to the Royal Naval College, Dartmouth, at the age of 16, or by special entry after a few years of service at the enlisted level. Courses for both groups include a period of fleet service after completion of the Dartmouth requirements. Candidates for commissions in various administrative and technical lines are secured at a higher age from among young men educated in the desired fields at civilian institutions. Advancement in rank, automatic at the outset, early becomes selective as officers qualify for admission to a progression of graduate schools, successfully complete their courses and prove their merits in fleet service. The most important postgraduate school is the Royal Naval College, Greenwich. Its courses embrace most of the range of technical, staff, and general educational fields open to the line officer or specialist. Limited numbers of officers are sent to interservice schools and finally to the Imperial Defence College.

Premilitary training for enlisted personnel may begin ashore in a boy's 16th year. Basic training, likewise ashore, begins at 18. Both include considerable general education. The young seaman completes the practical and technical parts of his training on shipboard, along with instruction in educational matters of importance to a seaman. Promising men are screened out for advanced training to become specialists and petty officers. The very best are permitted to qualify for commissions. The annual training program is completed with fleet maneuvers.

Supporting the regular establishment is the Naval Reserve and various types of auxiliaries. In effect, as recent wars have shown, all officers and sailors of the merchant marine and the fishing fleet constitute a general naval reserve. Ample opportunities are provided for part-time training of such personnel.

The Royal Air Force, youngest component of the national defense system, is extremely selective in the procurement of its air crews, both commissioned and enlisted. The great bulk of the National Service men taken in are assigned to ground crew duties; in fact the short period of required service makes such action mandatory. Premilitary instruction for apprentices in technical trades is provided for boys. At the age of 18 they may be accepted for a 12-year enlistment. At a corresponding age, youths who wish to fly may join a training squadron. The best of both groups are given the opportunity to qualify for commissions.

The major nucleus of general-duty air officers is produced by the RAF College, Cranwell. After a period of commissioned service, junior air officers receive training in various specialties. Some years later they may be selected for advanced training in high command and general staff duties, and still later for courses at interservice schools. Operational training includes participation in annual exercises for all components of the armed forces.

The basic principles underlying the training system of the Royal Air Force are not dissimilar from those of the army. The major distinction occurs in the vastly greater emphasis on technical training, not only to develop personnel concerned with flying duty, maintenance of aircraft, research, and so forth, but also to provide the specialists who operate the aircraft warning system and the anti-aircraft artillery installations. The enormous expansion of the RAF during World War II entailed a number of short cuts in the procurement of commissioned personnel and enlisted specialists. In recent years standards for acceptance have been raised, particularly in the procurement of officers. In general, the officer candidate must now serve a period as an enlisted man before he becomes eligible for a commission. Cadetships are open to airmen who can meet the age and educational requirements, to youths from civil life, and to RAF apprentices who complete their term of service. General Duties cadets, the men earmarked for flying duty, are trained at Cranwell, where they receive both flying and ground instruction. Other institutions train cadets whose careers will be in the ground branches responsible for maintenance and administration.

Career officers after 10 to 15 years of service are sent to the RAF Staff College, in preparation for high command and staff duty. Selected officers are later ordered to the Joint Services Staff College and a limited number to the Imperial Defense College.

The United States.—The National Defense Act of 1916, amended in 1920, along with com-

plementary laws for the navy provided for a small peacetime professional nucleus. In theory it called for rapid expansion to meet a military emergency, initially through the absorption of reserve elements into active full-time service, thereafter through the mobilization of the untrained reserve of able-bodied male citizens at the call of Congress. The rate and cost of actual mobilization after Pearl Harbor disclosed the unsoundness of the policy in fact if not in theory. Only one aspect of this failure, namely peacetime training and education, is of interest in this connection. Insofar as appropriations permitted, the schooling of officers and of potential officer material during the years between the two world wars was the brightest spot in the picture. The establishment of several new basic and advanced schools for the various arms and branches (like the Infantry School, Fort Benning, Ga., and the Signal School, Fort Monmouth, N. J.) assured the steady development of competent troop leaders. At the next level, an expanded Command and General Staff School, Fort Leavenworth, Kansas, turned out increasing numbers of officers trained for higher command and staff duties. Top-level schools like the Army War College and its navy counterpart used the lessons of World War I in their studies of grand strategy and their draft of war plans. A newcomer was the Army Industrial College, charged with research and training in all matters affecting wartime economy.

The largest single instance of expansion occurred on the campuses of more than a hundred colleges and universities, where the Reserve Officers Training Corps was expanded to prepare civilian students for the duties of junior officers. The availability of that backlog was of inestimable value in transforming the early millions of draftees into combat-worthy soldiers. In addition, a greatly improved National Guard program, including the assignment of selected officers to all levels of courses maintained for the Regulars, helped to ready that second line of defense for active service. Lastly, provision was made for the training of enlisted specialists, both in military establishments and in selected industrial plants.

In sum, such steps marked a great advance over pre-1917 conditions. The benefits, however, were sharply limited by the fact that the shortage of both funds and troops made it impossible to put classroom theory to the test of field maneuvers. That condition was corrected in the army only when the modest expansion of forces in 1940 made it possible to assemble skeletonized divisions and combat teams. The most serious deficiency, one in which United States ground forces lagged far behind the German military machine, was the lack of modern weapons and equipment. Without the weapons, there could be no realistic training. The navy, although with a greatly reduced complement of ships and men, had continued its policy of fleet maneuvers, including the testing of prototypes of modern ships.

Emergency legislation, beginning in 1940 with the Selective Service Act, was aimed at providing the men and equipment to put the armed forces on a fully modern basis. By the end of 1941 a respectable complex of training establishments was functioning in the United States and overseas territories despite the fact that much of the training was done with World War I types of weapons and improvised matériel. The global nature of the war was reflected in the opening of training centers designed to develop units for combat under the widely diverse requirements of jungle, desert, polar, airborne, and mountain fighting. Heavy emphasis was given to the joint army-navy techniques of amphibious warfare, in preparation for the storming of enemy-held beaches. Ground forces and army-air force tactical elements, taking a lesson from Germany's military successes, cooperated to provide team play in the coming battles; and the first steps in the direction of triphibious warfare were undertaken. Field maneuvers at this early stage showed more shortcomings than successes, clear evidence that the training of United States forces lagged far behind that of its major enemies. In one important aspect, that lag could not be overcome. German and Japanese troops (as also the Russians) were trained to push advancing infantry and armored elements forward into, rather than up to, supporting artillery fire. Combat statistics clearly show that the resulting losses from friendly artillery fire run far lower than those suffered when the defenders, recovering after the fire has passed beyond them, man their weapons and cut down the attackers. Despite this fact, American public opinion has never tolerated adoption of such realistic assault techniques.

Mid-1943 found all training establishments filled beyond capacity. These included not only the military camps and stations, but also some hundreds of colleges where accelerated courses were being given to selected students in uniform, and a wide range of industrial plants conducting courses for maintenance personnel. Officer candidate schools were for a brief period turning out a surplus of lieutenants. In the process, the original educational requirements for an officer candidate had been repeatedly reduced to a point where in time it was to become—and still remains—a serious problem. Training abroad, notably in the growing establishment in Great Britain, had assumed large-scale proportions. The shortage of modern weapons in these camps gradually disappeared. One year later many of these activities had been sharply curtailed, partly because the pipeline of trained personnel had in many respects been filled, partly because the demand for ground forces—chiefly of the infantry—had fallen behind planned combat requirements. Wholesale retraining of antiaircraft troops, originally tailored for home defense needs, and of Army Air Force ground elements, to convert them into infantry, was the order of the day. More than 100,000 Army Specialized Training Program trainees were transferred to infantry divisions in the spring of 1944.

In the final test of the campaigns which first halted Axis aggression and then drove forward to victory on all fronts, the composite of training for all components proved its merit. One shortcoming showed itself after the fighting had ceased; the preparation of all ranks for the highly specialized duties of military government was seriously inadequate. While postwar demobilization was eliminating most of the major units and cutting the occupation troops into fragments, the job of policing occupied enemy territory had to be learned on the spot. The record of that experience makes unpleasant reading. For a while, combat training almost vanished from the picture, largely because the slender garrisons of

occupation troops were too much dispersed and too fully occupied with the business of military government. However, certain major lessons of the war were promptly reflected in the reorganization of the entire complex of the armed forces' system of officers' schools. The Army War College reopened as the National War College, the highest level institution for the training of selected officers of all arms and services, and likewise of State Department officials. A similar transformation converted the Army Industrial College into the Industrial College of the Armed Forces. The opening of the Armed Forces' Staff College under the navy's direction provided for advanced training in the staff and operational aspects of amphibious and triphibious warfare. Moreover, all high and medium level schools operated by each of the three major services arranged to accept quotas of student officers from the other two. Lastly, the wartime practice of including quotas of officers from allied countries was continued on an expanded basis. The value of such moves toward unification in the training of United States officer personnel and toward some integration with allied nations proved itself after 1950, when Communist aggression compelled the rebuilding of the Western World's defensive strength.

The reorganization of training at the troop level came more slowly. Large-scale field exercises as well as major naval and air maneuvers were impossible after the trained manpower available in the United States became inadequate for such exercises. This situation was reversed only when militant communism's aggressive intentions were made clear by a succession of major actions in both Europe and Asia. For four years Congress' reaction, expressed in sporadic increases in armed force strength and subsequent decreases as Communist pressure declined, had been reflected in corresponding ups and downs of military training. The chain of events beginning with the Communist effort to seize South Korea placed the United States on a basis of partial mobilization. By 1953 trained forces and equipment were on hand to restore some military stability on all major fronts. The same year brought the first real results of the efforts to give tactical application to atomic power. Three years earlier the air force and the navy had expanded their training programs for the strategic use of atomic missiles. The disclosure of Russia's possession of the secret of atomic power compelled the three armed services to organize joint defensive measures for protection of the North American continent and key installations overseas. Close defense of strategic areas in the interior required the army and National Guard to organize and train anti-aircraft units, working in cooperation with air force interceptors. Radar teams were trained to man wide-flung networks in the United States and Canada, and in advanced areas occupied by American troops abroad. All such training, along with officer education, was complemented by a program aimed at delivering, when necessary, full-scale retaliatory attacks against selected Communist installations. In early 1954 all such measures had advanced far enough to warrant the administration's announcement of a new policy, combining a reduction in United States armed force strength with greater dependence in the future on the most modern weapons and techniques, notably the strategic A- and H-bombs and the expanding "family" of modern tactical weapons and missiles used by the army and navy. See NAVAL EDUCATION.

NATO.—The most complex peacetime training system on record is the effort to blend the NATO military forces into a strong, flexible, and fully integrated force for the defense of Western Europe. It is best viewed from the top down. The NATO Defense College, opened in Paris in late 1951, trains quotas of selected staff officers and civilians in the fields of NATO strategy and its military implementation. At the NATO headquarters, on-the-job training continues this program. Language and area instruction are emphasized. The effort to provide troops with standardized weapons and equipment requires the extensive use of training crews for familiarization purposes. Field tests of the efficacy of these methods are frequent. Maneuvers in some instances have involved operations embracing bases in the North American continent, and the sea, air, and land lines of communications to NATO's advanced positions. Smaller exercises for single components and for units of the ground forces down to combat team level, as also for their air and naval counterparts, are regular features of the annual training program. At the end of 1954 there remained the problem of the joint effort to institute a system of training to ensure the earliest possible development of Western Germany's prospective increment to the NATO forces. The task was expected to fall chiefly on a United States training mission inasmuch as most of the arms and equipment were of American origin.

International Cooperation in Military Education.—Leading military institutions the world over have always been a Mecca for career officers bent on getting to the top of their profession. Military allies for at least two centuries past have practiced some system of exchange of student officers. More recently officer candidates have been entered as cadets in foreign countries. As of June, 1952, for example, the roster of the United States Military Academy included 17 foreign cadets, most of them from Latin America. Foreign officers in much greater numbers were at the same time enrolled in the graduate schools of our three armed services. In turn, United States officers are sent abroad for military study.

Military Missions.—One more device looking to cooperative military effort is seen in the assignment of military missions to friendly nations with a view to improving their defense establishments. The United States military mission in Greece was a vital factor in re-creating the national forces which in 1949 eliminated the Communist army from that country. The United States mission in Turkey has since 1947 supervised to excellent effect the education and training of the Turkish armed forces. Other missions in Iran and Formosa are working to the same end. The great majority of United States military missions, however, like those assigned to Latin American countries, are operating under conditions of less urgency than those just cited. The program does much to promote sound liaison and understanding, and—more specifically—to inculcate a common application of tactics and techniques. Above all it should facilitate common action against a common foe in an hour of crisis.

HERMAN BEUKEMA.

MILITARY ENGINEERING. Military engineering is that branch of engineering science

applied under the direction of military commanders to maintain and increase the combat effectiveness of military forces. Specifically, military engineering is used to facilitate the movement and supply of friendly forces, to impede hostile movement and supply, and to provide for the shelter and comfort of friendly troops. The work may be carried out by engineer troops, or accomplished under the supervision of engineer officers by details of troops from other arms, by civilian labor, or by a combination of these means. Engineer troops are organized, trained, and equipped for carrying out such work, and also, in the usual case, for combat as infantry.

Military engineering work may be divided into those activities prosecuted in the theater of operations, which is the territory occupied and organized by the field forces for the carrying on of hostilities, and into those activities carried on in the zone of the interior, which is that part of the home country which remains under civil administration.

Military Engineering in the Theater of Operations.—Engineering work designed to facilitate the movement and supply of friendly troops consists in the main of the following: (1) engineer reconnaissance of roads, railroads, bridges, facilities, defensive positions, campsites, and engineer materials available locally; (2) the procurement or making and distribution of maps and map substitutes for the use of the military forces; (3) the removal of obstacles to movement; (4) the provision of boats and footbridges to assist infantry across streams; (5) the bridging of streams to insure the mobility of the artillery and supply columns; (6) the repair of roads by filling shell and bomb craters, replacing demolished culverts, renewing the surface where damaged, and signposting the roads; (7) the repair, extension and operation of railroads, and the construction of wharves, supply depots, and similar establishments to facilitate supply (see MILITARY RAILWAYS); (8) the construction of landing fields and other facilities for the air corps; (9) the provision of a supply of water in areas which otherwise troops could not pass through or occupy; and (10) the execution of demolitions and creation of obstacles for the protection of flanks and lines of communication against motorized or mechanized raiding parties.

Engineering work designed to impede the movement and supply of the enemy consists in the main of the following: (1) the creation of barriers to enemy movement, including the execution of demolitions, and provision of obstacles; (2) the furnishing of technical assistance to other combat arms in the organization, fortification and camouflaging of defensive positions, and the furnishing of the necessary tools and engineering supplies; and (3) the construction of special works, such as command and observation posts for higher echelons and dugouts or bombproofs.

Engineering work designed to provide for the shelter and comfort of friendly troops consists of the construction of temporary cantonments, rest camps, and all engineer appurtenances thereto, and such other engineering works as are found practicable and desirable. In addition, engineer troops operate all utilities of general service to the military forces, except signal communications and such utilities as may be assigned specifically to other services, such as the quartermaster corps.

Certain elements of military engineering mentioned above are discussed in detail in later paragraphs.

Military Engineering in the Zone of the Interior.—The following military engineering is carried on in the zone of the interior, both in peace and in war: (1) the preparation of technical literature; (2) the provision of permanent defensive works, including participation in the selection of sites, preparation of plans and estimates, and construction and repair of fortifications, including the procurement, installation, and maintenance of such accessories therefor as searchlights, electric power and lighting systems, and fire control systems; (3) the preparation, reproduction, and distribution of military maps, including co-operation with other government and private mapping agencies, and reconnoitering and surveying for military purposes; (4) the development, procurement, storage, and distribution of engineer equipment and supplies and certain other equipment; and (5) the development of bombproofing and camouflage technique for the protection of important installations such as air fields and vital manufacturing plants.

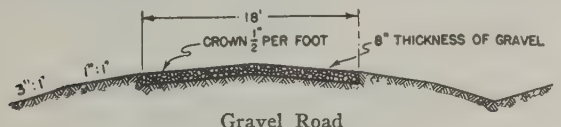
Military Roads.—The tactical plans of the commander, the supply arrangements made necessary thereby, and the condition of the roads in the area determine the type and amount of military road work which must be done. This is held to a minimum but must be adequate. Generally, combat troops with modern transportation are able to move over any roads if obstructions are removed, but the roads require maintenance because of heavy traffic caused by supply, evacuation, and replacement requirements. This traffic moves between supply and evacuation facilities, generally at the heads of railways leading to the front, and the combat troops. In determining the number and location of roads to be maintained, attention must be given to the locations and requirements of combat elements and to the capacity of the roads in vehicles over a period of time. Though the theoretical capacity in vehicles per hour of a one-way, one-lane road is about 2,000, the actual working maximum for military traffic is only about 750. Considering traffic friction and time lost due to turnouts and turnins, the working capacity for a two-lane road with traffic moving in both directions is about an average of 250 vehicles per hour in each direction, though a higher rate may be obtained for short periods by special effort. These capacities will be cut down if, due to enemy air power, supply must take place only at night or with vehicles moving at increased intervals. In addition to maintenance of supply roads, some construction will have to be done at supply facilities.

Special definitions used in connection with military roads are as follows: *axial road*—a road leading toward the front and generally perpendicular thereto; *main supply road*—an axial road designated as the principal traffic artery of a division or higher unit; *belt road*—a road parallel to the front, also known as a lateral road; *reserved road*—a road, the use of which is reserved for some particular unit by higher authority; *strategic road*—a main arterial highway which lends itself to the whole-

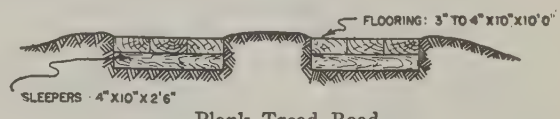
sale movement of troops and supplies over a considerable distance in furtherance of a general strategic plan, and which is usually constructed as part of the highway system of the country; and *tactical road*—a road over which troops or supplies may be moved for the execution of a specific, limited operation.

Military roads are classified as standard roadways, and improvised or hasty roads. Standard roadways may be of high-type, hard surfaces, such as brick, concrete, or macadam; or low-type surfaces such as gravel, shell, coral, sand clay, or earth. Improvised roads include plank roads, corduroy, wire-mesh or expanded-metal roads, tread roads, and trails.

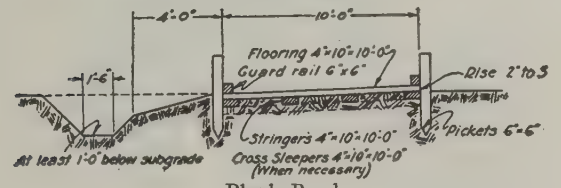
Minimum design requirements for strategic roads in the United States are: (1) high-type surfacing at least 20 feet wide to support 9,000-pound pneumatic wheel load; (2) in flat or rolling country, grade and curvature not to exceed 5 per cent in lengths greater than 500 feet and 6 degrees respectively; in mountainous regions, limitations are 8 per cent in lengths greater than 500 feet and 14 degrees respectively; (3) vertical clearance, 14 feet; (4) capacity of bridges—to carry 15-ton vehicles; and (5) minimum sight distances—nonmountainous, 1,000 feet, mountainous, 650 feet. The basic requirement for a tactical road is that it carry the traffic satisfactorily. However, a minimum width of 9 feet for one-lane traffic or 18 feet for two-lane traffic is desirable; grade should not exceed 10 per cent; radius of curvature should be in excess of 150 feet, or additional width of 10 feet should be provided; and overhead clearance of at least 11 feet is required.



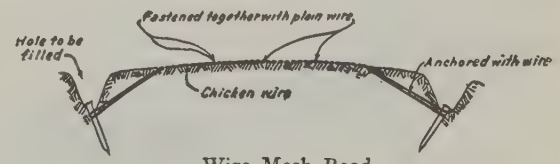
Gravel Road



Plank Tread Road



Plank Road



Wire Mesh Road

EXAMPLES OF MILITARY ROADS

The fundamental requirement in construction and maintenance is to provide and keep up an adequate drainage system, an adequate foundation, and a suitable road surface. Measures used to provide drainage are, as in civil practice, adequate crown, side ditches, culverts, and if necessary, subdrains. Maintenance generally consists of keeping these facilities working. In providing a suitable surface, crushed rock or gravel, with or without bituminous treatment, will be used as a rule. In general, maintenance will consist of repairing with materials available any damage to the surface.

Ordinarily, roads are constructed, repaired, and maintained by general engineer troops assigned or attached to the various command echelons such as the division. Only emergency work to let troops pass is done by the forward engineers, who are backed up by units further to the rear, doing heavier work.

Boats and Footbridges for Infantry.—The necessity for obtaining control of ground on the opposite bank of a stream before vehicular bridges can be built requires some means of moving infantry over such an obstacle if it is unfordable for foot troops. These means usually consist of standard equipment, provided organically in the service for such use. Such equipment consists generally of pneumatic rafts, assault boats, standard footbridges, standard cartbridges, or ponton boats used for ferrying. In addition, improvised rafts and footbridges may be used. Floating improvised types use gasoline drums, cans, wooden floats, or other expedients for buoyancy; nonfloating expedients may be simple stringer, light trestle, or pile-bent bridges.

As to the types of standard equipment provided, pneumatic rafts are not used in the United States Army, though foreign armies make use of them. The United States assault boat, used for passing assault waves of infantry over streams, is of a conventional skiff type about 13 feet 6 inches long, with a flat bottom, a square, slightly sloping stern, and a pointed bow. It weighs about 200 pounds. The skin of the boat is of ¼-inch fur plywood, highly resistant to moisture. With a minimum of 6 inches freeboard, the boat displaces 3,200 pounds, and will carry 11 men or an equivalent load. Boats are carried by truck, 10 boats being a standard load for a 1½-ton engineer dump truck, and are launched by hand. They are propelled by paddling or by a 4½ horsepower outboard motor. Usually engineer crews of two men are provided. The United States foot or cartbridge equipment consists of duckboards and floats with other appurtenances. The floats are white pine crates, containing expanded rubber blocks. The duckboards and floats may be assembled to provide a passage 22 inches wide for foot troops, or a passage 5 feet 6 inches wide for carts. The cartbridge uses three times as much equipment per length of bridge. A unit of footbridge equipment (432 feet of bridge) is carried in four 1½-ton dump trucks. The bridge is assembled in bays or sections on the shore, and the bays are carried to the water, floated, and fastened together. Trained engineer troops have built 350 feet of this bridge in a three-mile current in daylight in eight and one-half minutes. Ponton boats, which may be used for ferrying infantry, are mentioned in the following paragraph.

Vehicular Bridges and Stream-Crossing Expedients.—Lines of communication such as roads and railways must be kept intact to be of value. Their particularly vulnerable

points are bridges. In addition, bridges or other means of crossing streams are needed by the vehicles accompanying the combat troops, such as the artillery. The provision and maintenance of bridges and other means of crossing streams is therefore an important engineering duty.

Special definitions used in connection with military bridges are as follows: *balk*—standardized stringers of a floating bridge; *bent*—an intermediate, transverse support of a trestle or pile bridge, consisting of a framework of horizontal and vertical members; *chess*—standardized floor planks of a floating bridge; *ponton*—a float, often in the form of a standardized boat, used to provide buoyancy for the superstructure of, and the imposed loads on, a floating bridge.

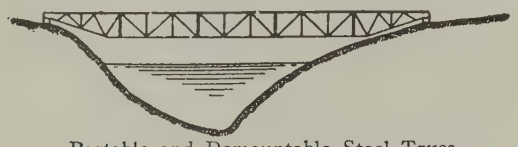
Military bridges are classified as floating and nonfloating. The commonest types of floating bridges are those built of the standardized ponton equipment with which every army is provided. Such bridges may be constructed in a minimum of time and over any waterway which provides the necessary depth of water to float the boats. Ordinarily, light and heavy ponton equipment with which to install light and heavy vehicular bridges is provided. The light equipment used by the United States Army will carry 10 tons, and may be reinforced to carry 20 tons by using additional pontons and balk. The heavy equipment will carry 25 tons, and may be reinforced to carry about 45 tons. One unit of equipage for these bridges will provide about 250 feet of standard bridge and about 125 feet of reinforced bridge. Generally, the equipage is maintained and transported on trailers by engineer troops especially provided for these purposes. In the absence of the standardized equipment, ponton bridges may be built with improvised supports consisting of metal drums, wooden rafts, or boats.

The commonest types of the nonfloating military bridges are single-span stringer bridges, trestle and pile-bent bridges, lashed-timber bridges, and bridges constructed of standardized portable girder equipage of high-strength steel. Most armies are now provided with such equipage, which can be transported on trucks and used to build light or heavy vehicular bridges over spans up to about 125 feet. Equipment used by the United States Army is classified as light and heavy and is suitable for loads up to about 40 tons.

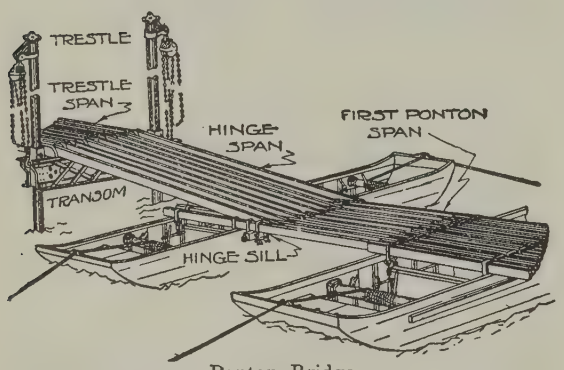
In the design of military bridges, factors of safety are reduced considerably below those used in civil practice. In the latter, the factors are usually 4 to 6 for wood and 2.2 for steel. Military practice uses 3 for wood and 1.75 for steel. In addition, allowances for impact and the like are somewhat reduced, the idea being to save materials, transportation, labor, and time, since ordinarily the bridge to be built is not permanent. Design standards contemplate provision of a 10-foot roadway for single-lane traffic, and 18-foot roadway for two-lane traffic, and at least 11-foot overhead clearance.

In building trestle or pile-bent bridges, it is desirable to follow a standard design whenever possible, since, thereby, materials to be stocked in engineer depots may be standardized, and personnel trained to erect such bridges quickly. In the United States Army standard design for a trestle bridge to carry loads of 15 tons has the following characteristics: bents—framed from 6- by 8-inch timbers, the thickness of the bent being 6 inches, the posts 4 in number with a height not to exceed 16 feet, the bent braced with 2- by 10-foot lateral bracing; stringers—either wooden or CB steel beams, the wooden stringers consisting of eight 6- by 12-inch timbers not exceeding 16 feet in length, or the steel beams, six in number, not exceeding 25 feet in length and of a suitable size; and flooring consisting of two thicknesses of 3- by 12-inch timbers, the lower layer across the stringers, and the top layer forming two treads 4 feet in width along the bridge. The trestle bents must be braced along the bridge with longitudinal members of 2- by 10-inch timbers. This bridge may be modified to carry only 10-ton loads by omitting a suitable number of stringers and the top layer of flooring. It cannot be easily strengthened to carry over 15 tons.

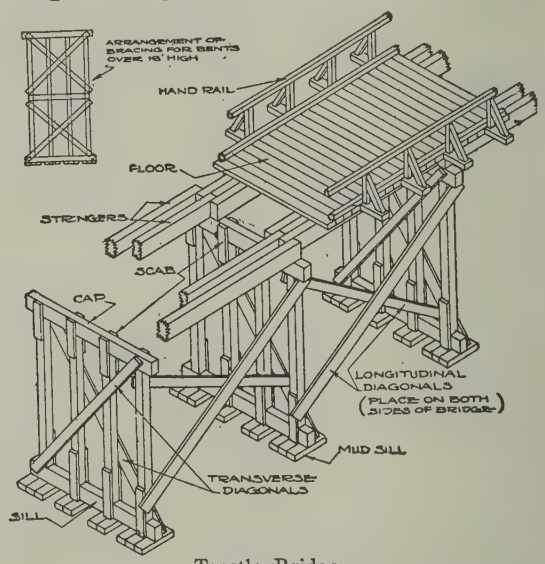
In addition to building bridges, military engineers are trained in rapid estimation of the



Portable and Demountable Steel Truss



Ponton Bridge

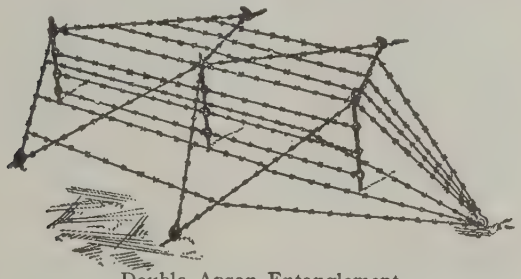


Trestle Bridge

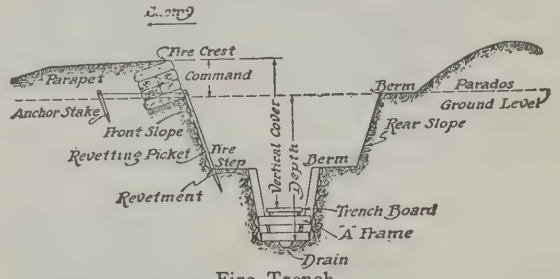
TYPES OF MILITARY VEHICULAR BRIDGES

load capacity of existing bridges, and the quick reinforcing of bridges unsafe for expected loads.

Means other than bridges of crossing vehicles over streams are fords, passage on ice, and passage by boats, rafts, and ferries. Assuming moderate currents and hard bottoms, streams, in general, are fordable when depths do not exceed the following: for infantry, 3½ feet; for cavalry, 4½ feet; for artillery (horse drawn) and for wagons, 3 feet; for trucks, 2 feet; for light tanks, 1-3 feet; for medium tanks, 2-4 feet; for heavy tanks, 4-6 feet. Fords as a rule are located and prepared or improved by engineer troops. Crossing by ice is an expedient which rarely will be used, but may be found valuable in northern sections of the country. New, sound ice in floating contact with the water will bear the following loads: 3 inches, small groups of men; 4-5 inches, cavalry in small groups; 7 inches, wagons and 75-millimeter guns; 9-12 inches, 10-ton loads; and over 20 inches, 20-ton loads. In freezing temperature, the thickness may be increased by flooding the surface. The laying of wooden treads or 6 inches of straw on the passage will considerably increase the bearing power. However, this figure varies considerably under different circumstances, and all precautions should be taken both in establishing the crossing and using it. Passage by boats, rafts, and ferries has the objection that it is a tedious and slow process for large bodies of troops and transport. However, it will be used frequently. The type of crossing provided will depend on the equipment or materials available. The best crossing of this type is constructed with standard ponton equipment, using three pontons, balk, and chess to form the raft, and propelling the raft with a ponton and outboard motor. In the absence of such equipment, ferries may be propelled by hand, by motors on the shore, or by utilizing the force of the current by turning sidewise the boats supporting the raft.



Double Apron Entanglement



Fire Trench

TYPES OF FIELD FORTIFICATIONS

Organization of the Ground for Defense.—When a military force is on the defensive on part or all of its front, the terrain at these locations is prepared for defense by the deployment on the ground of the troops, arrangement of the available fire power, and the employment of field fortifications to strengthen the position.

In locating and constructing a system of field fortifications, an appreciation of the terrain is of vital importance, since field fortification consists primarily of strengthening its defensive value. Terrain is evaluated in terms of six factors: observation, fields of fire, cover, obstacles, routes of communication, and general conformation of the ground. Observation over enemy approaches and over the battle position itself enables the fire power of a unit, including particularly that of the artillery, to act effectively. Therefore, defensive positions are located to utilize and protect important observation. Adequate fields of fire allow the full fire power of the unit to be brought to bear. Cover allows concealment from hostile observation, both from the air and ground, limits action of enemy artillery and aircraft, and confronts the attacker with tactical surprise. Obstacles hinder movement of the enemy and hold him under the defenders' fire. Routes of communication affect the possible supply arrangements of both the attacker and defender. Conformation of the ground, such as ridges perpendicular to the enemy's approach or valleys leading into the defensive position, affect both the possible organization of defensive fires, and the ability of the attacker to bring his fire power into play.

In organizing a position, tactical organizations such as regiments, battalions and companies occupy and fortify localities along the position for all-around defense. Such positions have both width and depth. For example, a regimental position may have a width, or sector, of from 1,600 to 4,800 yards, and a depth of from 900 to more than 1,800 yards. Positions of smaller units have correspondingly smaller dimensions. In addition, some units are held in reserve. Within a regimental sector, the tactical localities are usually arranged for combat, mutually supporting fire, and counter-attack missions into four lines, from front to rear: the main line of resistance, the support line, the battalion reserve line, and the regimental reserve line. Of these lines, the first and the last mentioned are usually the most important to hold intact. In addition, there may be created outpost positions to the front and complete or partial battle positions in rear.

The positions as thus selected are strengthened by field fortifications. In hasty fortification work, the following would be carried out: camouflage of important installations, clearing fields of fire for machine guns, digging emplacements for machine guns and other important weapons, erecting wire entanglements, digging small pits for individuals, and digging shallow trenches connecting the pits. If time permits, additional work may convert the position into what is known as a deliberate fortification, in which there would be provided: standard fire and communication trenches, dummy trenches, additional wire entanglements and other obstacles to movement of personnel, antitank obstacles, artillery emplacements, splinter-proof

or shell-proof command and observation posts, and finally, protected shelters for all troops. The rule followed in such work is to carry on the most vital items first.

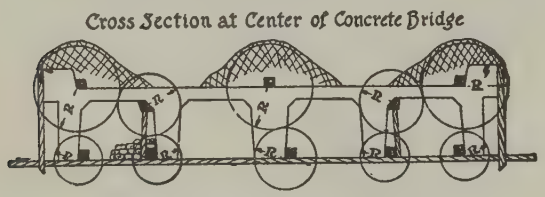
Ordinarily, the occupying troops organize the ground and construct the fortifications. Duties of engineers are to provide tools and materials and to execute works of general use, such as command and observation posts for higher units, communications for supply and evacuation, and all works of such a technical engineering nature that they are beyond the capabilities of the occupying troops. However, in the construction of rear battle positions or permanent fortifications, engineers would carry on the work. See FORTIFICATIONS; TRENCHES.

Barriers, Obstacles, and Demolitions.—Modern armies use large numbers of motor vehicles for reconnaissance, combat, transportation of troops and supplies, and for hauling artillery and equipment. These include motorcycles, scout cars, armored cars, tanks, trucks, and tractors. The use of this equipment greatly increases the mobility of the military force and its striking power, either in attack or counterattack. The means of minimizing the power thus created, for a force on the defensive in whole or in part, must consist of fire to destroy or damage the vehicles, or the blocking of paths by which the vehicles may advance. Military engineering is chiefly concerned with the latter: the creation of barriers to movement, consisting of obstacles.

Special definitions used in connection with barriers, obstacles, and demolitions are as follows: *mechanized unit*—a unit, the main portion of which is equipped with armored combat vehicles; *antimechanized defense*—a collective term including all measures for defense against mechanized units; *obstacle*—anything other than fire power used to impede or stop enemy vehicles; *barrier*—a group of obstacles used to block passage by motor vehicles through a region; *barrier tactics*—the use of obstacles defended by fire to further the plans of a commander; *road block*—an obstacle or group of obstacles used to block a road and the adjacent open terrain; *demolition*—the destruction of an object, such as a bridge, to deny its use to the enemy.

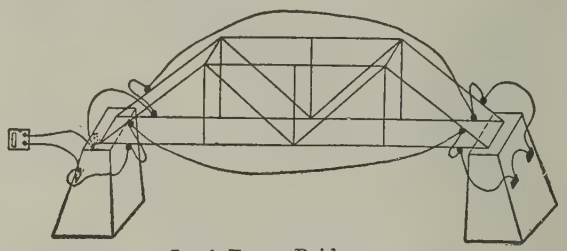
Obstacles may be natural or artificial. Natural obstacles include such terrain features as water courses, ponds, swamps, gullies, steep slopes, heavy woods, and the like. Full advantage must be taken of such features in creating a barrier. They are supplemented when necessary by artificial obstacles. These may be works of destruction such as destroyed bridges or buildings, road craters, inundations, and felled trees or telephone poles; or works of construction such as mine fields, gassed areas, tank ditches, fields of steel rail, wooden posts, heavy fences, cribs, cables, wire rolls, or barricades. Works of construction must be designed to deal effectively with the capabilities and limitations of the enemy vehicles which they are intended to stop.

Works of destruction are accomplished by demolition with explosives, by burning, wrecking, air bombing, artillery fire, or flooding. For the engineer, demolition by explosives is the most important of these means. Such a demolition should be thorough enough so that the enemy will be forced to replace the structure rather than repair it. To cut steel or wooden members of bridges, a quick-acting explosive is necessary, such as dynamite or trinitrotoluene (TNT), the standard United States military explosive. The destruction of a hostile tunnel is accomplished by firing a camouflet, a charge which exerts all its effect below the surface of the ground. Extensive damage to surface works, such as roadways, may be carried out by firing a mine placed underneath the works. Charges for camouflets and mines must be carefully gauged to obtain the desired radius of destruction and no more. If undercharged, the destructive purpose of the explosion is not accomplished; if overcharged, explosive will be wasted. Charges for cutting and breaching materials and for the charging of mines and camouflets are figured by empirical formulae used in the military services and founded on experiment and experience. Demolition men quickly become expert in the use of these formulae, and can predict the action of explosive quite accurately. The action of any charge is vastly increased by confining the action of the explosive in some manner, such as by sandbagging it or tamping thoroughly a shaft leading to a mine.



NOTE: *The 3 top charges tamped with mud, other charges held with sand bags or blocked in.*

Concrete Bridge



Steel Truss Bridge

PLACING OF DEMOLITION CHARGES

Organization and Equipment of Engineer Troops.—Engineer troops in the United States Army are organized, trained, and equipped to carry on the above duties, and are assigned as component parts of the larger units of the army, the smallest unit to which they are assigned being generally the division. Higher echelons, such as an army corps or a field army, have additional engineer units, the principle being to assign the minimum number of engineers to the lower echelons for carrying on ordinary missions. Generally, a division will have as a component part an engineer combat battalion; a corps, in addition, would have two engineer combat regiments, and a topographical company; and a field army, in addition, would have three general service regiments, six separate battalions, a topographical battalion, a camouflage battalion, a water-supply battalion, four light ponton companies, two heavy ponton bat

talions, and shop, dump-truck, and depot companies. Additional engineer units would be held in general headquarters reserve. Though the organization of different types of engineer units necessarily varies, the types which do general work, such as the combat battalion and the combat regiment, are composed of units similarly organized. The basic work unit is the platoon which has headquarters, an operating section of three squads of 12 men, and a tool section having pioneer, carpenter, and demolition equipment and supplies. Three platoons are combined into a company with company headquarters for command and administration. Three companies combine into a battalion with battalion headquarters. Additional equipment and supplies are usually carried by the company and higher headquarters. The equipment provided in engineer units consists of both hand and power tools. For instance, in the combat battalion for work on roads, there is an ample supply of picks, shovels, axes, log chains, machetes, saws, brooms, stone forks, rakes, road tampers, and wheelbarrows; also such equipment as drag scrapers, air compressors with air tools, gasoline-operated pavement breakers, tractor bulldozers, dump trucks, and a motorized earth auger. For work on demolitions, standard demolition sets are carried by each platoon, and in addition, such items as hammers, axes, saws, wrecking bars, and explosives. Generally, the equipment of a general engineer unit is such that the whole unit can be employed simultaneously, either on carpentry, pioneer, or demolition duty, or on other usual types of work. See also MILITARY RAILWAYS; MILITARY SCIENCE; OUTPOSTS, MILITARY; STRATEGY; SUPPLY RAILWAYS; TACTICS.

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MILITARY GOVERNMENT. See GOVERNMENT; MILITARY LAW—*Military Government.*

MILITARY HONORS, salutes and other marks of deference paid to army and navy officers, government officials and certain other distinguished individuals. See ORDERS AND DECORATIONS; SALUTES, MILITARY.

MILITARY HOSPITALS. See HOSPITALS, MILITARY.

MILITARY INTELLIGENCE. Evaluated and interpreted information upon which the armed forces base plans and preparations for war and conduct operations if war eventuates, is known as military intelligence. The complete processes by which military intelligence is produced and made available for use includes collection, collation, evaluation or analysis, interpretation, and dissemination. Dissemination must be accomplished in time for military intelligence to influence estimates, decisions, plans, and operations, or the very purpose of the intelligence organization is defeated.

Historically the term military intelligence is relatively new. This does not imply, however, that the function is new. It is as old as the first organization of men into a political body. After men had grouped themselves into a political body, collection of information essential to security ceased to be entirely an individual responsibility and became somewhat centralized in the chief of the clan or head of the nation.

The gathering and use of military intelligence was simple in ancient times as it always is among primitive peoples. With the passage of time nations became larger, civilization more complex, and the people more readily controlled and manipulated by their rulers. Industrialization and mechanization, communications, and the range, speed, and destructiveness of weapons accentuated the importance of military intelligence in all of its aspects. At the same time, the instruments and means for accomplishing the intelligence mission have been multiplied. New instruments, many of them highly technical and mechanical, have been superimposed on older means of gathering information, but many of these older ones, such as agents and political and military observers, still play a vital role. The intelligence organization of a great nation in the atomic age has, therefore, become an exceedingly complicated thing.

With the development of the means of communicating ideas and of influencing mankind in an ever widening area, the military intelligence agencies of the great nations progressively became more and more concerned with influencing the actions of friends and of enemies and with maintaining, by counterintelligence measures, cohesion within the nation and among allies. These disruptive and cohesive measures are continuous and worldwide and designed to create the desired results within geopolitical objectives. In some geopolitical objectives the aim may be merely the disruption of the established social and political order by measures short of force. In other geopolitical objectives the aim may include disruptive measures, economic pressure, and a minor application of force. In still other geopolitical objectives all of the previously listed measures may be employed as well as limited warfare, accompanied by guerrilla warfare and disobedience of prisoners behind the lines of the opposing armed forces. Finally, at a time of supreme crisis, when conflict takes on the pattern of total war, all possible measures are simultaneously adopted to bring about the destruction of the enemy, and opposing intelligence organizations, like the forces they serve, become locked in a titanic struggle for supremacy.

The military intelligence organization of a great power of the modern world is fantastically complicated. The responsible individuals who conduct the day-by-day affairs of the tireless, sleepless military intelligence organization must understand the past to comprehend the present in order to influence the future. They are almost as diverse in their skills as civilization itself, for almost every aspect of human knowledge has a role to play in modern military intelligence.

Each nation has adopted a military intelligence organization appropriate to the peculiarities of the government and its civilian and military institutions and to its relative situation in the world. It is only natural, therefore, that the intelligence organization of a repressive regime should be highly centralized, extremely secretive, extraordinarily suspicious, and devious.

The narrower field of combat intelligence, which is of direct and immediate concern to all organizations or elements of the armed forces from the lowest to the supreme headquarters directing the combined operations of a vast coalition, has become infinitely more complicated than

ever before in history. It is at the strategic and tactical levels that deficiencies or failures in the military intelligence organization and in the use of military intelligence are most obvious. This is well illustrated by the failure of American authorities to properly utilize available military intelligence in 1941. This failure contributed to the Japanese success at Pearl Harbor on December 7. Then, as on other occasions, the major fault was not with the intelligence agencies but with the commander in chief and his principal assistants who were responsible for decisions based upon the military intelligence presented. This and other historical examples indicate that the mere production of timely and accurate intelligence, important though it is, cannot insure national or coalition security. Military intelligence can be effective only when it leads to prompt and correct decisions followed by decisive action.

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MILITARY LAW. Distinguished from the law governing citizens in their relations to each other and to the state in their everyday affairs, military law is that which ordinarily governs the military establishment and which, under extraordinary conditions, may extend to government of the civilian populace and the civil machinery of the state. In the latter case it is known as martial law or military government, dependent upon the conditions under which it is invoked. As applied to the discipline and regulation of the armed forces of the United States, military law is operative in peacetime as well as in war. It is recognized as a distinct legal system by those clauses of the Constitution granting to Congress the power to make rules for the land and naval forces, exempting cases arising in the land and naval forces from the guaranty of jury trial in criminal prosecutions, and constituting the president as commander in chief. In this phase military law does not concern itself with rights of property or rights flowing from torts or contracts; its primary concern is the maintenance of good order and obedience among the members of the military establishment and the regulation of rights, obligations and status incident to such membership. It applies to the conduct of civilians to a very limited degree and then only through their direct relationship to the armed forces. An example is found in the case of civilians serving with the armed forces outside the continental limits of the United States and outside certain parts of the territories, made amenable by the uniform code of military justice.

Statutory military law applicable to the armed forces is found in the uniform code of military justice and in numerous other enactments of Congress regulating the organization and administration of the armed forces. Supplemental to the statutes is a great body of regulations and orders issued by the president by virtue of his powers as commander in chief or by the president and his subordinates in implementation of the statutes. There exists, also, a considerable volume of unwritten military law consisting of the customs of the service and of decisions and opinions in particular cases from authoritative sources. Illustrative of such opinions are those of the judge advocates general of the army, navy and air force and of the court of military appeals, an appellate agency. Another body of usages, generally international in origin, constitutes the "law of war." The law of war represents the efforts of mankind to regulate and ameliorate the rigors of warfare. The conventions of The Hague and of Geneva are largely codifications of the law of war.

The uniform code of military justice embodies the substantive and adjective criminal law for the American officer and enlisted person. It provides for the form, establishment and procedure of military tribunals and denounces offenses of military and civil type. Military offenses so defined include, among others, desertion, fraudulent enlistment, absence without leave, mutiny, willful disobedience, sleeping on or leaving post, unbecoming or discreditable conduct and frauds against the government. Civil type offenses include, among others, murder, rape, robbery, larceny, forgery, assault, and burglary. Persons subject to military law are also subject to local civil law. For example, should a soldier rob a man on the street of a village of some state of the union, the wrongdoer would be subject to trial by court-martial and would also be amenable to trial in the civil criminal courts of the state in which the village is located. The uniform code of military justice authorizes delivery for trial, upon request, of any member of the armed forces accused of an offense against the civil law of the requesting authority. The jurisdiction which first attaches is, generally, entitled to proceed. In practice requests by the civil authorities for delivery to them of offenders of military status are exceptional and isolated. The rules as to delivery apply in time of war as well as in time of peace. Jurisdiction of military tribunals does not, in general, depend on where the offense was committed.

Members of the military forces who are separated from active service by discharge or similar measures normally cease to be subject to the punitive processes of military law upon such separation. The uniform code of military justice provides, however, that a member of an armed service who obtains his discharge by fraud may be apprehended and tried by court-martial for his fraudulent act and, if convicted, for any prior offense. Re-entry upon active service does not revive jurisdiction with respect to offenses committed prior to separation. Any hiatus during which the individual ceases to be subject to military law, although but momentary, suffices to bar trial. Mere change of status, such, for example, as discharge of an officer from a reserve commission in the regular establishment, which discharge does not involve a period of nonamenability, has no effect upon the continuance of military jurisdiction. The rule that separation from military service casts off amenability to processes of military courts is rooted in the constitutional conception of supremacy of the civil over the military power and in the traditional right of the citizen jury trial where accused of crime.

The military law follows the armed forces

of the United States when they go abroad. Whether the occupation by the forces of foreign soil in such an event is friendly or hostile the forces and their personnel are subject to military law. The United States has historically taken the position that the presence in a foreign country of its organized military personnel does not render the force or its individual members amenable to the law of the country occupied. In cases of friendly occupation, agreements by treaty or otherwise delimiting jurisdiction are invariably sought. Legislative enactments by the occupied countries implementing the agreements are not uncommon. This immunity from local law, known in its general scope as extraterritoriality (q.v.), is essential to continued control by the United States of its armed forces through its own laws. Most other nations assert the same immunity in behalf of their own forces. The millions of American troops located during World War II in England, Canada, Iceland, France, Africa, Italy, China, India, Burma, Australia, the Dutch East Indies, Japan, and elsewhere were governed solely by the military law of the United States.

Martial Law.—The term "martial law" or "martial rule," sometimes loosely used as the equivalent of military law, is, precisely, the law or body of rules applied as a matter of necessity in domestic areas when civil government fails to function and the armed forces are required to assume control until civil processes and courts can be restored to their lawful places. Martial law applies only within domestic territory as distinguished from occupied territory of an enemy recognized as a belligerent. In its pure form it is nothing more or less than the will of the military commander who, because of unlawfulness and turbulence, assumes control of an area for the time being. It is usually implemented through the simple device of supplying armed sanctions to enforce the normal police and judicial activities of the civil government, disappearing as these activities become effective. It is oftentimes established by proclamation. Martial law, being an expedient resorted to only where there is no other operative law, is not recognized by the Constitution or by federal statute. Martial law has been proclaimed or otherwise established in the United States in numerous instances since the adoption of the Constitution. During the Civil War it was freely used in the border states as an instrument of control by the North where activities by sympathizers for the Southern cause resulted in uncontrollable disturbances. Suppression of disorderly and riotous conduct incidental to labor difficulties in industry was frequently accomplished during the early part of the 20th century through the medium of establishing martial law.

Military Government.—Military government, sometimes called the law of military occupation. is a term used to describe the authority exercised by the armed forces over domestic territory in close proximity to the enemy (falling short of martial law) or exercised by the armed forces of a belligerent overoccupied enemy territory. Examples are found in the military government established by the Army of the United States over the territory of Hawaii during the imminence of Japanese invasion of that territory at the beginning of participation by the United States in World War II, and in the military governments established for the control of Italy, Japan, and parts of Germany during the occupation of those countries incident to World War II. Military government does not transfer sovereignty but merely assumes the powers and duties and exercises the authority, in whole or in part, of the sovereignty. Its purpose is not only to establish law and order but also to insure the safety and dominance of the military power which sets it up. Except during the Revolutionary War the territory of continental United States has never been subjected to foreign military government save in one instance of such government by the British at Castine, Maine, in 1814–1815. Federal forces maintained military governments in some Southern areas during and immediately after the Civil War.

The military government may, and usually does, employ its own tribunals for administering civil and criminal laws in their application to the inhabitants of the occupied area. On the other hand, the military government may utilize such of the established courts of the civil government as may be expedient for administering its military government. Such of the municipal laws of the occupied territory as the military government deems necessary may be continued in force. The jurisdiction of a military government, so far as concerns its punitive application by military tribunals, is exercised through military commissions and provost courts. They are summary in their nature, following to some degree the rules of procedure and evidence prescribed for courts-martial. The international tribunals composed during World War II for the trial of so-called war criminals, the political and military leaders of the aggressor nations, were, in legal effect, instruments of military government. They were constituted by the highest executive authorities of the nations concerned in the prosecutions, whereas the military commissions and provost courts generally utilized are appointed by army or other subordinate commanders of the occupying forces.

Universally recognized civil type crimes of serious nature, such as murder, rape, robbery, and larceny, as well as violations of the law of war such as spying, relieving the enemy with money, food or other supplies, communicating with the enemy, sabotage of military installations, and aiding in the escape of prisoners of war, are normally punished under military government through military commissions. Minor offenses, such as violations of traffic and curfew regulations, petty larceny, cheating, and other offenses such as normally would be punished in the police courts of American cities, are punished by the provost courts.

Courts-Martial.—Courts-martial are essentially instruments designed for the disciplinary control of the military establishment. Civilians, even in occupied countries, are generally amenable to trial by courts-martial only where the persons affected are in fact incorporated into the armed forces. Trials for spying and for other violations of the law of war are exceptions. The composition, jurisdiction and powers of courts-martial, as well as limitations upon their processes, are prescribed by the uniform code of military justice and by regulations by the president incorporated in the *Manual for Courts-Martial, United States.* For detailed discussion of courts-martial see separate article MILITARY COURTS-MARTIAL.

European Military Law.—Military law, as

distinguished from the law normally applied by civil institutions and courts, is recognized by European countries in its martial law and military government aspects and in application of the law of war. It tends to merge with the civil power where the civil government concerned becomes authoritarian in form. Military government was administered in occupied enemy territory by England, France, and Russia, as well as by the United States, following the termination of hostilities of World War II.

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MILITARY MASTS, in naval architecture, masts on a modern fighting ship, provided purely for military purposes. They are of steel, and hollow, and through them access is had to the conning tower on the superstructure of the deck where are the wheel, the wires communicating to all parts of the ship, and where the captain generally takes his stand; to the fighting-top with its rapid-fire guns; and to the look-out far above all of these.

MILITARY MINING. See MILITARY ENGINEERING; MINES AND MINING, MILITARY.

MILITARY MUSIC. See BAND; MUSIC.

MILITARY ORDERS. See ORDERS AND DECORATIONS.

MILITARY PENSIONS. See PENSION OR RETIREMENT SYSTEM—*Military Pensions and Compensation.*

MILITARY POLICE. In the United States Army military police units are assigned to commands as the requirements of an area or situation may dictate. Military police units are assigned to divisions and larger tactical units, to logistical commands in oversea areas, and to installations and commands in the Continental United States. The primary function of military police units is the maintenance of law and order, the protection of property, and the prevention and investigation of crime within the army. During the time of war, additional functions given military police units assigned to tactical units include traffic control; internment, care, treatment, education, work, and repatriation of prisoners of war, restrained enemy aliens and refugees; protection of the inhabitants of the country from violence and excesses of all kinds; supervision of military and civilian personnel while traveling; collection and return of army stragglers; and control of circulation and identification of individuals. Additional functions given military police units assigned to logistical areas and the Continental United States include the operation of guardhouses and stockades; physical security of posts, camps, stations, and special facilities; apprehension of absentees and escaped military prisoners; and control of traffic.

Historical records indicate that since ancient times armies have used certain troops as police for the general welfare and protection of the common good. During the American Revolution, some units of cavalry, known as Light Dragoons, were designated to assist the "Provost Martial" and perform other basic military police duties. Later, in the Civil War, the Union forces established a Provost Marshal General and Police Corps, both of which were abolished in 1866. In 1917, a Provost Marshal General was again designated and military police units established by the process of selecting a company and officially designating it as a military police company, or selecting so many men from each of several units to form a military police company. Since 1941, however, the United States Army has had an established military police corps of specially selected and trained officers and men. The Military Police Corps is now a permanent and basic branch of the army.

The police force of the United States Navy is the Shore Patrol. See NAVAL TERMS—*Shore Patrol.*

MILITARY PRISONS. Military prisons in the United States are used for the confinement of military offenders who have been sentenced by courts-martial to dishonorable discharge from the army and a period of confinement, but whose offenses are not so serious as to require confinement in a federal penitentiary. The largest military prison in the United States is the United States Disciplinary Barracks at Governors Island, N. Y. A military offender whose adjudged period of confinement is relatively short is incarcerated in the guardhouse in the fort where he is stationed.

The mission of military prisons is the reformation and rehabilitation of the inmates. Such policies and measures are adopted as will tend to correct faulty habits and erroneous inclinations of prisoners, improve their economic prospects, and increase their respect for social and moral laws. The definite purposes are: first, to restore to an honorable duty status in the army those who demonstrate their fitness for further service; second, to discharge the remaining offenders in the best possible condition to meet successfully the duties and obligations of a good citizen.

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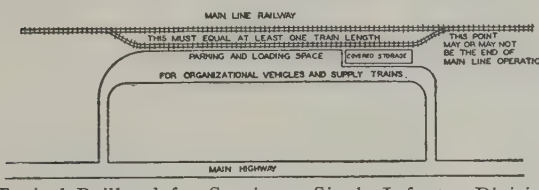
MILITARY PUNISHMENTS. See MILITARY LAW; ARREST, MILITARY; MILITARY COURTS-MARTIAL.

MILITARY RAILWAYS. Military railways include all railways under military control in the theater of operations, and all those which have been turned over to military authorities in the zone of the interior. The War Department is responsible for maintenance and operation of these lines and for the construction of new trackage and facilities.

Ordinarily, railways are superior to any other form of land transportation for bulk movement of troops and supplies over distances greater than 75 miles. Therefore, railways constitute the backbone of the transportation system supplying a military force. Since railway construction is a slow process, location of lines may be of great strategic importance, and most countries lay out their peacetime transportation systems with a view to their employment in war. The distance within which railway operation may approach the battle front varies within wide limits and depends upon the prevailing

conditions. It tends, at the present time, to be greater than formerly, due to the capabilities of modern artillery and bombing planes and also because of the increased effectiveness of motor transportation. In a stabilized situation, railheads may be about 20 miles behind the front. At the end of a rapid advance, this distance may be 200 miles or more. Ordinarily there is no advantage in employing narrow-gauge railways to supplement the transportation net except in the case of permanent fortifications.

Problems of Operation.—The basic problem in operating a military railway system for supply of the troops in a theater of operations


MAIN LINE RAILWAY
THIS MUST EQUAL AT LEAST ONE TRAIN LENGTH
THIS POINT MAY OR MAY NOT BE THE END OF MAIN LINE OPERATION
PARKING AND LOADING SPACE
COMBAT STORAGE
FOR ORGANIZATIONAL VEHICLES AND SUPPLY TRAINS
MAIN HIGHWAY

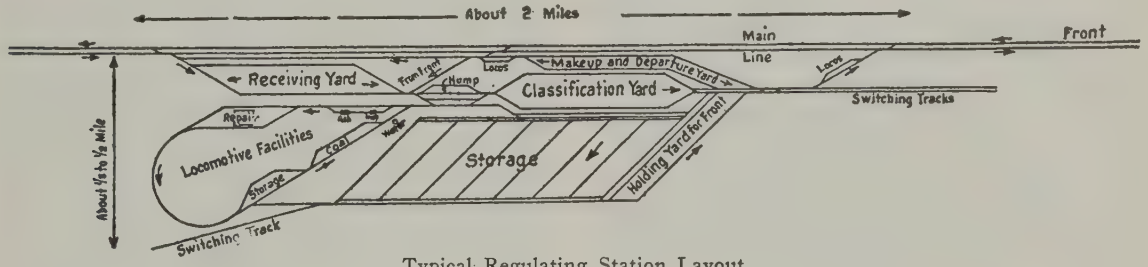
Typical Railhead for Serving a Single Infantry Division

is to receive the supplies from the zone of the interior and transport them to the using troops. Necessarily, this is a complicated matter, since the supplies are received in carload lots in very large quantities and must be transported to the troop units where these happen to be at the time. Also, the amount of supplies required depends considerably upon the nature of the operations being carried on. These conditions ordinarily require that the supplies first be transported to large *general depots* in the communications zone where they are received by the supply services in order to be sorted and administered and from which they can then be reshipped as needed by the troops. The agency for ordering the reshipping and for regulating the flow of supplies into the field army areas is the *regulating officer,* a general staff officer, reporting to the general headquarters. One of these regulating officers will operate normally in rear of each field army at a *regulating station* forward of the general depots, and will give the necessary instructions to the supply services involved and to the military railway service. The military railway service then transports the supplies forward to the railheads. The regulating officer also controls all movement of troops by railway forward of the regulating station.

General depots require very large yards consisting of receiving, classification, storage, and departure tracks, and unloading and loading facilities. A regulating station serving an army will usually require a similar but much smaller installation. For an average station, about 25 tracks, each 1,500 to 2,000 feet in length, would be required. Requirements for railheads may vary from siding facilities for about 12 cars, to several sidings of 1,500 feet or more. In some cases, dead-ending of the line will be sufficient for siding purposes.

Division and Control.—Construction, operation, and maintenance of military railways in a theater of operations is controlled by the commander of the theater and his staff. However, technical operation and maintenance is carried out by the communications zone. The engineer on the staff of the commander of the communications zone is the *director of military railways.* Directly under him there is the *manager of military railways,* ordinarily a railroad executive in civil life, who is in direct charge of all operation and maintenance. The railway system is organized into one or more *grand divisions,* each composed of a grand division headquarters, railway shops, and two or more *railway divisions.* A division may vary from 50 to 150 miles in length of line, depending on conditions. Military personnel, organized into special railway operating and shop battalions, may carry on the work. In this case, an operating battalion operates one railway division. However, it may be possible to utilize for at least part of the work the civilian personnel of the railroad. In this case, the personnel may or may not retain civilian status. Construction work and reconstruction of an extensive nature is not accomplished ordinarily by the special railway units such as the operating battalion, but is done by the general engineer units, working in the communications zone or army service areas.

Principles of Operation and Engineering.—Military railways are operated generally on the same basic principles as those prevailing in civil practice. However, there are certain distinct differences. There is greater emphasis on economy of men, materials, labor, and time at the sacrifice of personal comfort, convenience, and speed of movement. Also, prompt completion of any new work is of primary importance, and earthwork is reduced to a minimum at the expense of mileage, curvature, and gradient. Roadbed and track are as light as is consistent with contemplated use. Safety, to some extent, is subordinated to military necessity. Constant surveillance of trackage and bridges is required and greater maintenance must be expected.

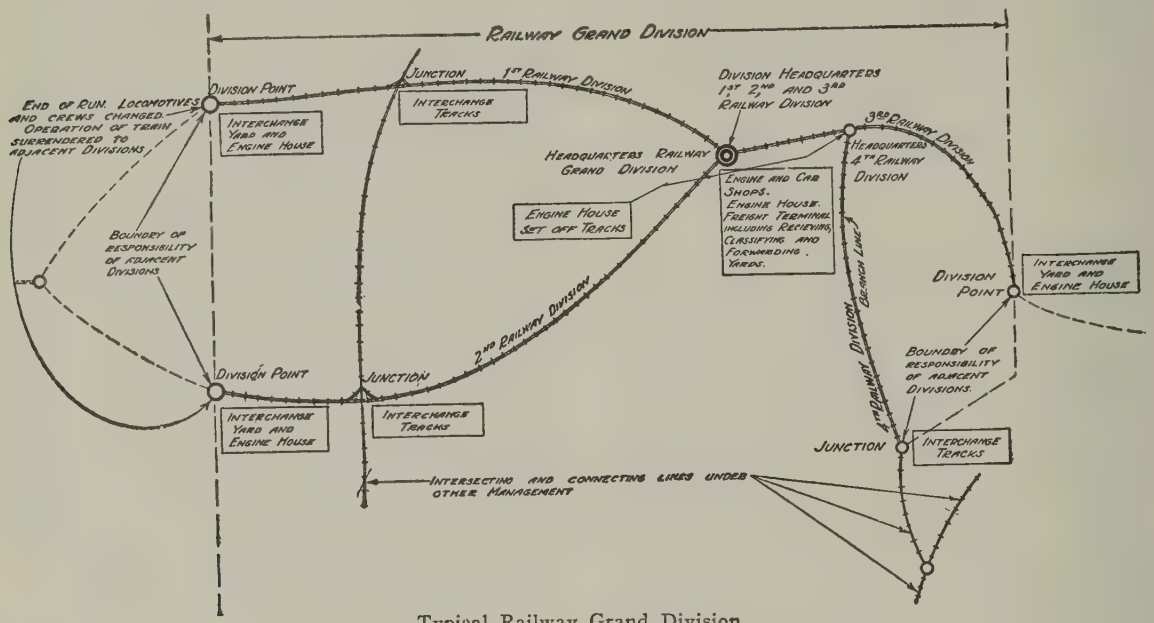


Typical Regulating Station Layout

Desirable characteristics of a military railway system from an engineering viewpoint are: (1) yard, terminal, and shop facilities well located; (2) double or multiple track; (3) seasoned roadbed, heavy rail, and good ballast; (4) light grades and curvature; (5) adequacy of passing tracks and sidings; (6) bridges adequate for military loads, including railway artillery; (7) ample loading, unloading, and storage facilities where needed; (8) reasonably

short mileage between important points; (9) a line not subject to damage from natural causes or particularly vulnerable to attack from the air; (10) additional lines making detour plans possible; and (11) ample supply of suitable rolling stock.

Capacity.—The capacity of a single-track main line railroad for military purposes is expressed in terms of the feasible movement of


RAILWAY GRAND DIVISION
DIVISION POINT
JUNCTION
1ST RAILWAY DIVISION
DIVISION HEADQUARTERS 1ST, 2ND AND 3RD RAILWAY DIVISION
3RD RAILWAY DIVISION
END OF RUN. LOCOMOTIVES AND CREWS CHANGED. OPERATION OF TRAIN SURRENDERED TO ADJACENT DIVISIONS.
INTERCHANGE YARD AND ENGINE HOUSE
INTERCHANGE TRACKS
HEADQUARTERS RAILWAY GRAND DIVISION
HEADQUARTERS 4TH RAILWAY DIVISION
ENGINE AND CAR SHOPS. ENGINE HOUSE. FREIGHT TERMINAL INCLUDING RECEIVING, CLASSIFYING AND FORWARDING YARDS.
ENGINE HOUSE SET OFF TRACKS
BOUNDRY OF RESPONSIBILITY OF ADJACENT DIVISIONS
DIVISION POINT
INTERCHANGE YARD AND ENGINE HOUSE
4TH RAILWAY DIVISION BEGINS
2ND RAILWAY DIVISION
DIVISION POINT
JUNCTION
INTERCHANGE YARD AND ENGINE HOUSE
INTERCHANGE TRACKS
BOUNDRY OF RESPONSIBILITY OF ADJACENT DIVISIONS.
JUNCTION
INTERCHANGE TRACKS
INTERSECTING AND CONNECTING LINES UNDER OTHER MANAGEMENT

Typical Railway Grand Division

trains per day, as: «six 30-car trains per day, each way between X and Y, with individual train loading not in excess of 1,500 tons.» The capacity of the line as thus expressed is fixed by the speed of operation under existing conditions and characteristics of the line, and by the length of the existing passing tracks which fix the number of cars per train. Under military conditions the capacity of a line is generally about as follows: a single-track line in good condition, with a ruling grade of one per cent and passing tracks at 6 to 10 mile intervals, will allow passage of 10 trains each way per 24 hours, the maximum length of trains being fixed by the clear length of sidings, and the maximum tonnage of train not exceeding 1,500 tons. Where the ruling grade exceeds one per cent, the number of trains would not necessarily be changed, but the ton-mileage would probably be reduced. On double-track line the ton-mileage is correspondingly affected by the controlling grade, but the number of trains which may be dispatched over the line per day is usually not so dependent upon conditions of the main line as upon facilities for dispatching and receiving trains at the terminals. To estimate the capacity of a given terminal, the procedure is to measure the total length of track in either the receiving or the classification yard expressed in feet, divide by the average length of cars to get the approximate car capacity of the yard, and assume that two-thirds this number of cars can be handled through the terminal in 24 hours.

Transport Trains.—The logistical planning of troop movements is facilitated when use can be made of so-called standard trains. These are made up in two general types from box cars, flat cars, coaches, and cabooses. Box cars may be used for men, supplies, equipment, or for animals. Stock cars are preferable for the latter if substitution is feasible. If commercial freight cars are employed for the transportation of men or animals, special precautions for ventilation are necessary. Flat cars usually are employed for the movement of wheeled vehicles, tractors, field guns, and similar equipment. They should be placed end to end in a train, preferably just ahead of the caboose. A coach is provided for officers.

Loading of animals or vehicles is best accomplished by the use of ramps. For animals, the ramps are usually constructed of timber with a cleated floor. To load vehicles, an end ramp on the last flat car is normally employed. Crossovers between cars are provided. A suitable ramp can be provided by building a crib support under short treads from the ground up to the car floor. The disadvantage of this type is the steepness of its slope, which requires the use of block and tackle. Better results can be obtained by removing the rear truck from the last car, thus letting the end of the car down to the ground.

Due consideration must be given to the placing and securing of the loads on flat cars. Arrangements must not interfere with train operation or create undue hazards for operating personnel; loads must be securely fastened so that no shifting will occur in transit; and the loaded car must be able to clear all possible obstructions, such as tunnels and bridges. Loads must not exceed the capacity or strength of the car, and must be placed symmetrically with reference to its longer axis. Very long loads, such as large gun barrels, may be carried by two or even three cars. When three cars are used, the load is supported by the two end cars, and the middle car is an idler. Loads may be secured to the car by hardwood stakes, braces or cleats, and by bolts, rods, wire, lashings, or steel bands. Vehicles must be held securely in place by blocking cleats and also, if necessary, by lashings. In the case of large

gun carriages or heavy trucks, the lashings can be drawn tight by deflating the tires, taking up the lashings, and again inflating the tires. See also ARMY TRANSPORTATION SERVICE; MILITARY TRANSPORTATION; SUPPLY RAILWAYS.

MILITARY SCIENCE. That field of observation, investigation, and analysis of military and related affairs that has for its object the determination of principles or rules to govern the conduct of military operations. The correlation and practical application of the deductions of military science comprise the art of war. Thus, war is both a science and an art. Military science is perhaps the most difficult of the sciences and it is also the most flexible. In its study, the actions of men which are variable and, at times, unpredictable play an important role. Further, there are limitations inherent in the field of observation. The effects of weapons and the capabilities of equipment can be measured and tested in maneuvers jointly with ideas of organization and tactics. Yet, while helpful, these measures cannot produce conclusive deductions. The atmosphere and urgency of war, the actions and reactions of men, and the unexpected frictions which arise in the actual conduct of battle are not present. The battlefield alone is the true testing ground, but civilized nations do not engage in war for the sole purpose of testing weapons, equipment, and theories. There remains then as the principal field for study and analysis the conduct of past battles and campaigns. Here further complexities are introduced, for no two battles or campaigns are ever the same even though they may look so. The morale, condition, discipline, and competence of men, the efficiency of their leaders, weather, terrain, weapons differences, and other factors all exert influences that are not readily apparent. So the "facts" set forth by accounts of eyewitnesses and participants, which form the basis of recorded military history, may not present accurately the realities of conditions. Eyewitness accounts are based on individual interpretation, and the actual participants having been subjected to stress and excitement may not be able to reproduce the true circumstances or avoid rendition of biased accounts. In brief, military science cannot be an exact science. Despite these inherent complexities, military science has synthesized its main conclusions into a series of generalizations known as the *principles of war* (q.v.). These are few in number but their truth has been demonstrated throughout the history of warfare. More than half of the present-day principles were postulated in 505 B.C. by the Chinese philosopher Sun Tzu. These principles and the few added later have remained unaltered, but the doctrine and techniques of their application have undergone successive changes wrought by new military developments and the products of other sciences. The wheel, the catapult, the crossbow, gunpowder, the rifle, artillery, field fortifications, the railroad, signal communications, mass production, motor transportation, chemical agents, the tank, the airplane, guided missiles, and finally atomic weapons each in turn caused modifications in military theory and practice and in the practical application of the principles of war. Stubbornness in adhering to tradition and failure to recognize the true military potentialities of new means have been the basic causes of many military reverses. Blind, rigid adherence to the principles of war also has produced disastrous results, for these are useful tools of the military art only when applied with a true appreciation of the circumstances affecting the conduct of war prevalent at the time: the capabilities and limitations of weapons and equipment of the day, psychological and geographic considerations, time and space and other factors. During and since World War II, technological advances affecting the tools of war have been great, particularly in fields that eliminate or minimize human influence. The normal methods of scientific approach are becoming more applicable to military science. Groups containing scientists of many fields have been organized in the military services to study military operations, tests, trials, and maneuvers scientifically, quantitatively, and qualitatively with the view to improving future strategy, tactics, and weapons. Actual operations in Korea were subjected to on-the-ground study and analysis by these groups. Their activities are known alternately as *operations research, operational research, operations evaluation,* and *operations analysis.* In the highest echelons similar studies are being made of entire weapons systems of the separate services and their mutual relationship. In the United States these studies are conducted by the Weapons Systems Evaluation Group of the Department of Defense. The branches of modern military science are many and varied. The main branches are: AIR SUPPORT; AMMUNITION; CHEMICAL, BIOLOGICAL AND ATOMIC WARFARE; LOGISTICS; MILITARY EDUCATION AND TRAINING; MILITARY ENGINEERING; MILITARY HISTORY; MILITARY INTELLIGENCE; ORGANIZATION; RESEARCH AND DEVELOPMENT; SIGNAL COMMUNICATIONS; STRATEGY; TACTICS; WEAPONS; WELFARE, RECREATION AND MORALE.

MILITARY SERVICE INSTITUTION OF THE UNITED STATES, a society of officers of the United States Regular Army, organized in 1878 by Generals James B. Fry, David S. Stanley, Colonels T. F. Rodenbough, G. N. Lieber, and others. It was designed as a similar organization to the Royal United Service Institution of Great Britain. The presidents of the American society included Generals W. S. Hancock, J. M. Schofield, Nelson A. Miles, and T. H. Ruger. The headquarters were at Governors Island, N. Y., where the institution at one time had a library of 20,000 volumes, including many rare documents. The society issued *The Journal of the Military Service Institution.* It is no longer in existence.

MILITARY SURGERY, or war surgery, treated formerly as a specialty pertaining only to the surgery performed by army surgeons in war areas, now has no such implication and the term in that sense is of interest only in historical medicine. (See SURGERY.) At present military surgery is included in the general category of war surgery and refers to injuries sustained in war by those engaged in the armed forces, whether ground, naval, or air, as well as to casualties sustained by civilians in the zone of hostilities. It has also some reference to medical conditions such as shock, psychosis, and prophylactic measures of various kinds, which also may be referred to as military medicine, if there is to be a strict separation of medicine from surgery. The experience of the United States and its allies in World War II and those of the campaign in Korea have been used largely as a basis for this article.

The sharp distinction that once existed between the military surgeon and his brother in civil life has long since disappeared and military surgery now is no different from civilian surgery, except that much of it is produced by the machinery of war, and the care of the injured is often dependent upon the terrain and the facilities that are available. The weapons and missiles of war are extremely varied. In the case of ground troops these may be small arms (rifles and machine guns), grenades, shells of all sizes and types, flame projectors, and, where hand to hand fighting takes place, bayonets and knives. The type of wound will vary with the weapon or missile. Injuries sustained by air force personnel are generally from bullets and shell fragments, and from burns. Among naval personnel flash burns, shell wounds, and lung injuries following immersion are common. The successful care of battle casualties is largely a matter of proper planning, adequate equipment, and teamwork on the part of all concerned.

Our present knowledge of modern war surgery dates from the conflict known as World War II, and for those in the United States it began on December 7, 1941 at Pearl Harbor. World War II casualties differ from those in all previous wars in that the civil population was subjected to bombing and other attacks hitherto unknown. New types of ammunition appeared, and bombing, the presence of large mined areas, booby traps, aviation bombs, rockets, and bazookas made moving, or even living, in the war areas extremely dangerous for troops and civilians alike.

Physical Effects of Modern Warfare.—These may be listed as: (1) wounds; (2) compound fractures; (3) burns; (4) closed cavity injuries (brain, chest, abdomen); (5) suffocation and submersion. To these should be added an injury common under conditions of extreme cold, freezing. In all cases shock, hemorrhage, and infection threaten the injured person with disability, deformity, and death. Many war casualties end immediately, or within a few hours, in death. Such especially are those involving the great vessels, as the aorta and vena cava. The protection afforded in recent years by helmets, bullet proof jackets, and asbestos clothing has reduced mortality from head and chest wounds and from burns, which was extremely high in World War II. On the other hand, insufficient protection from the elements, in the Korean campaign, was responsible for a great number of disabling injuries from freezing of the extremities.

First Aid and Surgical Treatment in the Battalion.—To comprehend the role of the military surgeon in battle one should understand the conditions usually present in the battle area. First aid and surgical treatment, except that which the soldier can give himself by using his first aid packet, begins at the battalion aid station. This must be located where the maximum number of casualties will pass in the stream of evacuation toward rear areas and it should not be placed too far forward. If the aid station is pinned down by machine gun or artillery fire it cannot function. At the station antibiotics are given, shock treatment administered, and certain definitive surgical measures are employed just as in civil emergencies but with some limitations and differences. In warfare the types of wound are different, the time between injury and definitive treatment may be long, and most serious of all, evacuation may be delayed. In modern warfare many casualties may occur in non-military persons. Bombing and strafing activities of the enemy air force may result in a large number of casualties in rear areas which may not be well prepared for their prompt care.

The target areas of the body may be assembled into 4 main groups which are given here, with the percentages involved. They are: (1) head, face, and neck, 8.51 per cent; (2) upper extremities, 20.15 per cent; (3) trunk, 28.9 per cent; lower extremities, 41.45 per cent (World War II). Wounds of the extremities constitute about 75 per cent of all wounds. The types of wounds change with each war. High explosive shells, bombs, and mines now cause more severe hemorrhage, shock, and cardiorespiratory disturbance than in any previous wars. Many casualties in battle are not due to explosives or missiles and the battalion surgeon may be called on to care for those injured by falls from cliffs, by falling trees, and by motor vehicles. In general, it has been stated that if the battalion surgeon is able to care for the wounds of the extremities he will have looked after three fourths of all the casualties that will pass through his station.

When a man is wounded in action he is located by the company aid man or the litter team of the aid station. A sterile first aid dressing is applied to the wound, which protects it from irritation and infection as well as lessening the pain. When the man arrives at the aid station, either walking or on a litter or other device, his dressing may be replaced, clothing cut away, and, if the wound is extensive, a large vaseline dressing may be applied. Irrigation may or may not be indicated. Proper bandaging is most important. A copious, heavy bandage is a great protection when the man is moved to a rear area. All aid station men are trained in the emergency care of wounds. Shock is best treated by preventive measures and should be anticipated from the nature of the injury. Early immobilization of fractures, early use of whole blood and plasma, and early employment of morphine for pain, often prevent shock from developing.

Head and face injuries may result in fatality within hours or even minutes. If the patients survive as long as 6 hours, the majority recover from the immediate effects of the injury. Every scalp injury, no matter how trifling, is a potential wound of the skull. Many penetrating wounds of the skull are encountered in walking wounded. In neck injuries with a fracture of the spine, slight traction and heavy bandaging is advisable and great care should be exercised in moving the injured man. Wounds of the chest cause death in 1.4 per cent of the deaths in action. In penetrating wounds of the chest about three quarters have hemorrhage into the pleural cavity and about one third of these become infected. Early evacuation of these cases saves many lives.

Fractures of the dorsal and lumbar spine must be moved carefully, preferably using three aid men. The back must not be jackknifed by sitting the patient upright, and he should always be moved on a litter that is heavily padded with blankets. Fractures of the pelvis should be moved on a litter whenever possible. All abdominal wounds are given a first aid dressing,

the knees are flexed, nothing is given by mouth, and the wounded man is tagged with a high priority evacuation to a rear area hospital. Fractures of long bones are carefully and adequately splinted before being moved. In cold climates the greatest care should be exercised to prevent chilling or freezing.

The Campaign in Korea.—Certain facts regarding the Korean campaign are presented here. It is to be understood that much of the surgical history of that struggle is not yet available for general reading and study, but enough is available to afford comparison with other wars. As far as military surgery goes, that does not differ materially from the surgery of other wars except that in reduction of mortality the following factors exerted a considerable influence: increased use of chemotherapy and antibiotics; increased use of body protective devices; great increase in teamwork in forward areas; evacuation of wounded in great numbers by air.

Certain statistics and methods of treatment are noted briefly as of interest, even though the number of those engaged was infinitely smaller than in World War II. In considering the battle casualties in the Korean theater the period from September 2, 1950 to February 28, 1951 (about 18 months) has been selected. In this period there were 41,951 battle casualties with 7,017 deaths. A total of 12,908 persons were evacuated to the United States for definitive treatment. Of these 169 were amputations; 271 required neurosurgery; 71 were deaf; 6 were blind; and 7,448 required general and orthopedic surgery. The remainder were distributed among a large number of categories including medical. These figures indicate that considerably more than half the cases did not require evacuation to the home territory but were handled in Korea and Japan.

Types of Operation Performed.—*Craniotomy:*—In a series of 123 cranial operations the indications were for injury to cranionasal sinuses, transventricular wounds, venous sinus injury, and brain abscess. Penicillin was used freely. In 40 per cent of the cases dural transplants were required for closure.

Intrathoracic Wounds:—In a group of 6,333 casualties from all types of missiles there were 834 chest wounds of which 8.5 per cent were intrathoracic. About 75 per cent of these were complicated by blood in the chest cavity (hemothorax), retained foreign body being next with 20 per cent of cases. Injury to the heart was reported in only 1 per cent of all cases.

Maxillofacial Injuries:—These were numerous. The treatment involved primary wound debridement with chemotherapy and administration of antibiotics (penicillin and streptomycin), continuous wet dressings, removal of contaminating food debris, and stabilization of fractures. Tracheotomy was employed freely (119 cases), a life saving measure. Complications in maxillofacial injuries were infrequent and were principally empyema and secondary hemorrhage.

Burns:—The exposure method was utilized freely in a series of 200 burned patients. After 72 hours the injured dermis becomes dehydrated, contracts, and becomes a dark brown eschar. In about 14 days the eschar is removed and the area is ready for grafting. The exposure method follows the procedure outlined: (1) cleansing of the surface by washing gently; (2) removal of debris; (3) administration of antibiotics; (4) exposure to room air; (5) placing the patient at rest; (6) elevation of the injured area to avoid edema. This method was used in hospitals in burns of the face, neck, hands, extremities, and trunk. The healing time averaged about 16 days. As a rule, where burns covered 60 per cent of the body area the patient died.

Evacuation:—In about 30,000 cases 24,000 were sent out by air and the remainder by ship.

Cold Injury:—There was a high incidence of cold injury, and 630 cases were reported from Korea. Amputation was required in many instances. About 15 per cent of the injuries from cold resulted in some permanent disability.

General Battlefield Surgery:—Mobile army surgical hospitals were in use. These had been prepared to do all types of major surgery. The unit was organized into 2 sections, administration and professional. An ambulance company and a helicopter unit were often in attendance. The mobile surgical unit is especially adapted to cases which cannot be moved until life saving measures have been instituted.

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MILITARY TERMS. From the thousands of military terms in use, the following have been selected as those most generally used by writers and radio announcers on miltiary subjects. Although each term was chosen for its military significance, most of the terms may also be used in a general sense.

Abatis.—Obstacle formed of felled trees, or of bent down small trees, often interlaced with barbed wire. The former is called a dead abatis and the latter a live abatis.

Absent Without Leave.—Failure to be at the proper place at the proper time, but without intending to desert the military service. The absentee may be unaware that his absence is not authorized. Abbreviation AWOL.

Accrued Leave.—Total amount of leave of absence due an individual in the military service at any given time.

Action Station.—Place to be occupied and duties to be performed by an individual in the event of an air attack.

Activate.—Constitute a military unit on the active list by assigning personnel and equipment thereto with which it can operate as a distinctive organization.

Active Duty.—Military service performed by those on the active list; includes those performing military or naval duties.

Adjustable Pitch Propeller.—Airplane propeller, the pitch of whose blades can be changed by the pilot while in the air.

Adjustment of Fire.—Determination of corrections in elevation and deflection of a gun or the moment of explosion of its projectile, and their application in firing, so as to place the gunfire on a certain part of the target.

Advance by Bounds.—Move forward in a series of separate advances, usually from one concealed position to another, or from one point of observation to another.

Advance Guard.—Force sent out ahead of the main body to protect it from surprise attacks and to insure its uninterrupted advance by removing obstacles and wiping out enemy resistance where possible.

Aerial Torpedo.—Large explosive projectile driven by its own motor, and usually launched from low flying aircraft at water-borne targets.

Aid Station.—First medical establishment on the route of evacuation from the fighting zone to which wounded are brought. The wounded are given first aid treatment and separated into groups. Those needing further care are sent to the rear.

Air Superiority.—Greater number or superior types of military aircraft possessed by one force that allows air or ground operations in a particular area without effective opposition by enemy aircraft.

Airborne.—Transported by air or in the air. Airborne troops are soldiers specially organized, trained, and equipped for transportation into combat by air. They usually land by parachute or glider.

Aircraft Warning Service.—System established for reporting the movement of aircraft to the air defenses. The system includes observers, filter centers, and communications.

Alert.—Warning signal of a real or threatened danger, usually an air attack; time during which troops are on the lookout for danger; condition of aircraft prepared to immediately perform a mission.

Alinement.—Formation in a straight line; the line so formed; straight line on which several elements are formed; the dressing of individuals or units upon a straight line.

All-around Traverse.—Gun, radar, or other equipment capable of being turned by its traversing mechanism in a complete circle in a horizontal plane.

All-Clear Signal.—Signal to indicate that danger, usually an air attack, has passed.

Allotment.—Portion of their pay that military personnel may authorize to be paid directly to another person, as a dependent, or to an institution, as a bank or insurance company.

Allowance.—Prescribed amount of rations, supplies, or equipment allotted to an organization or to an individual. Monetary remuneration in addition to the prescribed pay, such as travel, quarters, subsistence, and clothing allowances.

Alternate Position.—Location assigned to a unit, weapon, or piece of equipment from which the same mission can be accomplished as when located at the main position. The alternate position is occupied when the main position becomes untenable.

Angle of Approach.—In gunnery it is the angle between the line along which the gun is pointed and the line along which the target is traveling.

Antipersonnel.—Explosive charges, such as antipersonnel mines and antipersonnel bombs, designed to be used against individuals rather than against materiel.

Antitank.—Explosive charges, weapons, and other devices, such as antitank bombs, antitank mines, antitank grenades, antitank rockets, antitank guns, and antitank ditches, designed to be used against tanks and other armored vehicles.

Area Target.—Target for gunfire or bombing covering a considerable space. It differs from a point target in that the latter is a particular point or structure.

Armor-piercing.—Bombs, shells, rockets, and grenades designed to pierce armor.

Armored Car.—Motor vehicle protected by light armor and provided with machine guns or small caliber cannon. Used chiefly for scouting, but also as self-propelled mounts for antiaircraft artillery and as personnel and ammunition carriers.

Articles of War.—Laws governing the conduct of military personnel and others temporarily attached to the army.

Artificial Moonlight.—Use of searchlights to provide illumination for ground operations carried out during the hours of darkness.

Assault.—Final phase of an attack; closing with the enemy in close combat. It may be made by dismounted, mounted, mechanized, or armored units.

Assembly Area.—Location in which parts of a command are assembled in preparation for further action. Also called assembly point, and assembly position.

Assign.—To permanently place in a military organization so as to make the individual, unit, or item of equipment an organic part thereof.

Atomic Energy.—Release of power through a sustained neutron chain reaction resulting from nuclear fission.

Attach.—To temporarily place in a military organization an individual, unit, or item of equipment.

Attack.—Offensive action against an enemy. Usually involves an advance combined with firing and fighting at close range.

Autobahn.—German word meaning superhighway for automobile traffic.

Automatic Fire.—Fire from an automatic weapon which is continuous until the ammunition is exhausted or until the pressure on the trigger is released.

Axis.—Route of advance or supply toward the enemy or route of evacuation of personnel and materiel to the rear.

Azimuth Deviation.—In gunnery, the difference between the azimuth from gun to target and the azimuth from the gun to the point where the projectile strikes.

Bail Out.—To make an emergency jump, with a parachute, from an aircraft in flight.

Ball Turret.—Ball-shaped projection on aircraft containing guns and power driven to enable them to be quickly aimed in various directions.

Ballistic.—Pertaining to the motion or hurling of missile weapons; as ballistic curve and ballistic wind.

Balloon Barrage.—Protective screen of balloons anchored to the ground or to ships, to hinder flights by aircraft at low levels over a certain area or point.

Band of Fire.—Belt of fire, at least part of which grazes the ground; usually fired from more than one automatic weapon.

Bangalore Torpedo.—Metal tube containing a high explosive; principally used for clearing a path through a mine field or barbed wire.

Barrage.—Prearranged concentration of artillery or automatic weapons fire on one or more lines. Often used to isolate a portion of the front to prevent its reinforcement or attack.

Base.—Installation from which a military force operates and from which it obtains its supplies.

Base Angle.—Angle between the line from the gun to its principal target and the line from the gun to the visible reference point, from which angles to other targets are measured.

Bazooka.—Portable launching tube for rocket projectile. Two men usually carry the ammunition and launcher and serve as the firing crew. It is used chiefly against armored vehicles. See article ROCKET.

Billet.—Shelter for military personnel that consists of buildings other than barracks.

Biological Warfare.—Employment of bacteria, fungi, viruses, rickettsiae, and toxic agents derived from living organisms to produce death or disease in humans, animals, or growing plants.

Bivouac.—Temporary camp in the field. It may have no overhead cover, or only natural cover, shelter tents, or cover made from available material.

Black Out.—To obscure in darkness, as by extinguishing all lights as a protective measure against enemy observation.

Blast Effect.—Destruction or damage to the works of man or vegetation on the surface of the ground or water caused by the force of an explosion on or slightly above the surface.

Blitzkrieg.—German word meaning lightning war. Violent surprise offensive by coordinated air, armored, and ground units, designed to quickly crush all enemy resistance.

Blockade.—Shutting up a place or enemy troops by the use of troops and/or warships to prevent ingress and egress; force maintaining a blockade.

Blowback.—Gases forced to the rear of a gun when a projectile is discharged. Blowback is a necessary part of the firing action in some automatic weapons. In other weapons it is usually the result of faulty ammunition.

Bomb.—Receptacle, usually of metal and streamlined in shape, containing a chemical agent and/or an explosive charge. Explosive bombs are usually demolition bombs for the destruction of heavy material and fragmentation bombs to cause casualties among personnel. Chemical bombs include incendiary, gas, and smoke bombs. To drop bombs from an aircraft.

Bomb Bay.—Portion of the interior of a plane designed for carrying large bombs. Bombs are carried in a device known as a bomb rack. They may be dropped from the plane when the bomb door is opened and the bomb release mechanism is actuated.

Bombing.—Act of dropping bombs from an aircraft. Bombing is classified into skip, dive, or glide bombing according to the performance of the plane at the time of release. Bombing is further classified into area, pattern, or precision bombing according to the method used in hitting the target.

Bracket.—In gunnery, space between two shots or group of shots one of which is over the target and the other

short of it. Normally, the third shot or group should be very close to the target.

Break-through.—Penetrating into and beyond an enemy defensive position with a force sufficiently large to continue on for a considerable distance.

Bridgehead.—Position on the enemy's side of a stream established by the leading elements of a force to protect the crossing of the remainder of the troops.

Brief.—Concise instruction given to participants of an air, ground, or sea mission immediately prior to departure.

Burst Interval.—Distance between the target and the point of explosion of the shell.

Cadence.—Uniform length of step and time in marching. Number of steps marched per minute.

Call Sign.—Signal used for identifying a radio station or a telegraph station. The radio station may be in a ship, an airplane, a tank, a truck, or immobile on the ground. Each station is assigned a different call sign.

Camouflage.—Disguising of an individual or a military target so as to deceive the enemy as to its existence or true nature by the use of nets, burlap, paint, foilage, etc. It also includes the placing of dummy targets.

Capital Ship.—Large size warship mounting guns of more than 8-inch caliber; battleship or battle cruiser. An aircraft carrier is not classified as a capital ship.

Cartel.—Written agreement between opposing nations, usually for the exchange of prisoners or the passage of mail and supplies through a blockade.

Ceiling.—Top limit of visibility for flying as determined by a cloud bank or fog. Highest altitude an aircraft can attain under certain conditions.

Censorship.—Act of inspecting and, if necessary, deleting all or part of written and printed matter; telegraph, telephone, and radio messages; radio broadcasts; still and motion pictures to prevent military information from reaching the enemy.

Center of Resistance.—Location in the main defensive position at which troops are concentrated to repel enemy attacks. Centers of resistance are part of a system of mutually supporting defense areas or fortified tactical localities.

Central Control.—System of fire control of weapons from a central location often used by antiaircraft batteries.

Chain of Command.—Series of officers and noncommissioned officers, in the military service, through which orders or other instructions must be transmitted from a senior to a junior.

Chemical Agent.—Chemical substance used in combat, such as poison gases, incendiaries, and screening smokes.

Chemical Warfare.—Use of chemical agents in combat. Bombs, shells, grenades, smoke generators, and flame throwers are used to disperse chemical agents against the enemy. Gas masks, special clothing, and decontaminants are used to neutralize chemical agents.

Chief of Staff.—Senior staff officer in a unit as large as, or larger than, a division who is in charge of coordinating the duties of all staff sections and is an adviser to the commanding general.

Classified.—Pertaining to the security restriction placed on military letters, messages, maps, publications, photographs, drawings, and motion pictures. The classifications, in order of importance, are top secret, secret, confidential, restricted, and unclassified.

Close Order Drill.—Drill formations and movements usually performed in drill, marching, and parades at normal or at close interval.

Coastal Force.—Naval force operating in a certain area as an aid in situations where the local naval defense forces are not sufficiently strong.

Coastal Frontier.—Geographical division of a coast to insure effective coordination between the armed forces of the nation defending the coastal area.

Color.—Flag of a nation; also the flag of a military unit comparable in size to a regiment. When both are carried toegther they are called the colors.

Combat Drill.—Drill formations and movements designed to train small units for combat. Usually conducted at extended intervals and distances.

Combat Troops.—Soldiers specially trained and equipped for actual fighting, as distinguished from service troops who provide supply, transportation, communication, evacuation, maintenance, construction, and other services for combat units.

Combat Zone.—Area where fighting is actually taking place; forward part of the theater of operations.

Combined Operations.—Military action carried out by two or more nations in concert. Military action by army and naval forces acting together is called joint operations.

Combined Training.—Maneuvers together of two or more branches of the army that normally fight together, such as infantry, artillery, engineers, armor, and air units.

Command Net.—Electrical means of communication over which orders are sent to the headquarters of units. These means include radio, telegraph, and telephone.

Command Post.—Headquarters of a military unit; location of the commander. In combat the command post is often divided into a forward and a rear echelon.

Commando.—Soldier specially trained to make surprise raids in small groups. This is the British term; the corresponding American term is Ranger.

Compartment of Terrain.—Separate division or section of the ground bounded on at least two sides by features, such as woods, ridges, or villages which limit observation and observed fire into the area from points outside.

Cone of Dispersion.—Space through which pass a group of shots fired from the same gun with the same sight setting. The cone-shaped dispersion is caused by vibration, ammunition variances, and other factors.

Correspondent.—Writer, photographer, artist, or radio broadcaster authorized to collect and disseminate information in a theater of operations.

Corridor.—Compartment of terrain the longer axis of which extends in the direction of advance, or is parallel thereto.

Corvette.—Small war vessel used to protect convoys from submarines.

Counterattack.—Attack made in reprisal for an enemy's attack. It is mostly a defensive action and differs from a counteroffensive, which is aggressive action on a large scale.

Counterbattery Fire.—Artillery fire intended to destroy the enemy's artillery.

Counteroffensive.—Aggressive action on a large scale to seize the initiative from the enemy. It differs from a counterattack in that the latter is a small local action.

Court-Martial.—Military court. The three kinds, classified according to importance are general, special, and summary.

Cover Position.—Location immediately in rear of a firing position in which personnel and materiel are protected from enemy fire.

Cross Compartment.—Compartment of terrain the longer axis of which is oblique or perpendicular to the direction of advance.

D-day.—Day on which an attack or operation, that has previously been planned, is initiated.

Danger Space.—Space in the trajectory of bullets fired from small arms which is not higher than the height of an average man.

Debark.—To unload troops and equipment from a vessel or aircraft.

Decontaminate.—To make safe for unprotected personnel, animals, equipment, or supplies by rendering harmless or destroying harmful chemicals.

Defend.—To attempt to hold an area against enemy opposition without attempting to advance.

Defense.—Means used as protection against an attack. An active defense is carried out by counterattacking. A passive defense is carried out by attempting to merely hold the area.

Deflection.—In gunnery, the horizontal angle between the line of sight and the axis of the bore of the gun when the gun is pointed for firing.

Delaying Action.—Defensive battle used to slow the enemy's advance and to gain time without becoming closely engaged, characteristic of the actions of a rear guard in a retreat.

Demobilize.—To disband troops as at the end of a war.

Deployment.—Act of spreading out a body of troops as for combat. The extension may be made in width or depth or both.

Desertion.—Leaving a military post or duty with the intention of not returning, or of avoiding hazardous duty.

Develop.—To make more apparent, as to develop the enemy's position. To break up a body of troops into smaller groups in preparation for combat.

Dumdum Bullet.—Bullet that expands upon impact. It usually has a soft lead nose.

Dummy Installation.—False targets, as dummy artillery guns, used to deceive the enemy.

Echelon.—Arrangement of individuals, units, or equipment with each slightly to the right or left of the one immediately in front, like a series of stairsteps. Subdivision of a unit, as the forward echelon and rear echelon of a headquarters.

Element.—Smaller part of a military organization or maneuver. It may be an individual, platoon, a crew, or any unit that is part of a larger group.

Elevation.—In gunnery, the vertical angle between the line of sight and the axis of the bore of a gun when the gun is pointed for firing.

Embark.—To load troops and equipment on a vessel or aircraft.

Embrasure.—Opening, with sides flaring outward, in the wall of a parapet or a fortification, through which weapons are fired.

Emplacement.—Position prepared for weapons or equipment from which their missions may be executed. Usually there is side and overhead protection against hostile firing and bombing.

Enfilade.—To fire from the flank of a line so as to sweep it with fire in the direction of its length. Gunfire which sweeps a line in the direction of its length is known as enfilade fire.

Envelopment.—Attack made around one or both of the enemy's flanks or rear, usually coordinated with an attack on his front; enveloping attack.

Expeditionary Force.—Military force for invading or fighting in a foreign country.

Field.—Terrain over which battles are fought or maneuvers are conducted.

Fifth Column.—Sympathizers and supporters of the enemy secretly engaged in espionage, sabotage, and other subversive activities behind the battle lines of a military force.

Fire Control.—In gunnery, pertaining to the operations required to prepare the data and actually place fire on a target; conduct of fire. Ability of a commander to open fire, adjust fire upon the target, shift fire to other targets, and to cease firing as required.

Fire Discipline.—Obedience of personnel to the orders of a commander in delivering fire on designated targets.

Fire Superiority.—Fire of greater accuracy and volume than that of the enemy. Fire superiority enables troops to advance against the enemy without unduly heavy losses.

Fixed Gun.—Firearm mounted in an airplane or vehicle in such a manner that it cannot be aimed except by maneuvering the plane or vehicle.

Flare.—Very bright light, designed primarily for illumination. It may be suspended from a small parachute or be unsuspended. Flares are a form of pyrotechnic and may be fired from weapons, dropped from aircraft, or burned on the ground.

Flash and Sound Ranging.—Method of locating the position of an enemy gun by observing the flash and by calculations based on the time intervals between the reception of the sound at previously oriented microphone stations.

Flexible Gun.—Firearm mounted in such a manner that it can be swung in any direction.

Flight Deck.—Upper deck of an aircraft carrier designed and constructed for the landing and taking off of aircraft.

Forced Crossing.—Crossing of a stream made in opposition to the enemy.

Forced Landing.—Landing an aircraft due to bad mechanical or weather conditions. Landing troops on a shore in opposition to the enemy.

Forced March.—Distance march during which the rate of march is increased above normal or the time for rest is reduced below normal, in order that troops may arrive at their destination in less than the usual time.

Foxhole.—Small pit used for the protection of one or two men against firing or bombing. It is usually constructed so that an occupant can fire from it.

Garrison.—Military post at which troops are stationed. To station troops at a military post or in a fortification.

Gas.—Chemical agent used for casualty effect in combat. To use such as an agent.

General Staff.—Group of officers in a unit as large as, or larger than, a division who assist the commanding general. The general staff is usually divided into four sections: personnel, intelligence, operations and training, and supply and evacuation.

Grade.—Rank in the military service; applies to both officers and enlisted personnel.

Grenade.—Small bomb, containing explosives or chemicals, thrown by hand or fired from a weapon. The two most widely used types are hand grenades and rifle grenades.

Guerrilla Warfare.—Irregular operations carried on by small independent bands, usually in connection with a regular war, for the purpose of harassing the enemy.

Guided Missile.—Projectile in which there is contained a mechanism for changing either its speed or direction, or both, in response to signals received while in flight.

Gunnery Officer.—Officer in an artillery unit who is especially qualified in the practical handling of guns and the technical problems involved in firing. He supervises the preparation of all data required for effective control of the fire.

H-hour.—Hour at which an attack or operation, that has previously been planned, is initiated; zero hour.

Half-track Vehicle.—Motor vehicle steered by two front wheels and propelled by a tracklaying arrangement in the rear; half-track.

Height of Burst.—Vertical distance from the target to the bursting point of the projectile.

Helmet.—Hat made of steel and worn as protection against small arms bullets and shell and bomb fragments.

High Explosive.—Any explosive that burns with extreme rapidity and has a shattering effect. A high explosive is used as a bursting charge in projectiles and bombs, whereas a low explosive is used as a propelling charge in guns and for blasting.

Holding Attack.—Attack for the purpose of containing the enemy in one part of the field, thus preventing him from reinforcing his troops along the line of main attack; secondary attack.

Howitzer.—Artillery piece with a medium length barrel, designed to deliver high angle fire with shells of a medium muzzle velocity. The high angle of fire enables this weapon to hit targets that cannot be reached by flat trajectory guns.

Incendiary.—Any chemical agent which generates sufficient heat to ignite usually noninflammable material. The incendiary material may be contained in shells, bombs, or grenades, and be ignited at the bursting of the container.

Indirect Fire.—Gunfire delivered at a target that cannot be seen from the gun position. The gun is aimed by sighting at a fixed object, called the aiming point, or by using a means of pointing other than the sight.

Inshore Patrol.—Part of the local naval defense forces operating in the inner areas of navigable coastal waters. It consists of naval vessels and aircraft, and it controls shipping within a defensive sea area.

Insignia.—Distinguishing badges, bars, medals, chevrons, and other insignia, worn on the uniform to show rank, branch, service, and honors.

Intelligence.—Collected, evaluated, and interpreted military information concerning a possible or actual enemy or theater of operation.

Jam.—To introduce false signals into enemy radio or radar receiving equipment so as to distort the information that otherwise might be received.

Jeep.—Four wheel motor vehicles, capable of carrying ¼-ton of cargo or 3 passengers, in addition to the driver. It has great cross-country and hill-climbing ability. The jeep has many uses, such as for reconnaissance, towing small cannon and cargo trailers, and transporting stretchers.

Jet Propulsion.—Reaction propelling in which the propelling unit obtains oxygen from the air, as distinguished from rocket propulsion in which the unit carries its own oxygen-producing material. In aircraft propulsion, a gasoline or other fuel turbine jet unit which discharges hot gas through a tail pipe and a nozzle, causing a thrust which propels the aircraft. See article JET PROPULSION.

Joint Operations.—Military action carried out by army and naval forces acting together. Military action by two or more nations in concert is called combined operations.

Journal.—Daily record of principal events, messages received and dispatched, visits of superior officers, and absences of the commander from the headquarters. It is kept by a unit or staff section in the field.

Kamikaze.—Japanese word meaning suicide corps. Pertaining to the Japanese pilots and planes that attempted to destroy enemy ships by flying into them and exploding the planes' bomb load on impact.

Landing Area.—Area for the landing of all units of an airborne or amphibious force. Usually the landing area will contain several regimental or battalion parachute drop zones and glider landing zones or landing beaches.

Launcher.—Device for discharging rockets (bazooka) or firing grenades from a rifle or carbine.

Liaison.—Close contact and coordination between a commander and his subordinates and between adjacent units. It is often maintained by an exchange of personnel between the headquarters concerned.

Loran.—Short for long range navigation. Two sets of radio stations send out waves to a receiver on a ship. The receiver translates the radio impulses into the ship's location.

M–1 Rifle.—Semiautomatic, gas-operated, clip-fed, .30 caliber rifle. It is standard equipment in the army. Often referred to as the Garand rifle.

Magazine.—Container, holding a supply of ammunition, which can be attached to a gun. The cartridges are fed into the gun from the magazine.

Maginot Line.—Line of defensive fortifications built by France, after World War I, to protect her eastern frontier. Named for André Maginot, (1877–1932) French minister of war.

Main Attack.—Attack carried out by the larger portion of a commander's troops with the mission of securing the chief objective or key point.

Main Line of Resistance.—Line joining the forward edges of the principal centers of resistance. A determined effort is made to prevent the enemy from penetrating this line.

Maneuvers.—Tactical exercises; war games carried out in the field by large bodies of troops for instruction of military personnel and tests of matériel.

Matériel.—Material equipment, apparatus, and supplies used in combat.

Mechanize.—To provide armored motor vehicles, such as tanks, half-tracks, and self-propelled guns in which a unit travels and from which it fights.

Meeting Engagement.—Encounter in the field between opposing forces, neither of which is fully deployed for combat.

Military Government.—Government by military forces over occupied foreign territory or over domestic territory regained from insurgents.

Mine.—Container for explosive or chemical agents fired at will by a control device or upon contact. Mines may be submerged, laid on the ground, or buried. They are used to cause casualties among ships, vehicles, and troops.

Morale.—Mental attitude of military personnel with respect to army life and its associations.

Mortar.—Short barreled, muzzle loading artillery weapon, usually with a smooth bore. It has a shorter range and a higher angle of fire than a howitzer.

Motorize.—To provide motor vehicles in which a unit travels. The unit normally dismounts from the vehicles to fight.

Muzzle Brake.—Device on the muzzle of a gun barrel which utilizes the escaping gases to reduce the effective recoil force.

Napalm.—Substance for thickening gasoline to be used in flame throwers and incendiary bombs.

Neutralize.—Render harmless or wipe out enemy troops and equipment by the use of gunfire, bombs, or chemicals. To decontaminate a chemical agent.

Nissen Hut.—Quickly erected, arched, insulated shelter.

Objective.—Military goal, such as a place that a unit has been ordered to occupy, or an enemy force that it has been ordered to overcome.

Offense.—Act of attacking; assault.

Operation.—Military action; combination of all the details of planning and executing a phase of combat.

Order of Battle.—Strength, organization, and dispositions of the enemy as deduced from all available information.

Ordnance.—Military equipment, such as weapons, ammunition, combat and special purpose vehicles, and repair tools and machinery.

Outpost.—Security detachment sent out some distance by a halted command or defensive position to protect against surprise, observation, and annoyance by enemy ground forces.

Pack Transportation.—Animals, with the required equipment and personnel, used for carrying weapons, ammunition, and supplies on their backs. Pack transportation finds its greatest use in mountainous terrain.

Panzer.—German word meaning armor. When combined with nouns it means armored, as panzer division, a mechanized armored offensive force employed specially for attack in coordination with attack aviation.

Parachute.—Folding umbrellalike contrivance, usually of light fabric, whose resistance to the air retards the speed of a falling body. It is used to enable personnel and supplies to be dropped from an aircraft in flight without injury or damage.

Patrol.—Small group of troops, vehicles, aircraft, or ships assigned to provide security for, or to gain information for, a larger force.

Pillbox.—Low fortification, containing one or more machineguns or antitank weapons, used to strengthen a defensive line. It is usually constructed of concrete, steel, or filled sandbags.

Ponton Bridge.—Temporary floating bridge for the passage of troops or vehicles, supported by boats, metal cylinders, or other buoyant objects.

Position in Readiness.—Location in which troops trained and equipped for battle are held ready for instant action, especially when the exact place in the battle that they will be required for has not been determined.

Pyrotechnics.—Fireworks signal lights used for communication. The signal may be dropped from aircraft or fired from the ground.

Quartering.—Assigning shelter for troops, headquarters, establishments, and supplies.

Quartermaster Corps.—Branch of the army responsible for providing food, clothing, shelter, and some types of equipment.

Radar.—Short for radio direction and ranging equipment. Electrical apparatus with which targets are detected and their ranges and directions measured. The radar transmits radio waves that are reflected by the target back to the receiving apparatus. See article RADAR.

Radio Direction Finder.—Aircraft instrument that receives direction signals from radio stations. The signals are registered by an indicator on an azimuth scale.

Raid.—Sudden attack or invasion by troops, aircraft, or naval vessels for the purpose of securing information, harassing or deceiving the enemy. Usually there is no intention of holding the territory invaded.

Railhead (truckhead, navigationhead, or airhead).—Point at which supplies are unloaded, and from which they are distributed or forwarded, usually by another means of transportation.

Range.—Distance from the gun to the target; elevation necessary to be set off on a gun to hit a certain target; operating limit, such as the range of a gun or an airplane. Also, area equipped for practice shooting at targets, called target range.

Ration.—Fixed daily allowance of food for one soldier. To supply with food.

Recoilless Weapon.—Weapon characterized by a lack of backward force and movement when fired. It differs from a rocket launcher in that the propelling charge is burned in the chamber of the weapon instead of in an attachment to, or a part of, the projectile.

Reconnaissance.—Examination of an area to gain military information. Reconnaissance may be made from the air, water, or ground.

Revetment.—Retaining wall of filled sandbags, boards, wire mesh, or brush, to prevent steep earthen slopes from caving in. Often used in fortifications.

Ricochet.—Glancing rebound or skipping of a projectile along a flat surface.

Road ock.—Obstacle to prevent the movement of vehicles along a road. It is usually guarded or covered by fire to prevent its unauthorized removal.

Rocket.—Projectile which is self-propelled by the escape of gases from the rear of the combustion chamber. Single rockets are fired from the bazooka and other hand carried rocket launchers. Multiple rockets are fired from launchers mounted on aircraft, ships, tanks, trucks, and trailers.

Roger.—Word used in radiotelephone conversation meaning received. In the phonetic alphabet, it is also the letter *R*.

Route of Communication.—Network of roads, navigable waters, and airplane landing and rail facilities over which supplies are transported and combat movements made.

Sabotage.—Destruction of, or damage to, installations and facilities by enemy agents acting surreptitiously in an attempt to impede the progress of the war.

Salient.—Outwardly projecting part of a battle line or fortification. The corresponding dent in the opposing line is called a re-entrant.

Salvage.—Collection of property (condemned, abandoned, or captured) for reclaiming or scrapping.

Salvo.—Group of shots fired at the same time by a battery of artillery or a group of bombs dropped at the same time by an airplane. One round per gun, in a battery, fired in a prescribed order with a prescribed time interval between shots.

Schutzstaffel.—Trained unit of the Nazi Army whose personnel were highly credited members of the Nazi Party. Abbreviation SS or S.S.

Screen.—Protection from enemy ground reconnaissance or observation, and sometimes from enemy fire. A body of troops, camouflage, smoke screen, or a natural terrain feature may serve as a screen.

Sector.—Clearly defined subdivision of a defensive position which a given unit, weapon, or individual protects or covers. Sometimes only the areas held by regiments or large units are called sectors.

Security.—Measures taken to prevent the enemy from gaining information. They include the placing of troops to protect against attack and the steps taken to insure that messages are genuine and that the meaning of the codes and ciphers are not known to the enemy.

Self-propelled Gun.—Artillery piece mounted on a motor vehicle, usually on a track-laying vehicle similar to a tank.

Service.—Military or naval duty; military service. Branch of the army primarily concerned with administration, supply, transportation, or medical care. A combatant branch is called an arm.

Shaped Charge.—Explosive material molded with a cone-shaped depression so that the explosive energy is concentrated in one direction. The shaped charge has great penetrating qualities and is able to blast holes in steel and concrete.

Shock Troops.—Troops specially organized, trained, and equipped for attack and hand-to-hand combat.

Situation Map.—Map showing the tactical and/or administrative situation of a unit at any time. It also shows the known enemy situation.

Small Arms.—Firearms carried on the person and used in the hands.

Sniper.—Rifleman, often camouflaged, who fires from a concealed position at detached enemy individuals, especially those not in action.

Sniperscope.—Portable device combining infrared rays with a shoulder weapon to enable an operator to see and shoot at targets in the dark.

Snooperscope.—Portable device using infrared rays to enable an operator to see in the dark.

Spearhead.—Leading assault troops in an offensive operation. To hold the most advanced position in an attack.

Standing Operating Procedure.—Previously prescribed instructions regarding the procedures to be followed when certain normal conditions exist or situations arise. Abbreviation SOP.

Strafe.—To shell or bombard vigorously, especially to machinegun and bomb enemy ground positions from aircraft.

Strategy.—Science and art of employing the armed strength of a nation in gaining and keeping the advantage over the enemy in combat operations. Strategy involves planning on a large scale; tactics involves the operations necessary to carry out these plans.

Support.—Assistance or protection given by one element or unit to another, as artillery fire used to support infantry troops. Unit which assists another in combat.

Sweep.—To pass a mine detector over the ground to locate buried mines. To drag the water to locate submerged mines. To cover an area with gunfire. Swift flight of a group of aircraft over enemy territory. The trace produced on the screen of a radar.

Tactics.—Science and art of maneuvering troops and ships in action or in the presence of the enemy. Tactics differs from strategy which refers to the broad plan of a nation at war.

Task Force.—Temporary grouping of several units; usually several arms, such as air, infantry, artillery, armor, and engineers; under one commander to perform a certain combat mission.

Terrain.—Area of ground considered as to its natural features for use in a military operation.

Theater of Operations.—Combat area, including that portion of the adjacent districts necessary for the administration and supply pertaining to the combat operations.

Thermite.—Incendiary agent, used in projectiles, consisting of powdered aluminum and the oxide of another metal, usually iron. When ignited thermite produces hot molten metal.

Ultimatum.—Final proposition or condition offered by one nation or military force to another, carrying with it a threat of military action if the demands are not met.

Unconditional Surrender.—Act of absolutely giving up without reservations or terms.

Unit.—Military organization. A unit may vary in size from a squad of a few men up to an army of millions.

VT Fuze.—Fuze on a shell or a bomb containing a device, normally a small radio, which causes the fuze to operate when it comes within a certain distance of the ground or any object. Used against targets in the air as well as against targets on the ground and water.

War Dog.—Dog trained to perform such special tasks as guard duty, scouting, carrying messages, and searching for the wounded.

War of Masses.—Warfare in which the large number of men involved, rather than the quantity and quality of their equipment, is the deciding factor.

War of Movement.—Mobile warfare characterized by maneuver, initiative, and the seizure of key terrain features.

War of Position.—Warfare characterized by lack of movement and aimed principally at denying strategic areas to the enemy.

West Wall.—Line of defensive fortifications near the western boundary of Germany; Siegfried Line.

Window.—Metallic strips scattered in the air by aircraft, rocket, or shell for the purpose of deceiving a radar operator as to the actual number and location of aircraft in the area.

Y Gun.—Antisubmarine gun, shaped like the letter *Y*, and usually mounted near the stern of a vessel, which is used to throw depth charges into the water.

Zero Hour.—Hour at which an attack or operation, that has previously been planned, is initiated; H-hour.

Zone of Operations.—Ground, sea, and air area containing the routes by which an army advances from its base toward its objective.

RICHARD G. THOMAS, JR.,
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MILITARY TRANSPORTATION includes all the media employed to carry the troops, baggage, supplies, stores, and impedimenta of an army. These means may be stated in the following broad general lines: (1) Water, (2) Rail, (3) Motor, (4) Air, (5) Pipeline, (6) Animal. These individual names are sufficiently descriptive to indicate the use and place of each in the transportation scheme. Operating responsibility rests with the quartermaster general who makes commercial carrier contracts; arranges rail facilities; operates ships, barges and lighters; provides port facilities; coordinates air corps and commercial lines procedure as they meet for army service; contracts for the purchase and manufacture of motor and animal-drawn vehicles, according to definite army specifications; purchases horses and mules and operates remount stations where army animals are bred; controls existing commercial pipelines used for transporting crude and refined oil. There is provision in the National Defense Act for the quartermaster general to take over the operation of all commercial carriers in time of national emergency. See also ARMY TRANSPORT SERVICE; MILITARY RAILWAYS; SUPPLY RAILWAYS.

MILITCHEVITCH, Djakov, Milam, Serbian author and ethnologist: b. Ripany June 4, 1831; d. Belgrade, 1908. He concluded his theological education in 1850, entered the service of the state in 1852 and in 1861 he became secretary to the minister of education. He edited the periodical *Skola* in 1868–1876, in addition to his official duties; and in 1886 was appointed librarian at the National Library of Belgrade. He ranked as one of the foremost Serbian scholars of his time. He wrote *History of Pedagogy* (1871); *The Principality of Serbia* (1876); *Life of the Serbian Peasant* (1867–1877); *Lives and Works of Illustrious Men* (1867–1879); *The Kingdom of Serbia* (1884); *Biography of Famous Serbians of Modern Times* (1888).

MILITIA. By definition, this is the term applied to fighting men, citizens under normal conditions, who are compelled to hold themselves in readiness for military service, really soldiers "on call." The word itself comes from the Latin *miles,* meaning "soldier," and *militia,* meaning "military service." Among primitive

people, it was common practice for the whole citizen body to serve as soldiers. Greece, particularly in its early organization of city states, definitely joined the art of war with the art of politics, for in the reign of Pericles in Athens, the youth was recognized as a *man* citizen in the state through his partaking of military training and becoming an *armed* citizen. Under Cleitenes, all freemen met as a body and, using their political right, voted for war; then, the same body of freemen became the military body which fought the war decided upon. Thus the militia idea became an accepted part of national thought. It was invoked against the too great grasping of monarchical power and the arrogance of eastern dynasties, and was employed to throw back invasion by mercenary troops. At Morgarten, Switzerland, in 1315, mercenary invaders suffered defeat at the hands of militia troops, since which time the Swiss have considered the militia to comprise their whole armed force.

English Militia.—The first mention of the *fyrd* occurs in the Anglo-Saxon Chronicle in the year 605. It was a local defense force, locally controlled, made up of the entire free male population, each member of which was charged with providing his own armament. By the 10th century, the fyrd was divided, half to fight and half to stay at home for farm work. No one was excused. Following the Norman Conquest, the fyrd gradually gave way to the feudal levy, founded on land and personal obligations. Warriors were weighed in terms of land, five hides to produce one fully armed fighter. However, enough of the old system was kept whereby siege warfare could be maintained with troops drawn by the general levy, thus freeing the mounted knight for his spectacular incursions on neighboring territories.

Henry II, in 1185, recognized the value of having something more than the feudal levy when he required that all burghers and freemen should be armed with a lance and should wear a mail doublet and an iron headpiece. He limited employment of troops so raised and armed to local service. As the feudal system expanded, the English kings used the general levy increasingly since it, and scattered units of hired professional soldiers, came to represent the only forces royalty could interpose to the tremendous power of the arrogant feudal barons. The Statute of Winchester (reign of Edward I) ordered that «every man have in his house harness for to keep the peace after the ancient assize»; certainly there was a definite intent here to use the militia to suppress civic disturbances. In the period from the 14th to the 16th century a practice arose of appointing outstanding persons in each county to have charge of the militia forces under royal commissions. In 1550, under Edward VI there is noted the existence of a lord lieutenant for each county whose duty it was as a military officer to raise his county's military forces in behalf of the nation. When the Spanish Armada threatened the British Isles, these lord lieutenants perfected all plans for internal defense, and it was under their administration that reliance came more and more to be placed upon the «train bands.» During the reign of Charles I, when King and Parliament were at each other's throats, both sides sought to employ these forces, but with the exception of the London «train bands,» there was little accomplished by their use.

After the Restoration there was a very definite public revulsion of feeling against the professional soldier, so much so that in 1662 England hoped to do away with the professional soldier entirely and substitute therefor the militia, controlled by the Crown and financially supported by the Parliament. However, the wars with France and Holland which occupied the following hundred years, showed that the professional soldier was an absolute necessity. Regular troops came into their own and the militia was tolerated as a very minor part of the national military system. In 1757, the militia was reorganized on a selective compulsory system and was frequently used, when the French threatened invasion, until 1815. From that date until 1852, the militia was allowed to lie dormant. On this latter date it was reorganized on a purely volunteer basis. Thus, militia in England practically came to an end in 1815. In 1871, the militia, which as we have seen went on a volunteer basis in 1852, was taken from control of the county lord lieutenants and placed directly under the Crown, becoming, in effect, a second standing army. In 1907, the Territorial and Reserve Forces Act completed the abolition of the militia whose units were shifted either to the Special Reserve or to the Territorials where, as units or as individuals, they should be available to supplement the Regular Army. In the 1940 war emergency, newspaper reports and pictures emanating from rural English communities indicated a possible rebirth of the militia.

American Militia.—From a social and political system which evidenced many signs of stability in pattern, colonists came to the North American continent to experience conditions of absolute primitiveness. As they came to the New World, they perforce brought with them the only institutions they knew—British. The conditions under which they had to live forced them to roll back the curtain of time somewhat and revert to the pattern of early Anglo-Saxon times, when, as mentioned previously, the fyrd constituted the home defense force. There was no time for debate on the matter—an Indian arrow could and very probably would silence the most profound debater. Neither was there room for one who was only a professional soldier. Grim necessity made of every workingman a soldier. The size of the colony made but little difference.

Governor Endicott of Massachusetts, in 1631, published his instructions from England to have «all planters and servants instructed in the use of arms and to designate certain days for trainings.» Virginia followed suit three years later, putting into operation a county system which closely resembled the lord lieutenant set-up familiar in England. One item of armament in Massachusetts provokes a smile, for it is difficult to see how settler-soldiers (when they were armed with the long pikes that were prescribed) could do much damage against the savages in the virgin forests.

In early American history, writers have accented the part played by the military forces of the Crown and have subordinated the militia, units of which were seriously involved in Bacon's Rebellion in Virginia (1676) and Leisler's Rebellion in New York (1689). As rela-

tions became tenuous between the colonies and the mother country, the militiaman again became a prominent factor. Events such as the Boston Tea Party and the Boston Massacre crystallized his expression of effort. He fought at Lexington and Concord, at the siege of Boston, and in following campaigns. Throughout the period of the American Revolution, 164,087 militiamen were engaged, constituting approximately 40 per cent of the total force.

When the colonists had won their independence, they had acquired through bitter experience a hatred for standing armies and professional soldiers. Accordingly, with the exception of a regiment of infantry and a battalion of artillery, the Regular Army was disbanded and a uniform militia was provided by the act of May 8, 1792 which stated: "That each and every free able-bodied white male citizen of the respective States resident therein, who is or shall be of the age of eighteen years, and under the age of forty-five years shall severally and respectively be enrolled in the militia by the captain or commanding officer of the company within whose bounds such citizen shall reside."

Western frontier troubles called for the raising and maintaining of a small regular force, and Indian uprisings in eastern and northern states dictated the necessity of having some better military protection than the militia law afforded. In the War of 1812 the militia merited no meed of praise for its service. Slowly through the 19th century the militia idea as set forth in the act of 1792 was abandoned.

The question of militia jurisdiction presents an interesting study. There was no federal militia; therefore, a concurrent jurisdiction over state militia arose. Shays' Rebellion (1787) threatened the federal arsenal at Springfield and we see the governor of a state (Massachusetts) ordering out the necessary militia to quell the uprising; harassed by the Whiskey Rebellion (1794), the President of the United States required that four state governors organize and hold in readiness the necessary militia force to handle the situation; John Adams (1799) called upon the governor of Pennsylvania for the militia force necessary to put down the Fries Rebellion; when the Civil War broke out, the federal government issued militia calls.

As the militia passed out of the picture, it was supplanted by what we call today the National Guard. The drafts of May 3, 1863 and of May 18, 1917 made no mention of drawing from existing militia bodies—they called simply for individuals. Federally and locally, enforcement of the militia law fell apart and the states swung to the organization of volunteer National Guard units. By successive acts in 1903, 1916, 1920, and 1933, the federal government recognized these state units and by imposing upon their members a dual oath, made them subject to federal orders in emergency. Until recent expansion of the Regular Army, the National Guard force outnumbered the Regulars. It is a splendid example of what a federal militia may be. Under existing provisions of the National Defense Act, the Army of the United States consists of the Regular Army, the Organized Reserves, and the National Guard. See also ARMY OF THE UNITED STATES; CONSCRIPTION; NATIONAL GUARD; UNITED STATES—*United States Army.*

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MILITIA, Naval. See NAVAL RESERVE.

MILIUM or **GRUTUM,** an old name, a skin disease caused by the retention of the secretion of the sebaceous glands, resulting in small white or yellowish-white globules the size of a pinhead or less, constituting a minute tumor. It usually forms around the eyes, on the cheeks or forehead, although it also occurs on other parts of the body. The tiny tumor lies just beneath the skin, slightly raised above its surface, and is supposed to form through the destruction of ducts through which the secretion of the sebaceous glands formerly passed. It may undergo calcification, but at no time in the process of its formation nor in its continued presence is there inflammation. In some cases it disappears in the course of the continuous change in the cuticle.

MILK may be defined as the normal secretion of the mammary glands. The milk of all mammals is similar in qualitative composition consisting mainly of water, fat, proteins, milk sugar and salts; together with other substances including the vitamins whose quantity is so small as to be scarcely measurable by direct analytical methods, but whose nutritional importance is very great. Colostrum, the fluid secreted for a short time immediately after giving birth to the young, is composed of similar substances, but differs considerably from normal milk in its quantitative composition and physiological properties. The average percentage composition of some of the more important milks is approximately as follows:

	Water	Fat	Protein	Sugar	Ash
Human milk	88.00	3.80	1.50	6.40	0.30
Cows' milk	87.00	4.00	3.35	4.90	0.75
Goats' milk	85.70	4.75	4.30	4.45	0.80
Ewes' milk	80.80	6.85	6.55	4.90	0.90
Asses' milk	89.50	1.75	2.00	6.25	0.50
Mares' milk	90.75	1.20	2.00	5.70	0.35

Human milk varies to such an extent that any attempt to state its average composition is liable to be misleading. The percentage of any constituent, and especially that of proteins, may differ widely from that given above while the milk is still entirely normal. Such differences are found not only in the milk of different women, but in that of the same woman at different periods of lactation.

The milk of any one species may vary widely in fat content, and considerably in protein content; but a few species' differences seem to be sufficiently established.

Cows' milk differs from human milk in containing less sugar and considerably more proteins and ash. The proteins are also of a somewhat different character, the casein being more easily coagulated and forming a tougher curd. Goats' and ewes' milks being rich in fats and proteins are well adapted to the manufacture of cheese and are largely used for this purpose in some parts of Europe. Asses' and mares' milks have been recommended as preferable to cows' milk for infant feeding, since they show some resemblance to human milk in the amount and nature of the proteins which they contain. In this country, however, the milk of the cow is the only one of commercial importance. Unless otherwise explained all of the statements which follow will be understood to refer to cows' milk, but many of them are true of the milk of other mammals as well.

Cows' Milk.—The constitution of cows' milk has been concisely stated by Henry D. Richmond: "It is essentially an aqueous solution of milk sugar, albumin, and certain salts, holding in suspension globules of fat and in a state of semisolution, casein together with mineral matter. Small quantities of other substances are also found." As regards its physical properties, milk is an opaque, white or yellowish fluid, somewhat heavier and more viscous than water, having a faint characteristic odor and a slightly sweetish taste. The yellowish color is due to the fat and the opacity and viscosity in part to the fat and in part to the casein and lime salts present. The specific gravity is usually between 1.029 and 1.034 at 15.5°C. (60°F.). Normal fresh milk shows toward litmus an amphoteric reaction, and reacts acid with phenolphthalein. This property is attributed to the presence of phosphates and of carbonic acid. The gases contained in cows' milk, carbonic acid with small amounts of oxygen and nitrogen, are for the most part evaporated in the usual processes of handling the milk and therefore need not be further considered here.

Proportions of Water and Solids.—The proportion of water in cows' milk varies considerably, depending upon breed, individuality, period of lactation, etc. While the average amount is about 87 per cent, the mixed milk of a herd may easily show as much as 88 or as little as 85 per cent of water corresponding respectively to 12 or 15 per cent of solids. The milk of a single healthy cow in normal condition may sometimes contain as little as 10 or as much as 18 per cent of solids, while in extreme cases even these latter limits may be passed. The writer has found 19.88 per cent of solids in the milk of a perfectly healthy cow and 27.40 per cent in that of a cow having fever. Over 16 per cent of solids in the mixed milk of a herd or over 18 per cent in that of an individual is, however, comparatively rare.

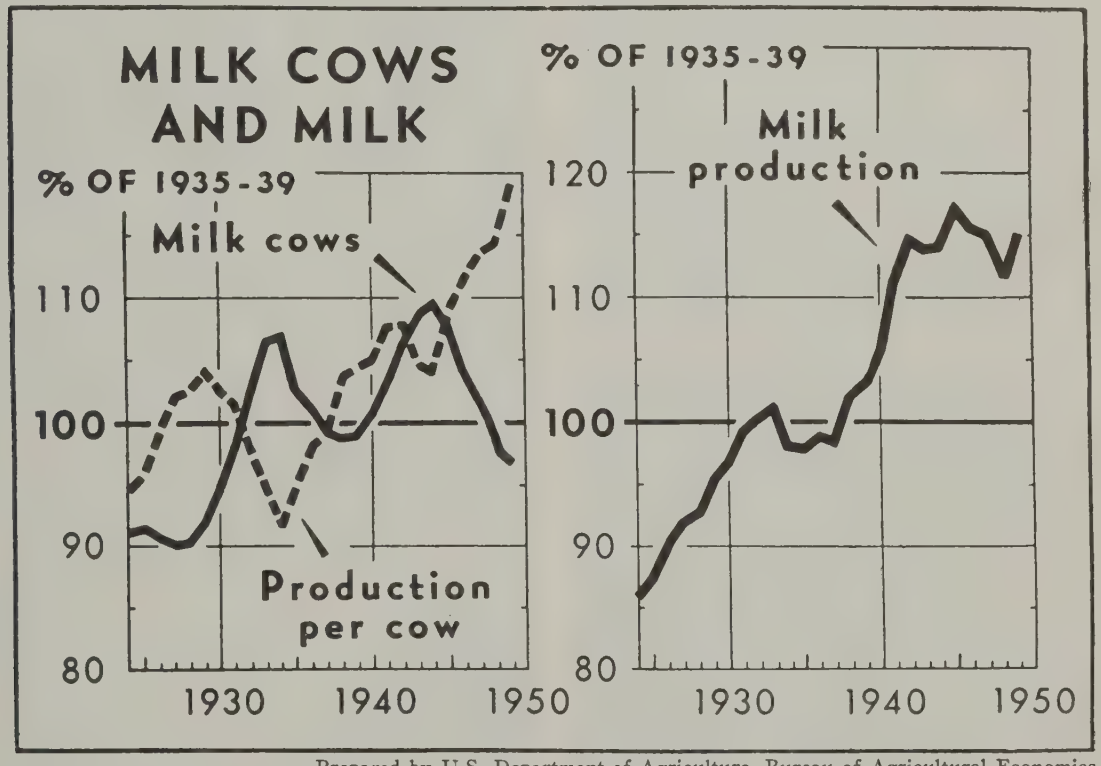
Breed.—While much depends upon the individual cow, it is well known that some breeds tend to yield richer milk than others. The following figures, obtained by averaging the records of tests made at the New York and New Jersey agricultural experiment stations, serve to illustrate the variation in richness of milk yielded by different breeds:

Breed	Total solids, per cent	Fat, per cent	Solids-not-fat, per cent
Jersey	14.87	5.19	9.68
Guernsey	14.69	5.16	9.53
Shorthorn	13.38	4.05	9.33
Ayrshire	12.73	3.64	9.09
Holstein	11.96	3.43	8.53

Advance of Lactation.—After the third or fourth month the milk tends to increase in richness as lactation advances. A study of nearly 50 lactation periods of individual cows at the New York State Experiment Station yielded the following average results, the observation being continued in each case for 10 months:

Months	Total solids, per cent	Fat, per cent	Solids-not-fat, per cent
First month	14.00	4.54	9.46
Second month	13.50	4.33	9.17
Third month	13.47	4.28	9.19
Fourth month	13.64	4.39	9.25
Fifth month	13.75	4.38	9.37
Sixth month	14.00	4.53	9.47
Seventh month	14.18	4.56	9.62
Eighth month	14.33	4.66	9.67
Ninth month	14.46	4.79	9.67
Tenth month	14.83	5.00	9.83

In the last few days of lactation, when the yield becomes very small, the proportion of



Prepared by U.S. Department of Agriculture, Bureau of Agricultural Economics

Milk cows and milk production in the United States, in percentages of the 1935–1939 average.

solids often rises to a marked degree, sometimes reaching 20 per cent or over.

Partial Milking.—All of the statements regarding the composition of milk refer to the product of a complete milking. In partial or fractional milking the first portions drawn are comparatively poor, especially in fat, and the last portions or "strippings" are much richer.

Milk Fats.—Milk fat, like other fats, is a mixture of glycerides (compounds of glycerin and fatty acids). It differs from other animal fats in containing a smaller proportion of stearic acid and large proportions of the acids of lower molecular weight. A detailed study of the constitution of milk fat by the late Dr. Charles A. Browne gave the following results:

Acid	Per cent of acid obtained	Corresponding per cent of glyceride
Oleic	32.50	33.95
Dioxystearic	1.00	1.04
Stearic	1.83	1.91
Palmitic	38.61	40.51
Myristic	9.89	10.44
Lauric	2.57	2.73
Capric	0.32	0.34
Caprylic	0.49	0.53
Caproic	2.09	2.32
Butyric	5.45	6.23
Total	94.75	100.00

The last four acids are the volatile fatty acids, the large amount of which serves to distinguish milk fat (butter) from other fats which as a rule have only a fraction of a per cent of these acids. In the milk the fat exists in the form of minute suspended globules which vary considerably in size, but average about $\frac{1}{10,000}$ of an inch in diameter. A drop of average milk contains more than 100,000,000 fat globules.

Amount of Fat in Milk.—The percentage of fat in milk varies more than that of any other solid constituent or, indeed, of all the other solids combined. In the mixed milk of herds where the influence of individual cases of advanced lactation is minimized, we may consider the usual range to be from 3 to 6 per cent of fat and from 8.5 to 9.5 per cent of solids not fat. Hence the varying richness of cows' milk is due principally to differences in fat content, and as fat is also the constituent of greatest pecuniary value, a "rich" milk is essentially one containing a high percentage of fat.

Nitrogenous Compounds or Proteins of Milk.—The greater part of the nitrogen in milk (usually over three fourths) is in the form of casein, a compound protein which contains phosphorus in organic combination and is probably also combined with lime salts. Casein is readily coagulated by acids or rennet and the curd thus formed encloses the greater part of the fat which the milk contained. Of the nitrogen compounds other than casein, albumin is by far the most abundant. Milk albumin is not coagulated by rennet, nor by acids at ordinary temperatures, but is coagulated by heat. In addition to casein and albumin, milk contains small amounts of other protein bodies including the enzymes or unorganized ferments which play an important part in cheese making and probably aid the digestion when milk is consumed in the fresh state without previous heating. Among the nitrogenous compounds other than proteins which have been found in milk may be mentioned small amounts of lecithin, amino acids, vitamins, and traces of ammonia and urea.

Amount of Proteins in Milk.—Formerly, through faulty methods of separation, the reported percentages of proteins were often very inaccurate and were usually too high. The amount of protein matter as determined by modern methods is usually between 3 and 4 per cent, being higher in those samples which are naturally richer in fat. Average milk with 13 per cent of solid matter usually contains about 4 per cent of fat and 3 1/3 per cent of proteins. In richer milk the increased amount of solids is usually made up of about three-fourths fat and one-fourth proteins. In other words, the percentages of fat and proteins tend to rise and fall together approximately in the proportions represented by the formula—Proteins $= 2.00 + 1/3$ Fat. Variations in fat, especially if due to temporary causes, are not always accompanied by so much variation in proteins as the formula would indicate. On the other hand, the percentage of proteins is apt to exceed that indicated by the formula, in very advanced lactation. As a rule when the amount of solids-not-fat exceeds 9 per cent, the excess is due chiefly to excess of proteins.

Milk Sugar.—Milk sugar, or lactose, has the same composition as cane sugar, but differs from the latter in some of its chemical properties and is less sweet and less readily soluble in water. The amount of sugar is rather more constant than that of proteins, being usually between 4.5 and 5.25 per cent in normal milks. While the latter figure is rarely exceeded, occasional samples may show considerably less than 4.5 per cent. In any genuine milk containing an unusually low percentage of solids-not-fat, the deficiency is apt to be principally in the milk sugar. Such milk is apt to be yielded in case of fever or unusual excitement or fatigue, and may sometimes be obtained from apparently healthy cows under normal conditions, especially during hot, dry weather.

Salts or Ash of Milk.—When milk is dried and burned there remains a white ash, the average composition of which was stated by G. F. W. Fleishmann and Max Schrodt to be:

	Per cent
Potassium oxide	25.42
Sodium oxide	10.94
Calcium oxide	21.45
Magnesium oxide	2.54
Ferric oxide	0.11
Sulphuric anhydride	4.11
Phosphoric anhydride	24.11
Chlorine	14.60
	103.28
Less oxygen equivalent to chlorine	3.28
	100.00

A part of the phosphoric anhydride of the ash is derived from the phosphorus of the casein. The sulphuric anhydride also comes from the oxidation of the milk proteins. If these acid constituents are deducted the bases in the ash are found to be in considerable excess. In the milk these bases are combined partly with the casein and partly with citric acid, the latter being a normal constituent of milk. The amount of ash does not, therefore, exactly represent the mineral matter originally present. The ash of normal milk is usually between 0.65 and 0.80 per cent, averaging about 0.73 per cent. The ash

tends to vary with the proteins approximately in the proportion — Ash = 0.38 + 1/10 Protein. Milk is an exceptionally rich and constant source of food calcium, together with a favorable proportion of phosphorus compounds.

Vitamins in Milk, and Its Place in the Diet.—As Milton J. Rosenau has well emphasized, milk contains all the known vitamins. The late Dr. Lafayette B. Mendel dwelt further upon the fact that while other foods are richer sources of some individual vitamins, milk is probably unique in containing all these essentials in proportions so nearly corresponding with the nutritional needs of the human family.

Its proteins are exceptionally efficient both directly in meeting the nutritional needs of the mammalian species, and also as supplementing the proteins of the cereal grains upon which man depends so largely, for economic reasons. The emulsified form in which fat occurs in milk adds much to its digestibility; and while various food fats after being digested and absorbed serve about equally as body fuel, yet milk fat and the butter, whole milk cheese, cream and ice cream made from it are of special nutritional value because they are (as compared with most foods) relatively rich in vitamin A. There are important interrelationships between these vitamins and the functioning of some of the mineral factors in nutrition, the full discussion of which would lead us beyond the scope of this article. Hence it must suffice the present purpose to say that milk and its products have highly special significance in furnishing the mineral elements and both the fat-soluble and water-soluble vitamins in such forms and relations as give much new force to the often-stated fact that milk is the one article which nature has evolved specifically to function as food; and correspondingly it is the one food for which there is no entirely satisfactory substitute. This is true notwithstanding the fact that some individuals because of allergies or other idiosyncrasies have to get along as best they can without it; and that some whole peoples have survived under such difficult geographic and economic conditions as have limited their milk supplies very nearly to what the human mother can herself produce for her offspring. Less outstanding to the present-day viewpoint but probably of permanent importance is the fact that milk furnishes even its carbohydrate in a form especially well adapted to favorable utilization in the body.

Samuel J. Crumbine and James A. Tobey chose as the title of their book on milk, *The Most Nearly Perfect Food;* and this is probably true for the great majority of people at every stage of the life cycle. The healthy adult enjoys and profits by a varied dietary in which milk is usually more important to his nutritional well-being and resulting health and efficiency than any other one article of food.

The most recent research supports the long-current saying that "the dietary should be built around bread and milk." The breadstuffs and analogous grain products are in most countries the most acceptable of the cheaper ways of obtaining the bulk of the food calories and food protein required in nutrition, while milk is the most efficient (and in temperate regions is also the most economical) of all the "protective" foods in furnishing the type of protein which supplements the proteins of the grains, and more especially in supplying the vitamins and mineral elements which the breadstuffs and other grain products do not furnish in sufficient proportion to meet our nutritional needs. Fruits or vegetables, or both, together constitute the next most important factor in the human dietary, from the nutritional standpoint. Then, as Elmer V. McCollum and Nina Simmonds effectively pointed out, "having eaten what one should, one may for the rest eat what one likes."

With the development and diffusion of the newer knowledge of nutrition which was initiated by the scientific discoveries of the first and second decades of the 20th century and at the time of present writing is still actively showing the way to increasingly "buoyant as contrasted with merely passable health," there has been some increase in the per capita consumption of milk, fruit, and fresh vegetables. And undoubtedly we can build to still higher levels of positive health by a further shift of our food habits in the same direction; especially by taking a *larger proportion* of whatever quantity of food we need in the form of milk and citrus fruits.

Food Laws—Standards of Purity.—On account of the great importance of milk as food most of the states had laws regulating the sale of milk and established standards of composition for it even before the enactment of the general food laws. More attention has doubtless been given to the standard of purity for milk than for any other article of food.

Much attention has also been given to the establishment of sanitary standards and the grading of milk on the basis of sanitary qualities. The grades and standards recommended by the National Commission on Milk Standards were as follows:

GRADE A

RAW MILK.—Milk of this class shall come from cows free from disease as determined by tuberculin tests and physical examinations by a qualified veterinarian, and shall be produced and handled by employes free from disease as determined by medical inspection of a qualified physician, under sanitary conditions, such that the bacteria count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 80 on the United States Bureau of Animal Industry score card.

PASTEURIZED MILK.—Milk of this class shall come from cows free from disease as determined by physical examinations by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 200,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacteria count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained should score 65 on the United States Bureau of Animal Industry score card.

GRADE B

Milk of this class shall come from cows free from disease as determined by physical examinations, of which one each year shall be by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 1,000,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacteria count shall not exceed 50,000 per cubic centimeter when delivered to the consumer.

It is recommended that dairies producing grade B milk should be scored and that the health departments or the controlling departments, whatever they may be, strive to bring these sources up as rapidly as possible.

GRADE C

Milk of this class shall come from cows free from disease as determined by physical examinations, and shall include all milk that is produced under conditions, such

that the bacteria count is in excess of 1,000,000 per cubic centimeter.

All milk of this class shall be pasteurized, or heated to a higher temperature, and shall contain less than 50,000 bacteria per cubic centimeter when delivered to the consumer.

Whenever any large city or community finds it necessary, on account of the length of haul or other peculiar condition, to allow the sale of grade C milk, its sale shall be surrounded by safeguards such as to insure the restriction of its use to cooking and manufacturing purposes.

These grades and standards have been adopted, either directly or with such modifications as local conditions might suggest, in several of the states and cities of the United States. Merging of grades has occurred in some regions. Those interested should consult their local authorities. In general the presence of large numbers of bacteria reflects serious doubt upon the sanitary quality and even upon the wholesomeness of milk. Present opinion on this matter is perhaps best presented in the words of the following resolution adopted by the Commission on Milk Standards:

"Whereas, milk is one of the most perishable foods, being extremely susceptible to contamination and decomposition, and

"Whereas, the milk consumer is justified in demanding that milk should be clean, fresh and cold, in addition to having the element of safety, and

"Whereas, milk which is from healthy cows and is clean, fresh, and which has been kept cold, will always have a low bacterial count, and

"Whereas, milk that is dirty, stale, or has been left warm, will have a high bacterial count; therefore, it is resolved:

"First: That the health officer is justified in using the bacterial count as an indicator of the degree of care exercised by the producer and dealer in securing milk from healthy cows and in keeping the same clean, fresh and cold; and

"Second: That the health officer is justified in condemning milk with a high bacterial count as being either unhealthy or decomposed, or containing dirt, filth, or decomposed material as a result of the multiplication of bacteria due to age and temperature.

"Third: That the health officer is justified in ruling that large numbers of bacteria are a source of possible danger, and that milk containing large numbers of bacteria is to be classed as unwholesome, unless it can be shown that the bacteria present are of a harmless type, as for example, the lactic acid bacteria in buttermilk, or other especially soured milks."

Pasteurization.—Since under ordinary conditions it is not always possible to guard perfectly against the possible introduction of the germs of communicable disease into milk and since times and temperatures of heating milk, so as to ensure destruction of such pathogenic bacteria with exceedingly little, if any, injury to the milk itself, have now been thoroughly worked out, there is now practically unanimous agreement among those most interested in the subject that all milk, except that produced under extraordinarily good sanitary conditions, should be subjected to modern low temperature pasteurization before being used. In order to guard against injury to the antiscorbutic properties of the milk it should preferably be pasteurized at a temperature of only 140° to 145° Fahrenheit (60° to 63° Centigrade). Heating at this temperature for 20 to 30 minutes is the best safeguard against distribution of disease through milk; and milk thus pasteurized and protected from subsequent contamination or deterioration may be used with confidence that it has been rendered safe as regards pathogenic bacteria without serious injury to any of the normal constituents of the milk itself. Since there is a possibility that the antiscorbutic properties of milk may be injured to a slight extent by even low temperature pasteurization, it is advisable that infants and young children fed on pasteurized milk should be given orange juice or other food of known antiscorbutic property and suited to the age of the child.

Preservation of Milk.—Milk produced under usual conditions contains large numbers of bacteria. At ordinary temperatures these multiply rapidly and soon cause such changes as to render the milk unsalable, if not unfit for use. Various preventive measures may be adopted, either to prevent bacteria from getting into the milk, to check or control their growth or to destroy them entirely. Strict cleanliness and the use of sterilized utensils exclude a large proportion of the bacteria usually present in milk and greatly improve its keeping qualities. If such milk is protected from access of air and kept cold, it will remain sweet and fresh for at least two or three weeks without any other preservative measures. (The sanitary production and handling of milk are more fully described in the article: Dairy Industry, American.) In this respect the American dairy practice is much in advance of that of other countries, as was strikingly shown at the exhibit of dairy products at the Paris Exposition of 1900. Three dairies engaged in city milk supply, one in New York, one in New Jersey, and one in Illinois, sent regular shipments of fresh milk and cream to Paris throughout the summer. These products were found to be sweet and sound when opened from 15 to 20 days after bottling, and it was only with great difficulty that European dairy experts could be convinced that nothing but "cleanliness and cold" had been used to preserve them. No other country except France attempted to show natural milk and cream and the French exhibits were all sour on the second or third day.

It is evident that milk may be preserved much longer than is usually necessary by the observance of cleanliness to exclude bacteria as far as possible and the maintenance of a low temperature to retard the growth of those present.

For longer preservation, both the canning (after condensation or evaporation) and the drying of milk are now practiced upon a large scale and by highly developed and well controlled techniques which appear to conserve in satisfactory degree most of the known factors of nutritional value. Readers desiring to keep abreast of current developments in this field will do well to consult the Council on Foods of the American Medical Association, 535 North Dearborn Street, Chicago.

Methods of Analysis and Detection of Adulterations.—The complete analysis of a sample of milk requires much time and elaborate apparatus and is not practicable for others than trained chemists. The tests described below are more easily performed and if carefully carried out will in many cases yield all the information required. Before taking a portion for any determination the milk to be tested should be thoroughly mixed by repeatedly pouring it from one vessel to another.

Determination of Fat.—Since fat is both the most valuable and the most variable of the solids in milk, its determination is often required. This may be accomplished by the method devised by Dr. S. M. Babcock, of the Wisconsin Agricultural Experiment Station, and popularly

known as the Babcock test. In making this test, a measured amount of milk is treated with about an equal volume of commercial concentrated sulphuric acid which dissolves the other constituents, leaving the fat free in a heavy solution from which it is separated by centrifugal force and collected in the graduated neck of the test bottle, where its volume is read off at once on the completion of the test. Complete directions are furnished with the testing outfit, which can be purchased for a few dollars from dealers in chemical apparatus or dairy supplies.

Determination of Specific Gravity and Estimation of Solids-Not-Fat.—Since the specific gravity of milk is raised by all of the other solids and lowered by the fat, it follows that after the influence of each has been determined, it should be possible to estimate from the percentage of fat and the specific gravity the percentage of solids-not-fat which the sample contains. To determine the specific gravity it is convenient to use a "Quevenne" or a "Soxhlet" lactometer, either of which is practically a hydrometer of sufficient range to cover the gravity of all ordinary milks and so graduated that the thousandths in excess of unity are represented by whole numbers on the scale. Thus a milk with a specific gravity of 1.0315 will give a lactometer reading of 31.5. The temperature should be observed at the same time with the lactometer reading and the latter corrected to 60° Fahrenheit by adding to the reading 0.1 for each degree Fahrenheit above the standard temperature of 60° Fahrenheit. One fourth of the corrected lactometer reading plus one fifth of the percentage of fat gives a fairly close approximation to the percentage of solids-not-fat. The lactometer reading may also be useful aside from the estimation of solids-not-fat. Although the addition of cream to milk would lower the gravity, yet in general the lactometer reading is a rough indication of the richness of the milk, because a high percentage of fat is usually accompanied by a high percentage of protein which raises the lactometer reading. Cases in which genuine milk shows a low gravity as the result of a high percentage of fat are not common and can usually be detected by noticing the viscosity and opacity of the milk as it runs from the bulb of the lactometer. The lactometer reading taken in connection with the appearance is therefore a useful preliminary test used by the milk inspectors of many cities.

Detection of Skimmed or Watered Milk.—The most common adulterations of milk are the removal of cream (or the addition of skimmed milk, which amounts to the same thing), and the addition of water. Milk which contains less than 3 per cent of fat has usually been partially skimmed, and milk containing less than 8.5 per cent of solids-not-fat has usually been watered. In most states there are minimum limits established by law and milk falling below the limit is considered to be adulterated. Thus in New York State milk must contain at least 3 per cent of fat and at least 11.5 per cent of total solids. As stated above, the percentage of fat varies much more than that of solids-not-fat. Skimming is therefore more difficult to detect than watering. In fact, it is usually impossible to distinguish by analysis between a genuine sample containing, say, 3.6 per cent of fat, and a sample originally containing 4.5 per cent of fat, one fifth of which has been removed. On the other hand, the addition of 20 per cent of water would almost certainly reduce the percentage of solids-not-fat to a figure considerably below the normal minimum. Recently, too, a more delicate method for the detection of watering has been devised.

Other Adulterants.—The addition of chalk, calves' brains, etc., though frequently mentioned in the older works on food adulteration, is now almost unknown. Cane sugar or starch may sometimes be added to mask the effect of watering. The former may be detected by the rose-red color produced when about 10 cubic centimeters of milk are boiled for five minutes with one cubic centimeter of hydrochloric acid and 0.1 gram of resorcin. To detect the presence of starch, boil about 10 cubic centimeters of milk, cool it thoroughly and then add a few drops of a solution of iodine in potassium iodide. If starch is present a characteristic blue color will be produced.

Artificial Coloring Matter.—Caramel or yellow coloring matter such as is commonly used in butter may occasionally be added to milk. The detection of these is of little practical importance, since they would ordinarily be used only to mask the effects of gross skimming or watering such as would be readily detected by the methods already given.

Detection of Preservatives.—Formaldehyde (Formalin).—Dilute the milk with an equal bulk of water in a test tube and carefully pour in commercial concentrated sulphuric acid, inclining the tube so that the acid and milk will not mix. If formaldehyde is present a violet ring forms at the junction of the two liquids. If pure acid is substituted for the commercial, a trace of some ferric salt should be added. Boracic Acid or Borax.—Evaporate a portion of the milk to dryness and burn to ash. Moisten with a few drops of dilute hydrochloride acid and introduce a slip of yellow turmeric paper. This is turned reddish brown by boracic acid and the color may be changed to bluish black by treating with a solution of sodium carbonate. Carbonates or Bicarbonates if present in the milk would remain as carbonate after ignition and be shown by an effervescence when the ash was moistened with acid in the test for boracic acid just described.

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MILK FEVER, a fever occurring in females at the time of lactation. In veterinary medicine, it is a curable disease occurring in dairy cattle upon parturition, not to be confused with milk sickness (q.v.).

MILK IN SYMBOLISM AND FOLKLORE. Since milk holds a primary position among the natural foods of man, it is not surprising to find that it has played a variety of roles in his religions, folk legends, and superstitions. Man's first use of milk from domesticated animals began in prehistoric times, and by the time written testimony appears, the production of milk and milk products was already a well-developed home industry, as is evidenced by Homer's description (*Odyssey* IX; 248f.) of goat milking in the cave of Polyphemus. However, in spite of its economic importance throughout the ages, milk probably owes its manifold symbolism more to the marvel of its origin and life-nourishing function than to man's dependence on it as food.

In the religion of the primitive Toda tribes of southern India, milk forms the most sacred element; the dairy is the most important tribal organization, and the gods assist in its operation. At their death rites, milk is fed to the dying, and after death the body is placed in the dairy. The Hereros of western Africa also use milk as an important element in their rites for the dead, at which it is consecrated and after which a small amount is left near the grave. Numerous milk superstitions are found among other primitive tribes: the Bahima and the Masai of East Africa believe that the cattle will die if their milk is boiled; the Zulus believe a wounded man must be purified before he may drink milk; among the Hottentots, the milk containers and the rams are touched by a pubescent girl for good luck; and the Gallas of East Africa rub their sacred trees with blood, butter, and milk to keep them from decaying.

In some ancient civilizations milk became the symbol for nourishment. In Egypt, the sky-goddess was depicted either as a full-breasted woman or a cow, and milk was the food she gave to the deified kings as they entered their celestial childhood; but it was otherwise of little importance in Egyptian mythology. In Indian Vedic literature, the earth is spoken of as a mother who pours forth milk to her worshipers (*Atharvaveda* IX: iii, 16) and ritual offerings combine both milk and honey (*Rig Veda* VIII: iv, 8); both the latter, however, were subordinate to soma, the sacred drink of the Hindus, just as the same combination seems to have been subordinate to wine in Graeco-Roman rites. How this combined use of milk and honey originated is not known; it is found in several traditions, representing either the best and purest in food, or, in its Biblical use (Exodus 3:8 and elsewhere), fertility, as the fertility of Palestine.

The early Hebrews were forbidden to boil a kid in its mother's milk (Exodus 23:19) and from this scriptural prohibition sprang complicated dietary laws regarding milk. See JEWISH HISTORY AND SOCIETY—*Religious Traditions and Customs* (Dietary Laws). Also in the Semitic tradition there is evidence that *laban,* or curdled milk, was used to drive away illness from the body and was extolled for its purity, a frequent attribute of milk. In the Persian *Avesta,* milk was known as a purifier of women who had given birth to a still-born child (*Vendidad* V: 52; VII: 67).

Graeco-Roman World.—Milk played a part in the symbolism of classical antiquity from the earliest times, perhaps even more than in later times when it was replaced by wine in religious rites. There is evidence that its use in ritual goes back to the Phrygian cult of the *Magna Mater,* and, by the time of Homer, mixtures of milk, honey, and wine were often employed in rites for the dead. In Euripides' *Orestes,* Helen instructs Hermione to "pour round Clytemnestra's tomb a mingled cup of honey, milk, and frothing wine" (115). Aeschylus describes a similar death offering in *The Persians* (1. 611), in which Atossa's libations at the tomb of Darius include milk and honey. As in other ancient civilizations, milk was usually associated with honey, and when combined, the mixture was called *melicration* (μελίκρητον) by the Greeks.

The symbolical use of milk survived a long time in Greek pastoral religions, as evidenced in a poem of the bucolic poet, Theocritus (fl. c.275 B.C.), and was also an important factor in the Greek mystery cults. Featured in the Dionysiac rites in lower Italy were the enigmatic words ἔριφος ἐς γαλ ἔπετον, found on a small gold plate of the 3d or 4th century B.C. In this rite, milk was a symbol of immortality and the medium for the baptizing or bathing of a baby goat. In the worship of Cybele in the Attis mysteries, its use is described by the Platonist Sallustius as a symbol of regeneration (*Concerning the Gods and the Universe,* ed. A. D. Nock, Cambridge 1926, p. 9). Later, milk symbolizing the first nourishment of man was included in elaborate Pythagorean cosmologies by the neoplatonists, Porphyry (*De antro nympharum,* 28) and Macrobius (*Commentarii in Somnium Scipionis,* I:12). According to the latter, "Pythagoras thinks that Pluto's empire extends from the Milky Way downward, because the souls, having fallen from there, seem already to have lost their celestial attributes. On that account, he said, milk was the first nourishment offered to the newly borne, because, by means of milk, the first motion of those souls falling into their terrestrial bodies was induced." From the number of references to the Milky Circle or Way in classical literature, it is evident that its "milky" attribute goes far back: Aristotle records various theories regarding its nature and origin (*Meteorologica* I:8) and later Ovid tells us "There is a high way easily seen when the sky is clear. 'Tis called the Milky Way, famed for its shining whiteness. By this way the gods fare to the halls and royal dwelling of the mighty Thunderer" (*Metamorphoses* I:168-172).

Like the Greeks, the Romans used milk in the rites of their pastoral worship. It played an important part in the cult of the Roman gods Rumina and Cumina, whose worshipers, according to Marcus Terentius Varro (*Rerum Rusticarum* II: 11, 4), were accustomed to offer sacrifices with milk instead of wine, and Virgil, in his 7th Eclogue (33), mentions a milk offering made to the garden god, Priapus. Milk instead of wine was used for the libation at the *ferae Latinae,* the rites to Jupiter Latiaris, which were held yearly on the Alban mount outside Rome. The Romans even had gods called *Lacturcia* or *Lacturnus* who were the special protectors of grain steeped in milk (*frumenta lactentia*). The evidence of the symbolical use of milk in Roman times is abundant, and many practices and superstitions regarding it were prevalent, as, for instance, the Roman women calling the wine libation made to

the *bona dea* milk, and their drinking a mixture of milk, crushed poppies, and honey as a philter at the festival of *Fortuna virilis.*

The Christian Era.—Several legends have been preserved regarding the milk of the Virgin Mary. A Milk Grotto in Bethlehem, originally a shrine of Ashtoreth, was supposedly the refuge of the nursing Virgin, a drop of whose milk fell to the floor, and since has been thought to promote the flow of female milk and to cure barrenness. Also according to legend, the small white limestone pebbles found around Bethlehem were miraculously formed by a drop of Mary's milk falling onto a rock. In several early Christian catacomb paintings a milk pail is depicted near the Good Shepherd carrying a lamb; these allusions to milk in this context have been interpreted as symbolic of the joys of heaven.

Milk and wine were used in the early Christian Agape ceremonies in honor of the dead, and in some early baptismal rites, a mixture of milk and honey was given to the neophyte to taste. This practice was described by Tertullian as forming a part of the baptismal ceremonies of the Christians in Africa; in the West, the ceremonial tasting of milk and honey often accompanied the baptism of infants as late as the 9th century. Officially, however, its use in baptisms was banned by the Trullan Council of 692.

With the development of Christian dogma, the use of *lacticinia* (milk and milk products) was prohibited during fast days because of their fleshly origin. A Russian sect called the Molokani (milk-drinkers) were thus known because they opposed the Orthodox ban; in the West, it became customary, especially in Germany, for the church to award exemptions from this prohibition, called *Butterbriefe,* in return for some specific beneficence. From such revenues a steeple of the Rouen cathedral, formerly known as the Butter Tower, was financed.

Proverbs and sayings regarding milk in modern times are too numerous to mention. Some of them are rooted in superstition and others are derived from ancient symbols and associations. An example of a modern holdover of ancient symbolism is found in the German wine, *Liebfraumilch,* which comes from the vineyards surrounding the *Liebfrauenkirke* (Church of Our Beloved Lady) outside of Worms.

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MILK SICKNESS (also TREMBLES). This disease, which is a poisoning and commonly called milk sickness in man and trembles in livestock, was formerly attributed to a bacillus organism. However, the cause has been definitely established as a toxic substance called tremetol, which is found in the white snakeroot (*Eupatorium urticaefolium*) and rayless goldenrod or jimmyweed (*Aplopappus heterophyllus*). The livestock contract the disease by eating the plants and in turn cause the condition to occur in humans through milk and milk products. The disease occurs at the same time the animals are in pasture, usually the latter part of the summer and the beginning of autumn. Clinical signs of this condition are headache, loss of appetite, fatigue, nausea, excessive thirst, constipation, and foul breath. While the prognosis is generally favorable, death may occur in a few days preceded by convulsions, then coma. The duration of the disease in man and lower animals is from a few days to several weeks.

Affected animals should be isolated and treated. No milk or milk product should be used from these affected animals, either for human or animal use. Treatment consists of saline laxatives, parenteral solutions of physiological salt solution, and glucose and sodium thiosulfate.

MILK SNAKE, the name given to a group of snakes (*Lampropeltis triangulum*) deriving their name from the unproven belief that they drink the milk of cows in pasture. Of moderate size, they are covered with reddish-brown, black-edged blotches on the body and tail, whose ground color is grey or light brown above and white with black spots underneath. The milk snake feeds on rodents, birds, and slugs, is nonpoisonous, and is found throughout the eastern United States and southeastern Canada. It is also known as house snake, spotted adder, or checkered adder.

MILK TREE, any of various tropical trees yielding a milky, wholesome sap. See COW-TREE.

MILKWEED. See ASCLEPIAS.

MILKWORT, the common name for plants of the genus *Polygala* (q.v.), widely distributed in the temperate and tropical zones.

MILKY WAY, The, or **THE GALAXY** (from Greek *galaktos,* milk), a nebulous band of faint stars, extending entirely around the celestial sphere. This band of luminosity is the result of an edge-on view from the Earth through a disk-shaped aggregation of stars (Galactic System) in which the Earth and Sun occupy a position well out from the center. The greater number of stars seen looking outward through the flat portion of the disk accounts for the diffuse belt of luminosity in this plane. Since the Milky Way is inclined 62° to the celestial equator, its appearance is variable with the seasons, the time of night, and the observer's latitude. Its brightest portions are in Cygnus, Aquila, Scorpius, and Sagittarius, where many bright star clouds exist. The apparent width of the Milky Way is irregular and its length is interrupted by rifts and superimposed dark nebulae, such as the northern and southern Coal Sacks. An imaginary line passing roughly central along the Milky Way and projected on the celestial sphere forms the galactic circle, from which galactic latitude is reckoned. See also STARS—*The Milky Way.*

MILL, mĭl, **Hugh Robert,** Scottish geographer: b. Thurso, Caithness, Scotland, May 28, 1861; d. East Grinstead, near London, England, April 5, 1950. Educated at the University of Edinburgh, he became physicist and chemist to the Scottish Marine Station in 1884 and, three years later, a University Extension lecturer. He served on several study boards and associations, including the British Rainfall Association, of which he was the director from 1901 until it was taken over by the Meteorological Office. He also edited *British Rainfall* and *Symons's Meteorological Magazine* and wrote *The Realm of Nature* (1892); *The Clyde Sea Area* (1895); *The Siege of the South*

Pole' (1905); 'Historical Introduction' to Sir Ernest Shackleton's 'Heart of the Antarctic' (1909). He also edited the 'Report of the Sixth International Geographical Congress' (1896), and 'The International Geography' (new ed., 1911); 'The Life of Sir Ernest Shackleton' (1923).

MILL, James, British economist, historian and utilitarian philosopher: b. Northwater Bridge, Forfarshire, Scotland, 6 April 1773; d. Kensingston, 23 June 1836. His father was a cobbler, his mother a farmer's daughter and his early abilities were so marked that great care was taken with his education, so that in 1790 he entered Edinburgh University. There he was carried away with Dugald Stewart's philosophy until he came to know Bentham's system, which he then adopted. But in the university he was better known as a remarkable Greek scholar than as a philosopher. In 1802 he went to London, where he was from 1803 to 1806 editor of the *Literary Journal* and then began the 'History of India,' which occupied him 10 years. During this time he wrote much for periodicals and came to know Bentham personally; at the same time he was busied with the painstaking education of his children, notably John Stuart Mill (q.v.). The 'History of India,' a wonderfully scholarly and unpartisan work, marred only by his lack of personal knowledge of country and people and a consequent theorizing at times, was published in 1818 and immediately won for him a place in the India Office and relief from his long battle with penury. This position was the more flattering a tribute since he was now well known as a radical and a skeptic. He rose rapidly, becoming head of the office in 1830. The *Westminster Review* founded in 1824 as the organ of Bentham's followers contained many contributions by Mill; and several appeared in the *London Review.* Both in ethics, where his position was strongly utilitarian, and in political economy, where he may still be reckoned as typical of the orthodox school so bitterly attacked by Ruskin, Mill is little more than a follower of Bentham, with greater force, perhaps, because of his comparatively larger knowledge of the world. In psychology, however, although largely a follower of Hartley, his work is more important, for he developed and gave to Hartley's principle of association a wider application, and thus was the founder of the school to which Spencer and Bain belong. Mill took part in politics and contributed largely to the success of the Reform Bill by introducing to England philosophical radicalism. His personal character was strangely unhuman and unlovable, though perfectly correct. His important works besides the 'History of India' are 'Elements of Political Economy,' the first great philosophic treatise on the subject (1821), and 'Analysis of the Phenomena of the Human Mind' (1829). Consult Bain's biography (1882) and J. S. Mill's 'Autobiography' (1867).

MILL, John Stuart, English social and political reformer, philosopher, economist: b. London, 20 May 1806; d. Avignon, 8 May 1873. Few have combined so intimately a vital enthusiasm for human progress, with a keenly critical and most scholarly temper. He presents in all his most important lines of work the interesting conflict which results when a candid, open mind, instinct with human interest, attempts to work with narrow conceptions and an inadequate method. The conceptions and method have in many respects been superseded, but the candor and sincerity, the scholarly, investigative temper, the deep interest in all things human, the democratic sympathy which manifest themselves in his works, give them permanent value.

Mill was the oldest son of James and Harriet (Burrow) Mill. His early education, conducted by his father, was extraordinary. He began Greek when about three years old, and Latin at seven, and read a great amount in both languages, especially in Greek, before he was 12. He studied algebra, geometry and the differential calculus also in this period. History he read of his own accord and found amusement in books on natural science. At 12 Aristotle's 'Logic' began a more advanced course of instruction which included the more difficult classical authors, and ended, so far as his father's personal instruction was concerned, in his 14th year with a thorough study of Ricardo's 'Political Economy.' Mill himself says that it «was not an education of cram.» «Anything which could be found out by thinking I never was told, until I had exhausted my efforts to find it out for myself.» At the same time he declares that it «was in itself much more fitted for training me to *know* than to *do.*» After a year in France, which had an important influence, the reading of Bentham made an epoch in his life. «I now had opinions; a creed, a doctrine, a philosophy; in one among the best senses of the word, a religion; the inculcation and diffusion of which could be made the principal outward purpose of a life.» In the winter of 1822–23 he planned a society to which he gave the name of «Utilitarian,» and thus brought the term into common use. In May 1823 he received an appointment from the East India Company as clerk in the office of the examiner of India correspondence. Here he remained 35 years, rising to be examiner two years before the transfer of India to the British government in 1858, when he retired upon a pension of £1,500. He became a frequent contributor to the *Westminster Review* founded in 1823 as a Radical organ, and in 1834 became editor of a new Radical review, the *London Review* (afterward the *London and Westminster*). He was one of an ardent party of «philosophic radicals»; his object in life «to be a reformer of the world.» Bentham, Malthus and Ricardo were influential upon the group. But several new influences now began to unsettle his political and social views. Coleridge, especially through Maurice and Mill's intimate friend Sterling, Carlyle, Goethe, Wordsworth, and the Saint Simonians, gave broader views of human interests, and greater importance to feeling and sentiment than James Mill and Bentham. In Mill's own judgment, however, the most important influence, especially in leading «him to apply his abstract principles to the actual state of society and estimate their bearing upon human interests and sympathies more clearly and widely than he would otherwise have done,» was that of Mrs. Taylor, to whom he was first introduced in 1830. He maintained with her for 20 years a friendship of increasing intimacy, and after the death of her husband

married her in 1851. Mill loved his wife tenderly and spoke of her, notably in the *Autobiography,* and in the dedication of the volume *On Liberty* which was a joint production, in terms which seemed extravagant to his friends. A third period of Mill's mental progress fell at about the time between the first and third editions of his *Political Economy* (1848–52). In the earlier period, he writes in his *Autobiography,* "I was a Democrat, but not the least of a Socialist. We were now much less democrats than I had been, because so long as education continues to be so wretchedly imperfect, we dreaded the ignorance and especially the selfishness and brutality of the mass; but our ideal of ultimate improvement went far beyond Democracy, and would class us decidedly under the general designation of Socialists." In 1858 his wife died of congestion of the lungs in Avignon. When the Civil War in America broke out he contributed a strong article on the side of the North. In 1865 he was elected a member of Parliament from Westminster, and took an active part in support of various reform measures, but was defeated for re-election in 1868. His later years were spent in literary labors until his death, which occurred at Avignon. He had then come to be generally regarded as the foremost living philosopher and economist of England.

Mill's published works are the following: *System of Logic* (1843); *Essays on some unsettled questions of Political Economy* (1844); *Principles of Political Economy* (1848); *Memorandum of the Improvements in the Administration of India* (1858); *On Liberty* (1859); *Thoughts on Parliamentary Reform* (1859); *Dissertations and Discussions* (1859–75); *Considerations on Representative Government* (1861); *Utilitarianism* (1863); *Examination of Sir William Hamilton's Philosophy* (1865); *Auguste Comte and Positivism* (1865); *England and Ireland* (1868); *Subjection of Women* (1869); *Autobiography* (1873); *Nature, the Utility of Religion and Theism* (1874). In addition may be mentioned his edition, with notes, of James Mill's *Analysis of the Phenomena of the Human Mind* (1869); his *Inaugural Address delivered to the University of Saint Andrew's* (Feb. 1, 1867); *Speech in Favor of Women's Suffrage,* Jan. 12, 1871 (1873); *Speech on the Admission of Women to the Electoral Franchise,* May 20, 1867 (1867); H. D. Pym's *Memories of Old Friends,* which contains 14 letters from J. S. Mill (1882); several articles in the *Westminster Review* and the *London and Westminster Review,* not reprinted in the *Dissertations and Discussions.*

The keynote to Mill's method is found in the individualism which he inherited from the 18th century. This meant associationalism in logic and psychology, a metaphysical conception of reality as made up of separate phenomena, an ethical theory that made pleasure and pain the motives of action, *laissez-faire* in political economy, and the political doctrine that the end of government is to protect each individual in the possession of the produce of his labor. But in all these various fields he passed the bounds set by his inheritance. He was more concerned to find truth than to maintain a creed.

As *Logician,* Mill's greatest contribution was his treatment of induction. The four "methods" of agreement, difference, residues and concomitant variation had been mentioned by J. Herschel, but were by Mill first brought out clearly. In the part of his *Logic* which deals with the nature and conditions of knowledge he attempts, with only partial success, to give logic a more vital relation to truth and fact than it had borne since Hobbes and Locke. He insists that propositions concern "things" not "ideas"; that there are "real kinds," not merely class names; that cause is not to be defined with Hume as "invariable antecedent" but as "unconditional antecedent" or "sum of conditions." But he does not see that this realy implies a reconstructed view of nature, in which a conception of an interrelated system or whole should replace the conception of a mere sum of individuals or particulars. He remains true to his older presuppositions in holding that reasoning is from particular to particular, and that axioms owe their force to association. Matter, he holds, following Berkeley, is only permanent possibilities of sensation. In his view of the self, on the one hand, he considers that we can know only states of consciousness, that the law of association is the "governing principle," and that the conceptions by which knowledge is organized are impressed upon the mind from without; on the other hand he recognizes "the paradox, that something which, *ex hypothesi,* is but a series of feelings, can be aware of itself as a series." He therefore admits that "the mind, or ego, is something different from any series of feelings or possibilities of them." While, then, he holds to the doctrine of "circumstances" as determining character, he is careful to insist that this is not "necessity" in the ordinary sense; "our own desires can do much to shape those circumstances."

As *Economist,* Mill attempted to follow the general plan of Adam Smith and give the science a more concrete form than it had received at the hands of Ricardo; to treat it not merely as an abstract science of the "economic man," but as "branch of social philosophy, so interlinked with all the other branches that its conclusions are only true conditionally." The current economist had aroused the antagonism of the working classes. Malthusianism held out a grim prospect of increasing stress with increase of population. Ricardo's presentation of the laws of wages seemed to condemn as absolutely futile all effort to raise wages, whether by voluntary association or by political action. The repeal of the corn laws would, it was feared, ultimately benefit the employers instead of the employed. Mill retained the Malthusian doctrine as one of his cornerstones. He sees hope for the laboring classes only if they will restrict their offspring and thus diminish the supply of labor. He retains also the doctrine that labor is supported by capital, and in his *Political Economy* speaks of a "wage fund." But as an ardent sympathizer with the working class Mill makes various concessions and suggestions which made his work far less a "dismal science." *Political Economy* "has no pretension to the character of a practical guide, apart from other classes of consideration." While the laws of the production of wealth are real "laws of nature," the modes of its distribution, "subject to certain conditions, depend on human will."

The «existing arrangements of society» have much to do with determining what shares fall to laborers, capitalists and landlords, and these arrangements may be altered «by the progress of social improvement.» At first he thought only of getting rid of primogeniture and entails, and of promoting restraint of population by general education. He later came to look for a great advance in co-operation, and in the character which this implies. In 1869 he definitely retracted the «wage-fund doctrine, recognizing that there is a considerable range in the wage which economic conditions allow and hence that trades-unions may raise wages to a certain extent.» In his last years he was especially impressed with the injustice of the places which the landowners occupy at «Malthus's feast.» «Land alone has the privilege of steadily rising in value from natural causes.» The «unearned increment» should be not for the private owner but for the nation. He differed from more complete Socialists in retaining competition in his scheme, and insisting that the associations for co-operation must be voluntary. He regarded the problem of the future to be «how to unite the greatest individual liberty of action, with a common ownership in the raw material of the globe, and an equal participation of all in the benefits of combined labor.»

His moral and political theories are set forth in his 'Utilitarianism,' 'Liberty' and 'Subjection of Women.' He always remained a Utilitarian in the sense that he believed «those actions right which promote the greatest happiness of the greatest number»; further, he attempted to prove this by the individualistic doctrine that since each one desires his own happiness, the general happiness must be a good, not noticing the possible conflict between such happiness-seeking in individuals, which would make a «sum» impossible. But elsewhere he breaks away decisively from Bentham's doctrine that happiness means only pleasure of varying intensity, length, certainty, etc., regardless of what objects produce it. «Higher pleasure,» a «sense of dignity,» will not be exchanged for any amount of the «lower» by the expert judge. It is «better to be Socrates dissatisfied than a pig satisfied.» This is evidently abandoning pleasure pure and simple as standard, and setting up instead a «standard for pleasure,» namely, the character of the man who judges. In the 'Liberty' he states that the utility which is the ultimate appeal «must be utility in the largest sense, grounded on the permanent interests of man as a progressive being.» The motives on which he relies are not the external «sanctions» of Bentham; nor yet the association of private with public happiness which James Mill had regarded as the structure of conscience. These suddenly appeared to him artificial. Partly under the influence or Comte he came to hold, rather, that conscientious regard for others is supported by natural social instincts. His 'Liberty,' the most carefully written of his works, contains a fresh and vigorous argument for the principle that only self-protection — to prevent harm to others — justifies society in interfering with the individual's liberty of action. «His own good is not a sufficient warrant.» The positive reason for this is the great value of individuality in human welfare. The principle requires not only liberty from legal restraint, but from the coercion of public opinion. It comprises, first, liberty of thought and discussion, in order that truth may be reached; secondly, liberty of tastes and pursuits; thirdly, freedom to unite for any purpose, not involving harm to others. In the 'Subjection of Women' he argues for the complete legal equality of men and women, not only to remove injustice but because «the only school of genuine moral sentiment is society between equals.» «We have had the morality of submission, and the morality of chivalry and generosity; the time is now come for the morality of justice.» Moreover, a position of equality with its accompanying effects of enlarged interests, wider responsibility, greater dignity and the possibility of individual development and satisfactions would add immeasurably to the well being of all other members of the family.

Mill's religious views are found chiefly in the 'Examination of Sir William Hamilton' and in the three essays published after his death. He found no warrant for making nature a standard of morals or for inferring from it perfect benevolence or justice. Indeed only by sacrificing the attribute of omnipotence can we reconcile nature with the existence of a moral deity. In all this he is considering the older deistic conceptions, nature, man and God, as three separate beings. But there is much in his thought which is incompatible with such mechanical separation of nature and spirit, and of human and divine, notably in the famous passage from the 'Examination.' In reply to Dean Mansel's mode of reconciling supposed divine action with human conceptions of justice by the doctrine that God is Inconceivable, and therefore what is wrong by human standards may be right by divine standards, Mill replies, «I will call no being good, who is not what I mean when I apply that epithet to my fellow creatures; and if such a being can sentence me to hell for not so calling him, to hell I will go.» See MILL, JOHN STUART, AUTOBIOGRAPHY; ON LIBERTY.

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MILL, the general name of a machine for grinding, crushing, or pulverizing. It also designates any of various machines which produce a manufactured product by the continuous repetition of some simple action, as a sawmill; and is used to refer to the building or buildings in which certain processes of manufacturing are carried on, such as a cotton mill or powder mill.

MILL, JOHN STUART, AUTOBIOGRAPHY. This has been called the history of an education, showing what may be accomplished in forming a boy's mind both for good and ill. Mill's teacher was his father, whose ardor in the task was stimulated by the facility of his pupil. He began Greek at three; Latin at seven; by 12 he knew most of the best in both languages, besides reading in English "chiefly histories," and composing one book in continuation of Pope's *Iliad.* At 12 he began logic; at 13, political economy; at 17 he was writing articles for the *Westminster Review.* But such forcing of the faculties must be paid for. It was impossible that Mill's education should not produce a distinguished mind, it was equally impossible that it should produce a joyous one. His boyhood lacked games and youthful companionship. At 20, a not unnatural reaction caused a sudden collapse in his whole intellectual outlook, resulting in profound depression, when this brilliant boy "seemed to have nothing left to live for."

From this state of "dry, heavy dejection," Mill was roused by the discovery of beauty, art, music and poetry, all of which had been omitted from the system of the elder Mill. Thus he came to perceive the value of feeling and emotion, and was brought back to hope and enjoyment by pleasure in Wordsworth's poetry and the Memoirs of Marmontel. Admirable as all this is, not less so is his account of "that friendship which has been the honor and chief blessing of my existence," his marriage with Mrs. Taylor in 1851. Mill's intellectual isolation made the experience a vital one; and the words in which he draws his wife's character and their companionship in work and thought are among the most impressive of their kind.

Much of the *Autobiography* is taken up with an account of the genesis and growth of Mill's chief works and with a discussion of his father's character and opinions and of the philosophy of Sir William Hamilton and of Auguste Comte. But the book, while primarily intellectual, is not without humanity and warmth, even apart from the glowing passages devoted to the author's wife. Mill's friends, Austin, Maurice, Sterling, the Carlyles and others, come into the human picture as well. The style is admirable for the purpose, clear, dispassionate and not unduly restrained; and the attitude of sane analysis, of modesty and of thoughtful discrimination has never been surpassed in any autobiography. The world has taken the earlier portion of the book—the story of the growth of the boy's mind and character—as its unique contribution to the literature of autobiography; but scarcely less valuable are Mill's pictures of his contemporaries and his analysis of the thought and the social movements of his time.

ANNA ROBESON BURR.

MILL ON THE FLOSS, The. This novel, by George Eliot (Mrs. Marianne Evans Cross), published in 1860, was the second of the long novels of the author, being preceded by *Adam Bede.* It was favorably received on publication and the opening parts, particularly those dealing with the childhood of Tom and Maggie Tulliver, are commonly regarded as among the best work that George Eliot ever did, but the last of the three volumes as originally published was regarded less favorably, largely because of some artificiality of episode and treatment.

In many respects *The Mill on the Floss* is the most personal of the author's stories. In depicting the heroine she drew to some extent from her own experience, and many of the characters in the book are drawn from people in her own family. The central idea is characteristic of the writing of the author. It is the hopelessness of the attempt of a person of given temperament to accommodate herself to unsympathetic conditions. Maggie Tulliver, a young woman of unusual sensibility and always seeking for happiness, grows up among plain, hard, matter-of-fact people and narrow surroundings. Her volatile temperament causes numerous misunderstandings with her robust and sturdy young brother, Tom, as notably in her forgetting to feed his rabbits during his absence. His partisanship in the feud that had wrecked the fortunes of the Tulliver family and brought about the ruin and death of his father thwarts Maggie's growing love affair with Philip Wakem and later on condemns her for her lack of fairness and firmness in the somewhat artificial episode of Stephen Guest. Meanwhile she has sought consolation in reading *The Imitation of Christ,* but this, like her family and friends and her affectionate nature, proves a fragile reed. The author, apparently despairing of any possible outcome under such conditions for the happiness of Maggie Tulliver or for her finding even a satisfactory place in the world, drowns her along with her newly-reconciled brother in a somewhat supererogatory inundation.

The desire of the author was apparently to push the temperament to an inevitable conclusion, but the real problem was to account for Maggie had she remained normally alive. The factitious elements which have been spoken of are out of keeping with the general tendency of George Eliot's work, which is to analyze and account for the development of character under less accidental conditions of life.

WILLIAM T. BREWSTER.

MILL SPRINGS, village, Kentucky, in Wayne County, 15 miles southwest of Somerset on the Cumberland River and State Highway 90, altitude 844 feet. It has steamer connections with places on the Cumberland and the Ohio Rivers. Notable chiefly as the site of the Civil War engagement fought here in 1862 (see MILL SPRINGS, BATTLE OF), it has a postoffice, a National Cemetery, a water-power grist mill (1818) with an overshot wheel 31 feet in diameter, said to be the second largest in the world, and Lanier House, the headquarters of the Confederate Gen. Felix Zollicoffer before the historic battle. Lake Cumberland was formed near the village by the construction of a dam on Wolf Creek. Pop. (1952 est.) 200.

MILL SPRINGS, Battle of. In the American Civil War, the opening of the Kentucky-Tennessee campaign of 1862, also known as the battle of Fishing Creek and of Logan Cross

Roads. It was the first important Union victory in the west.

At the close of 1861 the Confederate line extended from Columbus, Ky., on the Mississippi, through Fort Henry on the Tennessee, Fort Donelson on the Cumberland, Clarksville, Tenn., and Bowling Green, Ky., to Mill Springs on the Cumberland. Gen. Albert Sidney Johnston was in chief command. Gen. Dan Carlos Buell was the opposing Union commander. Gen. Felix K. Zollicoffer established the Confederate right at Mill Springs early in December. Gen. George B. Crittenden took general command there at the middle of the month, with the brigades of Zollicoffer and W. H. Carroll under him. Gen. Leonidas Polk held the Confederate left at Columbus, Gen. J. B. Floyd reached Fort Donelson on February 13, and had under him Generals Pillow, Buckner and Bushrod Johnson. Gen. A. S. Johnston was at Bowling Green, the center, Gen. George H. Thomas was on the Union left, with Gen. Albin F. Schoepf immediately opposed to Zollicoffer, while General Buell, with headquarters at Louisville, was in close communication with the Union center, which threatened Bowling Green and Nashville.

Gen. Zollicoffer having crossed from Mill Springs to the north bank of the Cumberland from which he threatened central Kentucky, General Thomas was sent against his forces, now commanded by General Crittenden, from the direction of Lebanon. On January 18 General Thomas reached Logan's Cross Roads about 10 miles from Crittenden's entrenchments. The latter officer, with the purpose of attacking before Thomas could concentrate his forces, marched at midnight of the 18th with Zollicoffer's and Carroll's brigades, consisting of eight regiments of infantry, six guns and four battalions of cavalry, and attacked General Thomas soon after daylight of February 19.

The Union troops, consisting of six infantry regiments, one battery and a portion of a cavalry regiment, were brought rapidly into action, both sides fighting with spirit. Finally, when three fresh Union regiments fell on the Confederate right, and the 2d Minnesota was pouring a galling fire upon the center, the 9th Ohio (German Turners) made a brilliant bayonet charge completely turning the Confederate left, resulting in the Confederate lines breaking and retiring in confusion. At this point General Schoepf's brigade from Somerset reached the field, and the whole force continued in pursuit, reaching the Confederate entrenchments during the night, and forming to assault them at daylight. During the night the Confederates succeeded in crossing their men, leaving artillery, cavalry, horses, mules, wagons, camp equipage, and private baggage. The Confederate right wing was effectually broken and largely dispersed.

MILL VALLEY, town, California, in Marin County, eight miles north of San Francisco on a branch of the Northwestern Pacific Railroad providing freight service only. Altitude 57 feet. It is a residential suburb of San Francisco located at the foot of Mount Tamalpais. Nearby is the Muir Woods National Monument.

In 1834 John Reed (Reid or Read) built a sawmill here, whence the place became locally known as Mill Valley. On a map of 1873, the site was designated as Read. The town was not established, however, until the Tamalpais Land and Water Company acquired the land and built a branch of the North Pacific Coast Railroad to it. The community was incorporated in 1900 and has a council-manager form of government. Pop. (1950) 7,331.

MILLAIS, mĭ-lā′, Sir **John Everett,** English painter: b. Southampton, England, June 8, 1829; d. London, Aug. 13, 1896. His earliest years were spent in Jersey and at Dinan in France, and at the age of nine he was sent to study art under Henry Sass in London. In 1840 he became a student in the Royal Academy, and in 1846 he exhibited his *Pizarro seizing the Inca of Peru.* Next year the gold medal of the Academy was awarded to his *Young Men of Benjamin seizing their Brides.*

In 1848, along with Holman Hunt, Dante G. Rossetti, and others, Millais founded the Pre-Raphaelite Brotherhood. Among the chief works of this period are *A Huguenot, The Order of Release* and the *Proscribed Royalist.* In 1853 he was elected an associate of the Royal Academy, and 10 years later Academician. For a few years thereafter his pictures were still influenced by the Pre-Raphaelite principles, which he gradually abandoned. He developed into a splendid colorist, a master of technique and altogether a great modern master.

Numerous honors fell to him; he was decorated with the Legion of Honor in 1878, elected a member of the Académie des Beaux-Arts in 1882, created a baronet in 1885 and elected to succeed Lord Leighton as president of the Royal Academy in 1896; but he only held this last position about six months, dying in August of the same year. He was most successful in figure pieces and portraits, but he also produced a certain number of landscapes, one of the finest being *Chill October* (1871). He painted portraits of some of the foremost men of the day, including Mr. Gladstone, Lord Beaconsfield, Lord Salisbury, Mr. Ruskin, Lord Tennyson and others.

His son, John Guille Millais (1865–1931) was an artist and author who traveled extensively in Africa, Norway, Iceland, and the North American continent. He was known for his collection of birds, mostly of the British Isles, and his illustrations of books on sporting and natural history.

MILLAR, mĭl′ẽr, **Andrew,** British publisher: b. Scotland, 1707; d. London, June 8, 1768. He established his shop in London in 1729 and soon carried on a flourishing business. Among the books published by his firm were *Sophonisba* (1729), *Spring* (1729), and the *Seasons* (1738) by James Thomson; and *Joseph Andrews* (1742), *Tom Jones* (1749), and *Amelia* (1751) by Henry Fielding. He also published the historical works of David Hume and William Robertson. His most notable undertaking, however, was the *Dictionary* of Dr. Samuel Johnson, who cherished a high opinion of his publisher.

In 1765 Thomas Cadell became Millar's partner and two years later took over the business, when Millar retired to Kew Green.

MILLARDET, mē-yär-dĕ′, **Alexis,** French botanist: b. Montmirey-la-ville (department of Jura), Dec. 13, 1838; d. Bordeaux, Dec. 15, 1902. He taught botany at the universities in Nancy, Strasbourg, and Bordeaux, and is noted for his plan of hybridization of French and American grapevines. He also worked out a treatment for

grapevines against mildew by using copper compounds. Among his writings are *Le Prothalle Mâle des Crytogames Vasculaires* (1869) and *La Question des Vignes Américaines au Point du Vue Théoretique et Pratique* (1877).

MILLAU, mē-yō′, (also MILHAU; the ancient AEMILIANUM, ē-mĭl-ĭ-ā′nŭm), town, France, in the department of Aveyron, 30 miles southeast of Rodez, at the confluence of the Tarn and Dourbie rivers. It is a glove manufacturing center with industries including tanneries, furniture, and woolen textiles. Roquefort cheese is also marketed. The seat of a viscounty in the middle ages, Millau has a Romanesque church of Notre Dame, restored in the 16th century and a modern church of St. Francois. Pop. (1946) 15,891.

MILLAY, mĭ-lā′, **Edna St. Vincent,** American poet and writer: b. Rockland, Me., Feb. 22, 1892; d. Austerlitz, N. Y., Oct. 19, 1950. One of the most popular poets America has produced, Miss Millay gained her reputation by voicing the spirit of rebellion and emancipation of the 1920's, and throughout her life her poetry, while in some respects conventional, reflected an individual and genuinely poetic talent.

She began writing verses in her childhood and her first poem to be published was "Renascence," which appeared in *The Lyric Year* for 1912. Graduating from Vassar in 1917, she published her first volume of poems in the same year. After several years of bohemian living in Greenwich Village, New York City, where she wrote short stories under the name of Nancy Boyd, Miss Millay married Eugen Jan Boissevain, with whom she moved to a farm in upper New York, and in 1923 received the Pulitzer Prize for her poem *The Harp Weaver.*

In later years her poetry revealed an increasing social consciousness. Besides her lyric and satiric verse, her works included verse plays such as *The King's Henchman,* made into an opera by Deems Taylor (1927), and a translation, with George Dillon, of Baudelaire's *Flowers of Evil* (1936). She was a member of the American Academy of Arts and Letters and in 1943 the Poetry Society of America awarded her a medal for her contribution to the humanities. First editions of her volumes of poems have commanded high prices and become collectors items. Among her many published works are *Figs from Thistles* (1920); *Second April* (1921); *The Harp Weaver and Other Poems* (1923); *Wine from These Grapes* (1934); *Conversation at Midnight* (1937); *There Are No Islands Any More* (1940); *Collected Sonnets* (1941); *The Murder of Lidice* (1942); and *Collected Lyrics* (1943).

MILLBRAE, mĭl′brā, city, California, in San Mateo County, 13 miles south of San Francisco on U.S. Highway 101 and the Southern Pacific Railroad; altitude 18 feet. Chiefly a residential community, Millbrae has only local industries, including dairies and wholesale flower growing.

In 1850 an American by the name of Perry Jones settled in this area, which was originally part of Rancho Buri Buri, granted by Mexico to Jose Sanchez. A large part of this ranch was purchased by Darius Ogden Mills in the 1860's, the name Millbrae then applying only to a railroad station there. In 1867 Millbrae was the name of a postoffice and three years later Mills built his own residence south of the townsite. Although there were only six families in Millbrae in 1905, the community has developed rapidly since then. It was incorporated in 1948 and has a mayor-council form of government. Pop. (1950) 8,972.

MILLBURY, mĭl′bĕr-ĭ, town, Massachusetts, in Worcester County, six miles south-southeast of Worcester on the Blackstone River, State Highway 122A, and the New York, New Haven, and Hartford Railroad; altitude 407 feet. Located in an industrial area, Millbury is a manufacturing town producing woolens and felt. Other manufactures are textile supplies, wire, tools, and castings. The New England Power Company which distributes electric power throughout central New England is located here. Nearby many Indian relics have been found.

Settled in 1716, Millbury was incorporated as a town in 1813. It developed rapidly after the opening of the Blackstone Canal in 1828, and on its closing 20 years later, transportation for Millbury's growing textile industry was provided by the Providence and Worcester Railroad. The town includes the village of West Millbury and is governed by a board of selectmen. Pop. (1950) 8,347.

MILLE, mēl, **Pierre,** French journalist and fiction writer: b. Choisy-le-Roi, near Paris, Nov. 27, 1864; d. Paris, Jan. 15(?), 1941. Receiving his baccalaureate degree from the Collège Rollin in 1885, he entered the Law School and the School of Political Sciences at the University of Paris, where he completed his studies in those subjects. He traveled extensively as a member of expeditions to West Africa, the Congo, Indo-China, and India, and served as a war correspondent for the *Journal des Débats* during the Greco-Turkish War (1897). From 1901 to 1932 he contributed the column *En Passant* to the Paris newspaper *Le Temps.*

Among his many published writings, including novels and short stories, are *Le Congo Léopoldien* (1903); *Barnaveaux et Quelques Femmes* (1908); *L'Ange du Bizarre* (1921); *Christine et Lui* (1926); *Mes Trônes et mes Dominations* (1930); *Chez les Hommes de l'Ombre et du Soleil* (1932).

MILLEDGE, mĭl′ĭj, **John,** American soldier and politician: b. Savannah, Ga., 1757; d. Feb. 9, 1818. At the dawn of the Revolution he was one of Joseph Habersham's party which captured the colonial government of Savannah. When the British took Savannah Milledge fled to South Carolina. He was at the sieges of Savannah (1779) and of Augusta, and rendered good service in the patriot army.

Appointed attorney-general of Georgia in 1780, Milledge later served in the Legislature, was representative in Congress 1792–1802, twice governor of the State 1802–1806 and United States senator 1806–1809. He is remembered for his donation of land to the University of Georgia and was honored by having Milledgeville, the first capital of Georgia, named after him.

MILLEDGEVILLE, mĭl′ĭj-vĭl, city, Georgia, seat of Baldwin County, 29 miles northeast of Macon on the Oconee River, state and federal highways, and the Georgia and the Central of Georgia railroads. It is also served by an airport with airline facilities. At an altitude of 325 feet, Milledgeville is situated in a rich agricul-

tural region for which it is an important trade center. Nearby clay deposits and forests have contributed to the growth of the clay products and lumber industries in the city. Manufactures include tile, brick, clothing, candy, and lumber. Other important industries are dairying, cattle raising, and cotton ginning.

In addition to its public school system, Milledgeville has the Georgia Military College and the Georgia State College for Women. From 1835 to the Civil War, and for a few years after the war, Milledgeville was the seat of the original Oglethorpe University, a name that was revived, in 1913, for the present college near Atlanta. Besides the college libraries, there is a county library in the city, and the State College for Women supports a museum, with collections of manuscripts and documents bearing upon the history of the South.

Milledgeville was laid out by state surveyors in 1803 as a site for a state capital, and named for John Milledge, the revolutionary soldier who was then governor. It was incorporated in 1836 and in 1868 the capital of the state was moved to Atlanta. A mayor and council administer the government. Pop. (1950) 8,835.

MILLENNIUM, mĭ-lĕn'ĭ-ŭm, (Lat. *mille,* 1,000, and *annus,* a year), a period of 1,000 years. Hence it is a term applied to the period during which, according to some, Jesus Christ will return to reign on earth before the end of the world. This premillennial appearance of Christ will be signalized by a first or particular resurrection of the just, who are to reign with Him on earth, and by the destruction of Antichrist. Those who hold such views are called millenarians or chiliasts, and their tenet chiliasm (Gr. χίλιοι, 1,000). It is admitted on all sides that these views were, if not general, at least very common in the ancient church. The belief was generally founded on Psalms xc, 4, according to which 1,000 years are before the Lord as one day, compared with the account of the creation as given by Moses. The six days of creation are taken as designating 6,000 years of toil, and the subsequent sabbath as designating 1,000 years of rest and happiness. The millennium was to be the sabbath rest of the new creation of mankind in Christ. Besides these passages, Revelation 21:1-6, is especially quoted by chiliasts in support of their views.

Chiliasm prevailed chiefly among the Jewish Christians, who retained after their conversion the hope that they would rule over all other nations under a royal Messiah (q.v.). The Ebionites, the Nazarenes and Cerinthians all advocated it and Montanus, and the sect which was called after him, regarded it as a fundamental doctrine of the Christian religion. Some early fathers of the Church also declared themselves generally in favor of the doctrine; Papias, Irenaeus and Tertullian were chiliasts; and Pipias appealed in support of his view to apostolic traditions. On the other hand, however, the epistles of Clement of Rome and Ignatius of Antioch are silent about it.

Justin Martyr who wrote in the 2d century was a believer in the millennium. "I and all Christians whose belief is in every respect correct," he says, "know that there will be both a resurrection of the flesh and a thousand years in Jerusalem, which will then be rebuilt, adorned and enlarged, as the prophets Ezekiel, Isaiah and others declare." This view was opposed by the whole Alexandrian school, especially by Origen, who believed in a spiritual supramundane interpretation of Revelations. Still it continued to find advocates during the 3d century, among whom Tertullian, Nepos, bishop of Arsinoe, and Methodius, bishop of Tyre, were prominent.

In the 4th century, Jerome, who did not believe in it himself, did not dare to condemn it, in consideration of the many pious and learned advocates it had found in former centuries. Soon after it began to die out; it was temporarily revived toward the close of the 10th century, by the popular belief in the approaching end of the world, but it never regained great strength.

The reformation of the 16th century gave a new impulse to chiliasm. Fanatical opinion identified the Pope with Antichrist, and regarded the anticipated downfall of the Roman Catholic Church as foreshadowing the approach of the millennium. But when the Anabaptists undertook in 1534 to erect the New Zion, both the Lutheran and Reformed churches declared themselves against this reversion of the old doctrine. Yet it was preached by many sectarians and theologians of the 16th and 17th centuries, among whom were Weigel and the Moravian bishop Comenius in Germany, Jurieu in France, the Labadists in the Netherlands, and Joseph Mede and Jane Lead (d. 1704) in England.

A third period in the history of chiliasm may be commenced with the writings of the esteemed exegete and New Testament commentator, Johann Albrecht Bengel. He practically reintroduced it into Protestant theology, where it has ever since been advocated by a number of prominent theologians. The ingenious prelate Friedrich Christoph Oetinger (d. 1782) brought it into connection with his favorite theosophic views. August Hahn (the founder of a pietistic sect in Württemberg), Johann Heinrich Jung-Stilling, and Johann Kaspar Lavater gave it a wide circulation among the lower classes of the people in Germany and Switzerland. In opposition to the "spiritualism" of modern exegesis, it was advocated, with exegetical arguments, by Hoffmann, Franz Delitzsch, Johann Heinrich Kurtz, and others; while Heinrich Thiersch, Karl Emanuel Nitzsch, Johann Peter Lange and August Ebrard supported it from a dogmatical as well as an exegetical standpoint. Swedenborg taught that the last judgment took place in 1757, and that the New Church or church of the New Jerusalem had actually been formed both in heaven and on earth.

After Germany, England and America have been the chief fields of modern chiliasm. The "Catholic Apostolic Church," organized by Edward Irving, laid great stress on the belief that the kingdom of glory was very near. Chiliasm lies at the foundation of Mormonism, whose adherents call themselves Latter Day Saints in reference to the near approach of the last day.

In the United States great excitement was caused by the preaching of William Miller (q.v.) who sought to prove from the Scriptures that the second advent of Christ would take place about 1843. He not only met with numerous chiliasts in most denominations, but he also founded the sect of Adventists (q.v.).

Chiliasm has been seriously taken in declarations of doctrine formulated by several churches. The Augsburg Confession implicitly repudiates it, speaking of "the last

days foreshown in Holy Scripture, in which the world is to become ever more and more degenerate and mankind more sinful and weak.» The Council of Trent declares that «the Scriptures also inform us that the General Judgment shall be preceded by the preaching of the Gospel throughout the world, a defection from the faith and the coming of Antichrist.» There is a sort of millennium also looked forward to by those who disbelieve in religion as the renovator of the world. According to these teachers there is a material millennium quite within the range of future possibilities. They teach that the race must look to its renewal and improvement by the nonpropagation of disease and impotency of every nature, and to the persistent and joyous multiplication of the best elements of our race, in a continual progress toward the hierarchy of life. The millennium, according to this newly invented philosophy, will come by natural and not supernatural means. See ESCHATOLOGY; RESURRECTION; JEWS AND JUDAISM—*Zionism.*

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MILLEPEDE, a myriapod of the *Chilognatha,* the second order of the class *Myriapoda* in which each segment of the body, except a few of the front joints, bears two pairs of legs—the joints in the nearly related centipedes (q.v.) bearing each one pair only. The common species (genus *Julus*) are found in damp places, concealed under stones, or under the bark of trees. The body consists of from 40 to 50 joints, protected by a horny skin, and when irritated or at rest these animals coil up for protection. The mouth is provided with a pair of strong jaws or «mandibles»; and the antennae or feelers consist of six or seven joints. See MYRIAPODEA.

MILLEPORE, family (*Milleporidae*) of *Hydrozoa,* remarkable for secreting massive calcareous skeletons like corals, with which they were for a long time classed. The hydranths are of two kinds: gastrozoids, or feeding polyps, which provide nourishment for the colony, and dactylozoids, which are elongated, mouthless, protective polyps provided with large numbers of nematocysts. The generative cells are remarkable for their wanderings through the tissues of the polyps and colonies. The colonies are hermaphrodite, but the related family *Stylasteridae* has unisexual colonies. They live in warm seas and form reefs in shallow waters. *Millepora alcicornis* is abundant near low water in the West Indies, where representatives of the *Stylasteridae* also occur in deep water.

MILLER, Adolph Caspar, American economist: b. San Francisco, Calif., 7 Jan. 1866. He was graduated at the University of California in 1887 and studied at Harvard, Paris, and Munich. He was connected successively with the faculties of Harvard, the University of California, and Cornell; was professor of finance at the University of Chicago in 1892–1902, and Flood professor of economics and commerce at the University of California in 1902–13. He served as assistant to the Secretary of the Interior in 1913–14, and until 1936 was a member of the Federal Reserve Board. He published *The Monetary Problem in the United States* (1895).

MILLER, Benjamin LeRoy, American geologist, b. Sabetha, Kans., 13 April 1874. He studied at the University of Kansas and two colleges in the same state. After serving as teacher in the public schools of Kansas he became an assistant on the Kansas University Geological Survey in 1896, professor of biology and chemistry at Penn College, Oskaloosa, Iowa, 1897–1900 and served on the Iowa Geological Survey in 1899. He was associate professor in geology at Bryn Mawr College, 1903–1907, and after that time was appointed professor of geology at Lehigh University. He was special consulting editor of the *Engineering and Mining Journal,* 1920–22, and from 1904 served on several state geological surveys, including that of the United States. He was a member of numerous learned societies and the author of several scientific treatises. Died Bethlehem, Pa., 23 March 1944.

MILLER, Charles Henry, American landscape painter: b. New York City, 20 March 1842; d. Queens, N.Y., 21 Jan. 1922. Graduated from Mount Washington Collegiate Institute, New York, exhibiting his first oil painting at National Academy of Design, 1860. He received the degree of M.D. from the New York Homeopathic College in 1863, but after his first trip to Europe as surgeon of a ship in 1864 he resolved to devote his life to the fine arts. He studied at the Bavarian Royal Academy with Adolf Lier from 1867 to 1870, when he returned to America. He was president of the New York Arts Club for five years, having become a member of the National Academy of Design in 1875. His paintings are principally landscapes of Long Island. He received the gold medal from Boston and New Orleans international expositions. His best-known work, *The Bouquet of Oaks,* is in the Metropolitan Museum. His *Sunset, East Hampton* (1878) is in the Brooklyn Museum; *High Bridge* hangs in the Democratic Club, New York. He was a lecturer, and author, under the pen name of Carl de Muldor, of *The Philosophy of Art in America* (1885).

MILLER, Cincinnatus Hiner (better known as JOAQUIN MILLER), American poet, whose pseudonym was due to his defense of Joaquin Murietta, a Mexican bandit: b. Wabash district, Ind., 10 Nov. 1841; d. San Francisco, Calif., 17 Feb. 1913. His father took him to Oregon in 1854. He had a little schooling but soon ran away from home; went to the California gold mine; accompanied Walker on the

filibustering expeditions in Nicaragua. He lived among the Digger Indians near Mount Shasta, Calif., between 1857 and 1859, and subsequently returned to Oregon, leaving behind an Indian wife and a young daughter. He then briefly attended Columbia College in Eugene, Oreg., studied law in his spare time while teaching school at Clarke, in the Washington Territory, and was admitted to the bar in Portland, Oreg., in 1861. He did not practice, but founded a pony express route, and in 1863 bought the Eugene *Democratic Register,* which was soon suppressed by the United States government because of its pro-Confederate tendency.

Miller removed to Canyon City, Oreg., where, after winning favor by leading a posse against hostile Indians, he was elected judge of the Grant County court in 1866. He published two volumes of verse, *Specimens* (1868) and *Joaquin et al* (1869), which brought him to the attention of literary circles and enabled him to become acquainted with prominent authors in San Francisco, notably Bret Harte. Subsequently he visited England and became a London celebrity with the publication of his *Pacific Poems* (1870). He was lionized as a romantic figure of the American West by the literary circle of William Michael Rossetti, and a revision of *Pacific Poems,* issued as *Songs of the Sierras* (1871), was praised by British reviewers.

He returned to the United States in 1872 but subsequently visited Europe, South America, and possibly the Near East, meanwhile continuing to write and publish. After residing for brief periods in New York and other eastern cities, he settled in Oakland, Calif., in 1887. He was a special correspondent in the Klondike for the New York *Journal* in 1897–1898.

Miller's many published writings included *Songs of the Sun-lands* (1873); *Life Amongst the Modocs* (1873); *The Ship in the Desert* (1875); *The Baroness of New York,* a novel (1877); *Songs of Italy* (1878); *Shadows of Shasta* (1881), a prose romance; *The Danites in the Sierras* (1882), a drama; *The Destruction of Gotham* (1886), a novel; and *The Building of the City Beautiful* (1893), a Utopian essay. *The Complete Poetical Works of Joaquin Miller* appeared in 1897 (rev. ed., 1902), followed by *Joaquin Miller's Poems* (6 vols., 1909–1910).

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MILLER, Dayton Clarence, American physicist and musicologist: b. Strongsville, Ohio, March 13, 1866; d. Cleveland, Ohio, Feb. 22, 1941. He received a doctorate in physics from Princeton University in 1890, and was professor of physics from 1893 at the Case School of Applied Science (now Case Institute of Technology) in Cleveland, Ohio. Among his major scientific contributions were studies of the relative motion of the earth and ether, and the photographing of sound waves. He was the author of *Sound Waves, Shape and Speed* (1937); *Sparks, Lightning, Cosmic Rays* (1939); and of several works on music, notably *Boehm on the Flute and Flute-Playing* (1908); *The Science of Musical Sounds* (1916); and *An Anecdotal History of Sound* (1935).

MILLER, Edward, American physician: b. near Dover, Del., May 9, 1760; d. New York, N. Y., March 17, 1812. He began to study medicine with a physician at Dover, was a surgeon's mate in the Revolutionary War, and subsequently practiced at various places in Delaware and Maryland, meanwhile studying intermittently at the University of Pennsylvania, where he received a doctorate in medicine in 1789.

Miller settled in New York City in 1796, and there joined in founding the first medical periodical in the United States, the *Medical Repository* (August 1797). He served as physician to the Port of New York from 1803, and helped to start the College of Physicians and Surgeons (1807). An authority on yellow fever, he recognized that it was not communicated from person to person. He studied the epidemic in New York in 1805, and wrote a celebrated report on it, entitled *Report on the Malignant Disease which Prevailed in the City of New York in the Autumn of 1805: Addressed to the Governor of New York* (1806).

MILLER, Ferdinand von, German bronze founder: b. Fürstenfeldbruck, Germany, Oct. 18, 1813; d. Munich, Feb. 11, 1887. He studied bronze founding and sculpture in Munich under his uncle, Johann Baptist Stiglmayer, whom he succeeded as director of the Royal Bavarian Foundry in 1844. He cast many celebrated bronzes, notably a statue representing Bavaria, in Munich, and the bronze door of the Capitol at Washington, D.C.

Baron Ferdinand von Miller (b. Munich, Germany, June 8, 1842; d. there, Dec. 19, 1929), his son and pupil, became director of the Bavarian Academy of Fine Arts in 1900 and received the title of baron in 1912. He cast statues of Shakespeare and Columbus in St. Louis, Mo.; figures for a fountain in Cincinnati, Ohio, and for the Soldiers' Monument in Charleston, S. C.; and an equestrian statue of Emperor William I at Metz, in Lorraine.

Oskar von Miller (b. Munich, Germany, May 7, 1855; d. there, April 9, 1934), another son of the elder Ferdinand, was an electrical engineer. He organized the first German electrical exposition, at Munich (1881), and was a cofounder and director (1884–1890), with Emil Rathenau, of the Allgemeine Elektrizitäts-Gesellschaft (General Electric Company) in Berlin. He was also president of the International Electrical Exhibition at Frankfurt (1891), where he demonstrated the practicability of high-tension alternating current transmission over long distances. In 1903 he founded the Deutsches Museum, devoted to science and technology, in Munich.

MILLER, Frieda Segelke, American public official: b. La Crosse, Wis., April 16, 1889. A lifelong champion of improved working conditions, especially for women, she was educated at Milwaukee-Downer College and the University of Chicago, and in 1918 became secretary of the Women's Trade Union League in Philadelphia, serving until 1923. In 1929 she was appointed director of the women's division of the New York State Department of Labor and, after nine years in that position, was made industrial commissioner of New York State, the second woman to occupy the office. Miss Miller improved the administration of the state's unemployment insurance laws and re-employment services, and worked to eliminate racial and religious discrimination in employment. She resigned at the end of 1942, and in the summer of 1944 was chosen by President Franklin D. Roosevelt to head the Women's Bureau of the United States Department of Labor, remaining in office until November 1953.

Miss Miller also represented the United States at many meetings of the International Labour Organisation and various organs of the United Nations.

MILLER, Harriet Mann (pen name OLIVE THORNE MILLER), American author: b. Auburn, N. Y., June 25, 1831; d. Los Angeles, Calif., Dec. 25, 1918. She was educated at private schools in Ohio and, after her marriage in 1854 to Watts Todd Miller, went to live in Chicago. Here, pursuing a life-long interest, she began to write and lecture about birds and their habits. A children's book, *Little Folks in Feathers and Fur, and Others in Neither* (1875), was well received. It was followed by *Queer Pets at Marcy's* (1880), *Bird-Ways* (1885), *A Bird-Lover in the West* (1894), *The First Book of Birds* (1899), *True Bird-Stories from My Note-book* (1903), and *The Children's Book of Birds* (1915). Her extensive knowledge of birds, founded on personal observation rather than scientific research, and the unaffected charm of her writing have given her books a lasting appeal for adults as well as children.

MILLER, Henry, American author: b. New York, N. Y., Dec. 26, 1891. He attended the College of the City of New York and subsequently resided in Paris, where his first books were published. His fiction became well known for its experimental style, its surrealistic fantasy, its frank treatment of sex and morals, and its pictures of life in the Bohemias of New York and Paris. Several of his works were banned as obscene in the United States and Britain. Miller is the author of *Tropic of Cancer* (1934), *Tropic of Capricorn* (1938), *The Cosmological Eye* (1939), *The Colossus of Maroussi* (1941), *The Air-Conditioned Nightmare* (1945), and *The Smile at the Foot of the Ladder* (1948).

MILLER, Henry (John), American actor and theater manager: b. London, England, Feb. 1, 1860; d. New York, N. Y., April 9, 1926. He accompanied his parents to Toronto, Canada, at an early age, became interested in the theater, and made his debut as an actor before he was 19. Coming to the United States, he played supporting roles opposite several stars, notably Helena Modjeska, Adelaide Neilson, Clara Morris, Fanny Janauschek, and Minnie Maddern, and gained valuable experience as a member of a celebrated troupe managed by Dion Boucicault in New York Ctiy.

Miller was leading man of the Empire Theatre Stock Company, under Charles Frohman, after 1890, and was an established star after 1896. He scored a triumph with his own production of *The Great Divide,* by William Vaughn Moody, at the Princess Theatre, in New York in 1906. Subsequently he produced and acted in numerous successful plays, including *The Havoc* (1911), *Daddy Long Legs* (1913), *La Tendresse* (1922), and *The Changelings* (1923). After 1918, his productions appeared in New York at Henry Miller's Theatre, designed and built under his supervision.

MILLER, Hugh, Scottish geologist and author: b. Cromarty, Scotland, Oct. 10, 1802; d. Portobello, near Edinburgh, Dec. 23, 1856. Apprenticed to a stone mason at 17, he was prompted to a life-long interest in geology by the sight of some ripple marks in the bed of a quarry. While working as a journeyman mason between 1822 and 1834 he read widely, studied geological formations in various parts of Scotland, formed friendships with persons of literary interests, and began to write verse and essays.

His *Poems Written in the Leisure Hours of a Journeyman Mason* (1829) received the praise of prominent critics, and his *Letters on the Herring Fishery* (1829), originally published in the *Inverness Courier,* gained him a local reputation.

He became an accountant in a bank at Cromarty in 1834 and continued to pursue various literary, religious, and scientific interests. His *Scenes and Legends of the North of Scotland* (1835), containing a chapter on geology, broadened his reputation, and in 1840 he became editor of *The Witness,* a periodical established at Edinburgh by leaders of the Scottish Free Church movement to advocate popular control of the Church of Scotland. In this publication he first brought out the articles subsequently collected as *The Old Red Sandstone, or New Walks in Old Fields* (1841), his most important geological work, illustrated with his own drawings of rocks and fossils, which first drew attention to the importance of this formation as a source of fossil remains.

A devout Christian, Miller defended the doctrine of special creation and maintained that the Bible, rightly interpreted, was not contradicted by geological discoveries. He believed that the six days of creation mentioned in Genesis correspond to six geological eras, of which he found evidence in rock formations. This theory he set forth in *The Footprints of the Creator, or the Asterolepsis of Stromness* (1847), and in *The Testimony of the Rocks* (1857). *My Schools and Schoolmasters,* an autobiography, appeared in 1852.

MILLER, (David) Hunter, American lawyer and government official: b. New York, N. Y., Jan. 2, 1875; d. Washington, D.C., 1932. He graduated from the New York Law School in 1910, was admitted to the bar in 1911, and subsequently practiced law in New York City.

An authority on legal and other problems of international relations, he became a special assistant in the State Department in June 1917, and helped prepare data used at the Peace Conference at the end of World War I. He was legal adviser to the American commission to the conference (1918–1919); co-author, with Sir Cecil Hurst, of the final draft of the League of Nations Covenant; and a member of the delegation that submitted the American disarmament plan to the League (1924). Subsequently he returned to the State Department as treaties editor (1929) and historical adviser (1931). He was the author of numerous articles and books on international affairs, notably *My Diary at the Conference of Paris, with Documents,* 21 vols. (1924–1926); *The Drafting of the Covenant,* 2 vols. (1928), and *The Peace Pact of Paris* (1928).

MILLER, James Russell, American Presbyterian clergyman and author: b. Harshaville, Pa., March 20, 1840; d. Philadelphia, July 2, 1912. He was educated at Westminster College, New Wilmington, Pa., and the Allegheny Theological Seminary of the United Presbyterian Church, where he graduated in 1867 and was ordained a minister. He was editorial superintendent of the Presbyterian Board of Publication

in Philadelphia from 1887 until his death, and was the author of more than 60 devotional books, notably *Devotional Hours with the Bible,* 8 vols. (1909–1913), which sold more than two million copies.

MILLER, Joaquin. See MILLER, CINCINNATUS HINER.

MILLER, Johann Martin, German novelist and poet: b. Ulm, Germany, Dec. 3, 1750; d. there, June 21, 1814. He studied theology at Göttingen and subsequently was a clergyman at Ulm. He was the author of sentimental novels in the manner of *Die Leiden des jungen Werthers* by Johann Wolfgang von Goethe. Among them were *Siegwart, eine Klostergeschichte* (1776); *Beitrag zur Geschichte der Zärtlichkeit* (1776); *Briefwechsel dreier akademischer Freunde* (1776–1777); and *Geschichte Karls von Burgheim und Emiliens von Rosenau* (1778–1779). His lyric poem, *Was frag ich viel nach Geld und Gut,* became widely known.

MILLER, John Henry (Ger. JOHANN HEINRICH MILLER or JOHANN HENRICH MILLER), German-American printer, editor, and publisher: b. Rheden, Germany, March 12, 1702; d. Bethlehem, Pa., March 31, 1782. He was apprenticed in 1715 to a printer at Basel, Switzerland, and subsequently published a newspaper at Zurich. In 1741–1742 he visited Philadelphia and for a short period worked in the printing shop of Benjamin Franklin. Returning to America in 1751, he joined Samuel Holland in founding a bilingual newspaper, *Die Lancastersche Zeitung,* in Lancaster, Pa. After another sojourn in Europe (1754–1760), Miller took up residence in Philadelphia, where in 1762 he established a newspaper, *Der Wöchentliche Staatsbote,* which continued to appear under various titles until 1779. As a patriotic gesture, he suspended it in protest against the Stamp Act, from Oct. 31 to Nov. 18, 1765. He also published a yearly almanac in German and other books in German and English, notably Thomas Godfrey's *Juvenile Poems* (1765), which contained *The Prince of Parthia,* the first play by an American to be produced professionally in America.

Henrich Miller's Pennsylvanische Staatsbote was the first newspaper to announce the adoption of the Declaration of Independence, carrying the news on July 5, 1776. The paper was again suspended in September 1777 because of the occupation of Philadelphia by British troops. It was reestablished in August 1778, but Miller retired from business the next year and removed to Bethlehem, Pa.

MILLER, John Peter, German-American Protestant clergyman: b. Zweikirchen, Germany, Dec. 25, 1709; d. Ephrata, Pa., Sept. 25, 1796. He attended the University of Heidelberg and in 1730 emigrated to Philadelphia, where he was ordained and engaged as a minister by various German Reformed congregations. Influenced by Johann Conrad Beissel (q.v.) to adopt a life of ascetic rigor, he renounced the Reformed Church in 1735 and retired to the Seventh Day Baptist cloister at Ephrata, where he remained until his death. He succeeded Beissel as head of the Ephrata Community in July 1768.

Miller edited various books published by the Seventh Day Baptist press at Ephrata, corresponded with Benjamin Franklin, George Washington, and other prominent men, and became widely known for his learning. He was chosen by the Continental Congress to translate the Declaration of Independence into various European languages.

MILLER, Joseph or **Josias** (known as JOE MILLER), English comic actor: b. 1684; d. London, England, Aug. 16, 1738. He first appeared at the Drury Lane Theatre in London in 1709 and from 1714 was a regular member of the company there, playing comic roles in all the popular favorites of the day. He is remembered chiefly because of the title of a book, *Joe Miller's Jests, or the Wit's Vade Mecum,* a collection of 247 jests compiled by John Mottley, which appeared in 1739. Three of the jests are told of Miller, but he had no other connection with the volume. It was reissued in so many revised and enlarged editions that any stale joke came to be called "a Joe Miller."

MILLER, Kenneth Hayes, American painter and etcher: b. Oneida Community, Oneida, N. Y., March 11, 1876; d. New York, N. Y., Jan. 1, 1952. He attended the Art Students' League and the New York School of Art in New York City, and subsequently studied in Europe. He taught drawing and painting at the New York School of Art between 1899 and 1911 and at the Art Students' League between 1911 and 1936 and again in 1943. Miller was awarded the gold medal for painting by the National Academy of Design in 1943 and the Ada S. Garrett prize at the Chicago Art Institute annual American painters' exhibit in 1945. His works, characteristically scenes of life in New York City, are represented in numerous collections, notably in the Museum of Modern Art, the Whitney Museum, and the Metropolitan Museum, New York City.

MILLER, Lewis, American inventor and philanthropist; b. Greentown, Ohio, July 24, 1829; d. New York, N. Y., Feb. 17, 1899. He worked as a machinist for the Ball brothers, manufacturers of reapers and mowing machines in Greentown, and in 1852 became a partner in Ball, Aultman & Company, which established its plant in Canton. When another plant was founded in Akron in 1863, Miller became its manager. He made several improvements in the design of mowing machines and binders.

In 1874, at Chautauqua Lake, N. Y., Miller and John H. Vincent organized the first Chautauqua Assembly, which became a regular annual summer event thereafter, providing educational and recreational activities for tens of thousands of adult visitors (see CHAUTAUQUA MOVEMENT). He remained active as a director of the institution until his death. Miller's daughter, Mina, became the wife of Thomas Alva Edison in 1886.

MILLER, Max, American author: b. Traverse City, Mich., Feb. 9, 1899. He served in the United States Navy during World War I, attended the University of Washington, and after traveling in the South Pacific, settled in San Diego, Calif., where he worked as a reporter. His first book, *I Cover the Waterfront* (1932), a volume of vivid reportage on the lives of San Diego maritime workers, scored an immediate success and was made into a motion picture. It was followed by *The Great Trek* (1935) and

Fog and Men on Bering Sea (1936), accounts of life in Alaska, and *Mexico Around Me* (1937), an unusual travel book dealing mainly with the southernmost part of the country. Miller's first novel, *A Stranger Came to Port* (1938), tells the story of a business executive who escapes for a year from his respectable surroundings to live on a houseboat among waterfront characters. During World War II, Miller again served in the navy and wrote several books based on his experiences.

MILLER, Olive Thorne. See MILLER, HARRIET MANN.

MILLER, Patrick, Scottish inventor: b. Glasgow, Scotland, 1731; d. Dalswinton, Dumfriesshire, Dec. 9, 1815. He was engaged in business as a merchant and banker in Edinburgh from 1760, became a director of the Bank of Scotland in 1767, and was deputy governor of the bank from 1790 until his death. He was also an important stockholder in the Carron Iron Company, manufacturers of ordnance, and participated in experiments for improving the naval cannon produced by the concern.

In October 1788, he demonstrated the practicability of steam navigation by sailing an experimental boat, with paddle wheels powered by a steam engine, on a lake at his estate of Dalswinton, Dumfriesshire, where he resided after 1785. In his old age he introduced the cultivation of fiorin grass into Scotland. Miller was for a time the landlord of the poet Robert Burns, and was occasionally his benefactor.

MILLER, Samuel Freeman, American jurist: b. Richmond, Ky., April 5, 1816; d. Washington, D.C., Oct. 13, 1890. He received a doctorate in medicine from Transylvania University in Lexington, Ky., in 1838, and subsequently practiced in the neighborhood of Barbourville, Knox County. Here he became a justice of the peace and a member of the county court. In 1847, after studying law privately, he abandoned medicine to become an attorney.

An antislavery Whig, Miller in 1850 removed to Keokuk, Iowa, hoping to find a community congenial to his moderate abolitionism. He established a successful law practice and, following the decay of the Whig Party, helped to organize the Republican Party in the state. In 1862 he was nominated by President Abraham Lincoln to succeed Peter V. Daniels as associate justice of the United States Supreme Court. The nomination was unanimously confirmed in the Senate because of the strong support of Republican politicians in Iowa and other Western states.

Miller soon became a prominent figure on the Supreme Court bench. His decisions were based on his view of what best served the national interest, with due regard to states' rights, rather than on legal and historical precedents. He admitted that he lacked scholarly training in the law, but regarded a sense of justice and a concern for the national well-being as more important than historical arguments concerning the meaning of the Constitution.

While a member of the Supreme Court, Miller wrote more than 600 majority decisions. In the so-called Slaughterhouse Cases (q.v.), he rendered the first important interpretation of the 14th Amendment, ruling that its guarantees apply only to rights and privileges held under federal, and not under state, law. He was a Republican member of the Electoral Commission of 1877, and voted with the majority that decided the disputed presidential election of 1876 in favor of Rutherford B. Hayes.

MILLER, William, American religious leader: b. Pittsfield, Mass., Feb. 15, 1782; d. Hampton, N. Y., Dec. 20, 1849. He had little formal schooling, but read widely in books borrowed from educated neighbors at Hampton, N. Y., where he spent his childhood and youth. After some years as a farmer at Poultney, Vt., he fought in the War of 1812, and then returned to Hampton to resume farming. During these early years Miller was a deist, but in 1816 he underwent a religious conversion. Minute study of the Bible for the next 15 years convinced him that various passages prophesied the second coming of Jesus and the end of the world in 1843. He began to preach the second coming publicly in 1831, attracting large audiences and gaining many adherents.

In 1836 he published a volume of lectures entitled *Evidence from Scripture and History of the Second Coming of Christ, about the Year 1843.* His teachings were given wide circulation after 1839 in publications issued by one of his disciples, Joshua Vaughan Himes, whose activities as a publicist for Miller led to the formation of a nation-wide Adventist movement. Miller traveled from town to town conducting revival meetings in which he preached the second coming and urged his hearers to prepare for the fatal day.

The Adventists, or Millerites as they were sometimes called, finding that the second coming did not take place in 1843, fixed on Oct. 22, 1844, as the prophetic date. As the day approached, thousands abandoned their occupations in expectation of the world's end. Disappointed a second time, Miller did not lose faith, but thenceforth refrained from trying to predict the date of the advent.

Up to this time, Miller's adherents had retained their membership in the established Protestant churches, but in 1845 rising dissension between his followers and other Protestants led to the formation of a separate Adventist Church. Miller soon retired from active leadership, but his disciples carried on his teachings, which in essentials formed the basis of several successor denominations that stemmed from the Adventist Church. See also ADVENTISTS.

MILLER, William, English soldier: b. Wingham, Kent, England, Dec. 2, 1795; d. Callao, Peru, Oct. 31, 1861. He entered the supply department of the British Royal Artillery in 1811, served under the 1st duke of Wellington in campaigns against Napoleon in the Iberian Peninsula and southern France (1811–1814), and accompanied British expeditionary forces to the United States towards the end of the War of 1812. After two years of travel in Europe, he joined the forces of Gen. Bernardo O'Higgins in the Chilean war for independence. Miller was commandant of marines aboard the flagship of the Chilean fleet in 1818, defeated a Spanish garrison at Pisco, Peru, in August 1821, and subsequently was made governor of the Peruvian Province of Ica. He became general of a brigade in the Peruvian Army in 1823, and later the same year was promoted by the Peruvian commander in chief, Simón Bolívar, to the rank of commander in chief of cavalry. At the decisive Battle of Ayacucho, July

1824, he distinguished himself by leading a brilliant cavalry charge.

After a four years' visit to Europe, Miller returned to Peru in 1830 and held important civil and military posts there until 1839, when changes in political control caused his banishment. He became British consul general in the Pacific in 1843 and died while on a mission to the Peruvian government.

MILLER, William, Scottish line engraver: b. Edinburgh, Scotland, May 28, 1796; d. Sheffield, England, Jan. 20, 1882. Educated in England and at the University of Edinburgh, he was apprenticed to an engraver in Edinburgh between 1811 and 1815, and subsequently was a pupil of George Cooke in London. He returned to Edinburgh in 1821 and became a successful engraver of landscapes. After 1837 he was known for his book illustrations and for engravings based on the paintings of Joseph M. W. Turner. He did the illustrations for the Abbotsford edition (1842–1847) of the *Waverley Novels* by Sir Walter Scott, and executed plates (1839) for the celebrated biography of Scott by John Gibson Lockhard, and for two editions of poems by Thomas Hood (1871, 1872).

MILLER, William, Scottish poet: b. Glasgow, Scotland, August 1810; d. there, Aug. 20, 1872. He became a wood turner or maker of wooden vessels at an early age, and worked at the trade until a few months before his death. He contributed verse regularly to the Scottish miscellany *Whistle Binkie,* and was especially well known for his nursery rhymes, notably *Wee Willie Winkie.* A collection of his verse, *Scottish Nursery Songs and Other Poems,* was published in 1863.

MILLER, William Allen, English chemist: b. Ipswich, England, Dec. 17, 1817; d. Liverpool, Sept. 30, 1870. At the age of 15 he became a surgical apprentice to his uncle, Bowyer Vaux, at Birmingham General Hospital, and later studied medicine at King's College, London, receiving a doctorate in 1842; but his major interest was chemical research. He became assistant lecturer in chemistry at King's College in 1841 and professor of chemistry there in 1845.

Miller devised new methods for using spectrum analysis to determine the chemical identity of substances, demonstrating in 1862, by means of photographs, the existence of characteristic differences in the spectra of 25 metals. Subsequently, with Sir William Huggins (q.v.), he made photospectroscopic analyses of the light of various stars and obtained the first reliable detailed information about solar and stellar chemistry.

MILLER, William Hallowes, British mineralogist: b. Velindre, near Llandovery, Wales, April 6, 1801; d. May 20, 1880. He was educated at Cambridge University and became professor of mineralogy there in 1832. His important book, *A Treatise on Crystallography* (1838), established the simplest and most accurate system of classifying crystals devised up to that time, and remained a standard work throughout the 19th century. Miller also took a prominent part in reconstituting the standards of weight and linear measure after the destructive fire in the Parliament buildings in 1834.

MILLER, William Henry Harrison, American jurist: b. Augusta, N. Y., Sept. 6, 1840; d. Indianapolis, Ind., May 25, 1917. He graduated from Hamilton College in 1861, served briefly in the 84th Ohio Infantry in the Civil War, and subsequently studied law privately in Toledo, Ohio, and Peru, Ind. He was admitted to the bar in 1865 and eventually, in Indianapolis, became a law partner of Benjamin Harrison, 23d president of the United States. When Harrison assumed office in 1889, Miller became attorney general in his cabinet and one of his closest political advisers. As attorney general, Miller was known for his impartiality and his refusal to bow to political influences.

MILLER, Willoughby Dayton, American dentist and bacteriologist: b. near Alexandria, Ohio, Aug. 1, 1853; d. Newark, July 27, 1907. He graduated from the University of Michigan in 1875 and subsequently studied chemistry, physics, and mathematics at the University of Berlin. In 1877, after working on a research project with F. P. Abbot, an American dentist in Berlin, Miller decided to adopt dentistry as his profession. He received a doctorate in dental surgery from the University of Pennsylvania in 1879, returned to Berlin, and began to practice with Abbot. In 1884 he was appointed professor of dentistry at the University of Berlin, and received a doctorate in medicine there in 1887.

Miller made important contributions to the knowledge of the chemical and bacterial causes of dental and oral disease. Using extracted teeth, he demonstrated in the laboratory that decay is the result of the acids formed by bacteria in the human mouth. His researches and his skill as a dentist brought him numerous honors. In 1894 he was appointed professor extraordinary on the medical faculty of the University of Berlin, one of the few foreigners and the first dentist to receive such an appointment. He was president of the National Dental Association of Germany and personal medical councilor to Emperor William II. He returned to the United States in 1907 to become dean of the dental college of the University of Michigan, but died before he could assume his post. He was the author of numerous articles on dentistry and of *The Micro-Organisms of the Human Mouth* (1890).

MILLER, the popular name for any moth whose wings appear to be covered with a dust or powder resembling the flour on a miller's clothes. By many entomologists, however, the name is restricted to members of the family Noctuidae—medium to large, hairy moths, with long antennae and strong wings, which are found all over the world, most abundantly in forests and plains. The family comprises about 500 genera and 20,000 species. The larvae of many species, known commonly as cutworms or army worms, are destructive pests.

MILLERAND, mēl-räN′, **Alexandre,** French statesman: b. Paris, France, Feb. 10, 1859; d. Versailles, April 6, 1943. He studied law at the University of Paris, became an attorney in 1881, and the following year began to contribute articles to the periodical *Justice,* founded in 1880 by Georges Clemenceau. He entered the Chamber of Deputies in 1885 as a Socialist, and in 1889 founded the newspaper *Voix* to advocate socialism.

Millerand assumed management of the Socialist periodical *La Petite République* jointly with

René Viviani in 1893, but in 1899 broke with the majority of Socialists, led by the Marxists Jules Guesde and Jean Jaurés, to become minister of commerce in a coalition cabinet of moderates and liberals under René Waldeck-Rousseau. He was instrumental in securing the enactment of far-reaching social legislation limiting hours of labor and providing for old age pensions, the latter adopted in 1905, after he had left office.

While minister of public works under Aristide Briand (1909–1910), Millerand broke a general strike of railroad workers in October 1910 by temporarily drafting them into the French Army. He was minister of war in the cabinet headed by Raymond Poincaré (1912–1913) and again during World War I under Viviani (1914–1915), and served simultaneously as premier and foreign minister from January to September 1920, when he was elected president of the French Republic. His repeated attempts to intervene in the conduct of affairs, however, led to his downfall. In 1924 Édouard Herriot refused to assume the premiership while Millerand was president, and he was forced to resign. He remained in public life as a senator from 1925 to 1940.

MILLEROVO, mĭl-ĕ-rō′vō, Russ. myĭl-lyĕ-rô′vŭ, city, USSR, located in Rostov Oblast, Russian Soviet Federated Socialist Republic, 120 miles northeast of Rostov. It is an important rail junction on the Moscow-Rostov line and a distributing and industrial center, with flour and oilseed mills, machine manufacturing plants, and railroad repair shops. In World War II, it was taken by German troops in July 1942 and recaptured, after a four weeks' siege, by the Red Army in January 1943. Pop. (1926) 12,822.

MILLER'S TALE, The, one of the *Canterbury Tales,* by Geoffrey Chaucer (qq.v.). It concerns the deception practiced on an old husband, a carpenter of Oxford, by his young wife and a clerk who lodges with them. The source of the tale is unknown. It was composed about 1390.

MILLER'S-THUMB, a common English and American name for several species of small, fresh-water fish of the genus *Cottus.* They are smooth skinned, and are remarkable for their disproportionately large heads, flattened like the proverbial miller's thumb. They feed on insects, small crustaceans, algae, and the eggs of other fishes.

C. gobio, common in streams in England, northern Europe, and northern Asia, seldom grows more than 4 or 5 inches long; it is brownish above and whitish beneath. *C. bairdii* and *C. cognatus,* common in clear, rocky streams in North America east of Missouri, grow up to 5 or 6 inches long. Olive green, or brownish mottled with darker brown, they readily blend with the appearance of stream bottoms or tangles of pondweed. Their spawning season is from April to July; the eggs, about one eighth of an inch in diameter, are laid in pinkish clusters of one or two hundred. Miller's-thumbs are also known as bullheads, but differ from the common American catfish so called.

Consult Gill, Theodore N., *Miller's Thumb and Its Habits,* Smithsonian Institution Miscellaneous Collections (Washington, D.C., 1910).

MILLERSBURG, mĭl′ĕrz-bûrg, village, Ohio, county seat of Holmes County, in the central part of the state, 32 miles southwest of Canton. It is a market and distributing point for an adjoining agricultural region, with some manufacturing (furniture, concrete burial vaults). Nearby are coal mines, sandstone quarries, and gravel pits. The village was settled in 1816. Pop. (1950) 2,398.

MILLERSBURG, borough, Pennsylvania, located in the central part of the state, on the Susquehanna River, in Dauphin County, 20 miles north of Harrisburg. Metal products, shoes, and clothing are manufactured here. The borough was laid out in 1807 and incorporated in 1850. Pop. (1950) 2,861.

MILLERSVILLE, mĭl′ĕrz-vĭl, borough, Pennsylvania, located in the southeastern part of the state, in Lancaster County, four miles southwest of Lancaster. A state teachers college is located here. The borough was incorporated in 1932 and is named for John Miller, who settled here in 1761. Pop. (1950) 2,551.

MILLES, mĭl′lĕs, **Carl** (originally Wilhelm Carl Emil Anderson), Swedish-American sculptor: b. Lagga, Sweden, June 23, 1875; d. Lidingö, near Stockholm, Sept. 19, 1955. After receiving his first instruction in carving and modeling at the Technical School in Stockholm, he attended the École des Beaux-Arts in Paris between 1898 and 1900. His work received praise from the celebrated sculptor Auguste Rodin, in whose studio Milles worked for several months, and in 1900 he was awarded an honorable mention for a marble sculpture at the Salon des Artistes Français and a silver medal for a figure at the Paris World Exposition.

His artistic reputation thereafter steadily widened, and by 1914 he was considered by many the foremost Swedish sculptor. In 1920 he was appointed professor of modeling at the Royal Academy of Art, Stockholm, but his artistic development ran counter to prevailing tendencies at the academy, and in 1929 he accepted a position in the sculpture department of the Cranbrook Academy of Art, Bloomfield Hills, Mich. He became a naturalized citizen of the United States in 1945.

Milles executed more than 100 major works, including numerous monumental sculptures for public buildings, parks, and gardens in Europe and the United States. Notable among his sculptures in the United States are *The Meeting of the Waters* in St. Louis, Mo., a group of 19 heroic nude figures representing mythologically the meeting of the Missouri and Mississippi rivers; a wood-carved mural for the Time and Life Building, Rockefeller Center, New York City; the *Fountain of Faith* at Falls Church, Va.; and bronze figures for the courtyards of the Chicago Art Institute and the Des Moines (Iowa) Art Center.

Milles was the recipient of numerous honors, including the decoration of the French Légion d' Honneur and honorary doctorates from universities in Europe and the United States.

Consult Rogers, Meyric R., *Carl Milles: an Interpretation of His Work* (New Haven 1940).

MILLES, Ruth Anna Maria (original surname Anderson), Swedish sculptor: b. Vallentuna, Sweden, Feb. 10, 1873; d. 1941. A sister of Carl Milles (q.v.), she became known for the delicacy and the elegance of her sculpture.

Among her works are 'Red Riding-hood and the Wolf' (1902); 'Fisherman's Wife'; 'Yvonne,' 'Wildflower,' 'After Waiting,' National Museum (1907), etc.

MILLET, Aimé, ā-mā mē-lā, French sculptor: b. Paris, 1816; d. there, 14 Jan. 1891. He studied art under David d'Angers (see DAVID, PIERRE JEAN), and the architect Viollet-le-Duc (q.v.), applied himself first to painting, but without great success. He then turned to the plastic arts and exhibited his first statue, a 'Bacchante,' in 1845. This was followed by his 'Ariadne' (now in the Luxembourg), a 'Mercury' and a statue of 'Civic Justice' for the mairie of the First Arrondissement, Paris; the statue of a 'Young Girl' for a monument in the cemetery of Montmartre, an 'Apollo' for the façade of the New Opera House and a bronze statue of 'Vercingetorix' (1865). Among his portrait and personal works are the statues of Chateaubriand at Saint Malo; of Denis Papin, at Blois, and numerous busts. His style has all the realism of modern French sculpture, combined with a certain theatrical demonstrativeness, a vividness of expression, pathetic, tragic or passionate. Consult Dumesnil, 'Aimé Millet, Souvenirs Intimes' (Paris 1891).

MILLET, Francis Davis, American artist, author, war correspondent and illustrator: b. Mattapoiset, Mass., 3 Nov. 1846; d. 15 April 1912, one of the victims of the *Titanic* steamship disaster. During the Civil War he acted as drummer and assistant surgeon. In 1869 he was graduated A.B. and A.M. in 1872 at Harvard University. While contributing and illustrating special articles for American publications he studied, in 1871–72 at the Royal Academy of Fine Arts, Antwerp, and in France and in Italy. In 1877–78 he was official correspondent for the New York *Herald,* the London *Graphic* and the London *Daily News* during the Russo-Turkish War, receiving Russian and Rumanian medals and decorations for bravery. In 1885 he was elected to the National Academy of Design, later to the American Academy of Arts and Letters, and was made an honorary member of the American Institute of Architects. He was awarded medals for pictures exhibited in 1889 at Paris, in 1893 at Chicago where he was in charge of the decorations and functions in connection with the World's Fair, and in 1901 at Buffalo. In 1898 he was correspondent for the London *Times* and *Harper's Weekly* in the Philippines. In 1905–06 he was actively engaged in organizing and securing endowment for the American Academy at Rome, of which he was elected the first secretary. Among his best-known paintings are 'An Old-Time Melody' and 'A Cozy Corner' in the Metropolitan Museum, also 'At the Inn' in the Union League Club, New York city; 'Between Two Fires' in the National Gallery of British Art, London. Portraiture includes paintings of Nicholas Murray Butler, president of Columbia University, and of Mrs. Millet. His best-known works are his five mural paintings, notably the 'Evolution of Navigation' in the Baltimore (Md.) Custom-house, and those in the Essex County Courthouse, Newark, N. J.; the Hudson County Courthouse, Jersey City, N. J.; the Cleveland, Ohio, post office; the Supreme Court at Madison, Wis., and in the Minnesota State Capitol. Besides his numerous contributions to periodical literature his published books include 'Capillary Crime and Other Stories' (1892); 'The Danube' (1892); 'The Expedition to the Philippines' (1899). With Maj. Archibald W. Butt, another victim of the *Titanic* disaster, he is commemorated by a memorial fountain erected in 1913 in Washington, D. C.

MILLET, Jean François, zhŏn fräṅ-swä mē-lā, French painter, the founder of the Barbizon school of painting: b. Gruchy, near Cherbourg, 4 Oct. 1814; d. Barbizon, 20 Jan. 1875. The son of a Norman peasant, he owed much in his childhood to a woman of simple piety and strong individuality, and to her brother, and learned enough Latin to delight in the Vulgate and Virgil. He was educated in the Academy of Design at Cherbourg, and received a bursary from that city which enabled him, in 1837, to proceed to Paris, where he entered the studio of Delaroche. This does not seem to have been a congenial home for his early art life, yet at first he struggled to comply with his surroundings and painted genres in the style of Watteau (q.v.) and Boucher (see BOUCHER, FRANÇOIS), as well as Biblical and mythological incidents, with landscape backgrounds, and signboards. It was in 1848 that he really found himself, and hit upon the line of art in which he could give utterance to the sincere feelings of his heart. This turning point in his career was marked by the appearance of his genre painting, taken from country life, 'The Winnower.' Henceforth his days were to be spent far from the glitter of Paris, the competition and jealousies of the studios; settling in Barbizon, on the edge of the forest of Fontainebleau, he devoted himself to the study and portrayal of peasant life. The hardship, toil and privation of the farm laborers he sympathized with acutely, and some have even accused him of being a social revolutionist, but he professed no views of this tendency, though his interpretation of the peasant's lot may be too gloomy and pessimistic, and his ironical bitterness of spirit such that it infected his canvas and clouded the beauty of external nature as depicted there. He himself was almost all his life battling with that poverty whose privations had early robbed him of his young wife. There is a profound pathos in his conception of the rural isolation and hardship of soil slavery, with all its stolid but unrequited patience, and this he has portrayed with a certain broad and impressionistic treatment which is both sincere and original. At first, his works were passed by or misunderstood, but gradually they were recognized at their true value, and he was hailed as the greatest painter of modern France. Since his death his pictures have been sold at enormous prices and are looked upon as the most precious pieces in private or public collections.

Millet's greatest picture, the 'Angelus' (1859), was sold by him for 1,800 francs and later brought at auction 800,000 francs. Millet himself sold his picture 'The Woman with the Lamp' for $2,800 in 1872. Shortly after it was sold for $4,600 and again for $7,000. In 1882 it fetched $18,000. The most important of his other works are 'The Sower' (1850); 'Man Spreading Manure' (1852); 'The Reapers'

(1853); 'The Gleaners' (1857, in the Louvre); 'Death and the Woodcutter'; 'La Becquée' (Feeding Her Birds)— a mother feeding her three children from the same bowl. These all belong to his early period when he was tortured with sickness and harassed by debt. After the appearance of the 'Angelus' his reputation was established, but chronic poverty still pursued him. In 1860 he produced his wonderful picture, the 'Sheep-Shearing' in which he seems to express as much pity for the dumb beast as for the patience of the human toiler who is bent over it. In 1862 appeared the 'Potato Planters'; in 1863 'The Wool Carder,' and 'The Man with the Hoe.' In 1867 he was awarded at the Paris Exposition a medal of the first class and the ribbon of the Legion of Honor in 1868. He took refuge in Cherbourg during the Franco-Prussian War, but returned to Barbizon in 1871, where he continued in broken health, though still working with untiring brush, until the end came.

Among the paintings of this artist now in the United States are 'The Sower'; 'The Water Carrier' (Vanderbilt collection); 'A Peasant Grafting a Tree' (Rockefeller collection); 'The Turkey Tender' (C. A. Dana collection, New York); 'The Buckwheat Threshers' and the 'Potato Planters' (Quincy Shaw collection, Boston); 'Harvesters Resting' and 'Homestead at Gréville' (Boston Art Museum); 'The Churners' (F. L. Ames collection); 'Potato Diggers' and 'Breaking Flax' (Walters collection); 'The Man with the Hoe' (San Francisco Museum).

The drawings, etchings and pastels of Millet are eagerly sought after and always bring a high price at auction or private sale. The most familiar is his own portrait, a sketch often reproduced. His 'Woman Feeding Chickens'· 'Flock of Sheep with Shepherd'; the 'Newborn Lamb'; 'Laundresses on the Shore' are best known. Among his pastels are 'The Vine Dresser' and 'Butter Making.' All his works show masterly drawing, and the landscapes which appear in many of them are put in with an ease and atmosphere worthy of the best periods of French art. His coloring may be sombre, and he disregards the power of the human countenance as giving expression to the sentiment of his conception. But the life of each picture is to be found in the inimitable pose of the figures, and the suggestiveness of the background. The hands, shoulders and feet of these figures, as they move in harmony with forms cumbrous, almost grotesque, are made to suggest the dull torture in which stolid and half-bestial creatures are held under the yoke of toil and poverty. The light reflected upon these figures from religious sentiment or natural affection only serves to intensify the profound melancholy by which the story of their lives is clouded.

Bibliography.—Ady, J. C., 'Jean François Millet: His Life and Letters' (New York 1902); Marcel, H., 'Jean François Millet: biographie critique' (Paris 1903); Sensier, 'La vie et l'œuvres de Jean François Millet' (Paris 1881); and its abridged English translation (Boston 1896); Thomson, D. C., 'The Barbizon School' (London 1890); Turner, Percy M., 'Millet' (in the 'Masterpieces of Color' series, London 1909); Yriarte, C. E., 'Jean François Millet' (Paris 1885).

MILLET, or **MILET, Pierre,** French-Canadian pioneer missionary: b. Bourges, France, 1635; d. Quebec, Canada, 31 Dec. 1708. He entered the Jesuit order and in 1667 went to Canada. In 1668 he was sent as missionary to the Iroquois in New York and in 1671 he was placed at the head of the Oneida mission. He succeeded in converting the principal chief and slowly gathered a congregation of considerable proportions. In 1684 he left his work among the Oneidas to accompany De La Barre in his campaign against the Senecas, and he served as interpreter between the Iroquois and the French at Frontenac in 1686. He was stationed at Fort Niagara in 1687 and afterward at Frontenac, in the hope that his experience among the Iroquois might enable him to promote friendly relations between them and the French. During the siege of Frontenac in 1689 he was captured by the Onondagas, who after maltreating him gave him over to the Oneidas. There he was sentenced to the stake but was finally rescued by an Indian convert who succeeded in having him adopted into the tribe. In 1694 he was permitted to return to Quebec, and afterward was petitioned by the Oneidas to return to them. From 1697–1703 he was missionary at Sault-Saint Louis.

MILLET, a popular name for many grasses grown in the Old World as cereals, but in the New almost wholly as forage. The principal ones are true or broomcorn millet (*Panicum milaceum*); foxtail millet (*Setaria italica*); barnyard or Japanese (*Panicum crus-galli*); pearl or cat-tail millet (*Pennisetum typhoideum*) and the African, Chinese, Indian, black and erroneously called "pearl millet" (*Sorghum vulgare*). Sometimes *Elusine coracana* is called African millet. In general they constitute one of the most important groups of food-plants, since they are the staple diet of about one-third of the world's population, the annual plantation in India alone being estimated at approximately 35,000,000 acres. The first three mentioned are the most important groups grown in the United States. The plants all thrive well upon rather light, well-drained soils, which should be prepared as for other cereal crops. In order to make a millet harvest succeed the harvest of other cereals, the seed is sown late in the spring. Broadcasting and drilling are both practised, the latter more extensively. Just after blossoming, the crop may be cut and cured for hay; for seed, just before the seed becomes fully mature to prevent loss from shattering. The hay makes valuable fodder, but some stockmen attribute various animal ailments to its excessive or exclusive use; others experience no such difficulties. The seed may be ground for stock food, but it is little used. For poultry, especially for young chicks, it is widely employed.

MILLIGAN, George, Scottish clergyman: b. 2 Apr. 1860; d. 25 Nov. 1934. He was educated at the universities of Aberdeen, Edinburgh, Göttingen and Bonn, and was afterward minister of Saint Matthews, Morningside, and of Caputh. After 1910 he was regius professor of divinity and religious criticism at Glasgow University, and he served as clerk of the senate after 1911. Author of 'History of the English Bible' (1895); 'The Theology of the Epistle to the Hebrews' (1899): 'The New Testament

Documents: Their Origin and Early History' (1912); coauthor, 'The Vocabulary of the Greek Testament' (1914–15); 'The Church and the New Testament' (1923).

MILLIGAN, Robert Wiley, American rear-admiral: b. Philadelphia, 8 April 1843; d. 14 Oct. 1909. He entered the navy with rank as third assistant engineer and was attached to the United States steamship *Mackinaw* in the North Atlantic Blockading Squadron during the Civil War. He saw service at both battles of Fort Fisher, and was present at the fall of Wilmington, N. C., and of Petersburg and Richmond, Va. He afterward served in the North and South Atlantic and Pacific squadrons, and was on duty as instructor at the United States Naval Academy. He was promoted chief engineer in 1892, in which capacity he served on the United States battleship *Oregon* on her famous run from the Pacific to the Atlantic coast in the Spanish-American War, and also served at the battle of Santiago. He was fleet engineer of the North Atlantic Fleet, on the flagship *New York,* for one year; was promoted commander in 1899 and was chief engineer of the Norfolk navy yard in 1899–1905. He received rank as captain in 1902 and was retired with rank as rear-admiral in 1905.

MILLIGAN, William, Scottish Presbyterian clergyman and commentator: b. Edinburgh, 15 March 1821; d. Edinburgh, 11 Dec. 1893. He was educated at the University of Saint Andrew's, entered the ministry of the Established Church of Scotland, held pastorates at Cameron and Kilconquhar and was professor of Biblical criticism in the University of Aberdeen from 1860. He was moderator of the General Assembly in 1882, and was appointed principal clerk to the assembly in 1886. He was one of the revisers of the New Testament and the author of 'The Higher Education of Women' (1878); 'The Resurrection of Our Lord' (1881); 'Commentary on the Revelation' (1883); 'The Resurrection of the Dead' (1890), etc. He visited the United States in 1872 as a delegate to the Presbyterian General Assembly from the General Assembly of the Scottish Church.

MILLIGAN, Ex Parte, a decision handed down by the Supreme Court of the United States in 1866 holding a military commission to be without power in a State not invaded nor in rebellion, and where the usual civil courts, both Federal and State, were open; rendered by a barely sufficient majority, with Chief Justice Chase and Justices Wayne, Swayne and Miller dissenting, and Chief Justice Chase pronouncing a forcible protest. The case was that of one Lambdin P. Milligan, a United States citizen residing in Indiana, arrested by military authorities in 1864 on a charge of conspiracy, disloyal practices, inciting insurrection and aiding and comforting the enemy. He was found guilty by a military commission and sentenced to death. His counsel filed a writ of habeas corpus in the United States Circuit Court and the case eventually was carried to the Supreme Court, where the military commission was held to be without jurisdiction in his case. Chief Justice Chase asserted that the power of Congress «to authorize trials for crimes against the security and safety of the national forces, may be derived from its constitutional power to raise and support armies and to declare war»; and that while the civil courts «might be open and undisturbed in their functions . . . yet wholly incompetent to avert threatened danger, or to punish, with adequate promptitude and certainity, the guilty conspirators.» Consult 'Wallace's Reports of the Supreme Court of the United States' (Vol. IV, 1866).

MILLIGAN COLLEGE, a coeducational institution located at Milligan College, 4 miles from Johnson City, Tenn. It is operated by a self perpetuating board of trustees. It was originally called Buffalo Male and Female Institute, which name was changed to Milligan College in 1881 by Josephus Hopwood, its president for many years. It offers courses leading to the degrees of bachelor of arts and bachelor of science. The student enrollment averages about 325 a year.

MILLIGRAM, the thousandth part of a gram. See WEIGHTS AND MEASURES.

MILLIKEN UNIVERSITY. See JAMES MILLIKIN UNIVERSITY.

MILLIKEN'S BEND, Engagement at. Milliken's Bend, La., on the west bank of the Mississippi, about 15 miles above Vicksburg, was the base of some of the military operations against that place and the lower Mississippi. Early in June 1863, when Grant was besieging Vicksburg from the east, Gen. E. Kirby Smith, commanding the Confederate Department of the Trans-Mississippi, sent Gen. J. G. Walker's division of 4,000 men to seize the place and other points on the river, and open communication with General Pemberton, in Vicksburg, with the object of furnishing him supplies, or failing in that, to cover his escape across the river. Walker moved to Alexandria, La., and reported to Gen. R. Taylor, commanding in West Louisiana, and was sent in transports up the Washita and Tensas rivers, until abreast of Vicksburg, when he landed and marched across to Richmond. At this time Milliken's Bend was held by Gen. E. S. Dennis, with about 1,400 men, mostly colored troops. A reconnoitring party sent out by Dennis was driven back by the Confederates. Walker arrived at Richmond at 10 A.M. on the 6th, and was ordered by Taylor to send one brigade to Young's Point and one to Milliken's Bend, distant respectively 20 and 10 miles, and to hold a third brigade in reserve six miles in advance of Richmond. Harris' brigade moved at night on Young's Point, was delayed and accomplished nothing. Gen. H. E. McCulloch, with a Texas brigade of 1,600 men and 200 cavalry, marched from Richmond at 6 P.M. on the 6th and at 3 A.M. on the 7th, when within one and a half miles of Milliken's Bend, the Union skirmishers were encountered and the Confederate advance driven back in some disorder; but McCulloch rallied his men and pushed on, driving the Union troops back slowly to their main line, carrying the Union breastworks, then driving the Union troops to the bank of the river, where two gunboats came to their assistance and, pouring shells into the ranks of the Confederates, obliged them to withdraw and return to Richmond. The Union loss was 127 killed, 287 wounded and 266 missing; the Confederates lost 44 killed, 131 wounded and 10

missing. Consult *Official Records,* vol. 24.

MILLIKIN, mĭl'ĭ-kĭn, **James,** American banker and philanthropist: b. Pennsylvania, Aug. 2, 1830; d. Orlando, Florida, March 2, 1909. In 1860 he engaged in banking and later founded the firm of Millikin and Company at Decatur, Ill., now the Millikin National Bank. He was president of the Union Works. He founded the Anna B. Millikin Home, an institution for the care of aged women and children, built and supported mostly by him, and named after his wife, Anna B. Millikin. He also founded the James Millikin University, dedicated in 1904.

MILLIN, mĭl-lĕN', **Aubin-Louis,** French archaeologist, numismatist, botanist, and mineralogist: b. Paris, July 19, 1759; d. there, Aug 14, 1818. Imprisoned during the Terror, he proved his revolutionary sympathies by adopting the given name Éleutherophile (Friend of Liberty) and publishing the *Annuaire du Républicain* (1794) where he substituted names of vegetables for those of saints. Keeper of medals and antiquities at the Bibliothèque Nationale, in 1795 he began editing the *Magazin Encyclopédique.* He was author of *Antiquités nationales,* 5 vols. (1790); *Monuments antiques inédits ou nouvellement expliqués,* 2 vols. (1802–1804); *Nouveau dictionnaire des beaux arts,* 3 vols., (1806); *Histoire métallique de la Revolution française* (1806); *Voyages dans les départments du midi de la France,* 5 vols. (1807–1811); *Galerie mythologique,* 2 vols. (1811); *Voyage dans le Milanais* (1817).

MILLIN, mĭl'ĭn, **Sarah Gertrude** (nee Liebson), South African author: b. Kimberly, 1889. Of Jewish parentage, she began her writing career at 16. Her early novels, *The Dark River, Middleclass, Adam's Rest* and *The Jordans,* were followed by her most successful *God's Stepchildren* (1924) a poignant tale of "Cape colored people." Later novels include *King of the Bastards* (1950) and *The Burning Man* (1952). Nonfiction books include *The South Africans* (rev. ed. 1934); biographies of Cecil Rhodes and General Smuts; and the autobiography, *The Night is Long* (1941).

MILLINOCKET, mĭl-ĭ-nŏk'ĕt, town, Maine, in Penobscot County, altitude 359 feet, on the Bangor and Aroostook Railroad, 83 miles north of Bangor. In a forested region; has paper mills. Government is by selectmen. Pop. (1950) 5,890.

MILLIS, John, American army engineer: b. Wheatland, Mich., Dec. 31, 1858; d. Cleveland, Ohio, March 30, 1952. On graduating from the United States Military Academy at West Point in 1881 he joined the Engineer Corps. In 1886 he constructed the electric light plant for the Statue of Liberty in New York Harbor, developing a new type of reflector, precursor of modern floodlight projectors, and working with arc lights, incandescent bulbs not yet having been invented. When Lieutenant Millis threw the switch in the Bedloe's Island powerhouse the night of Oct. 28, 1886, the first floodlight in the world bathed the statue. After service in New Orleans supervising harbor works and levees (1890–1894), he was chief engineer of the United States Lighthouse Board (1894–1898), then served with the Engineers' Battalion at Willis Point, N. Y. and in Cuba, attaining his majority in 1900. During the succeeding 12 years Major Millis had charge of harbor fortification construction on Puget Sound and in the Philippines, also of river and harbor improvements on the Atlantic and Pacific coasts. In 1910 he was promoted colonel. Division engineer of the Southeastern Coast Defenses in 1916, he was appointed chief engineer of the Southeastern Department in 1918, and of the Central Department in 1918. He retired in 1922. He was author of many papers on relativity, gravitation, glaciers, cosmogony, and navigation.

MILLOCKER, mĭl'ŭk-ĕr, **Karl,** Austrian composer: b. Vienna, Austria, April 29, 1842; d. Baden bei Wien, Dec. 31, 1899. He composed operettas and was also an orchestra conductor. His most successful operettas *Der Bettelstudent* (1882), *Gasparone* (1884), and *Der Arme Jonathan* (1890), are still performed.

MILLOM, mĭl'ŭm, urban district, England, in Cumberland, on the Duddon estuary, nine miles northwest of Barrow and 60 miles north of Liverpool, on the Furness Railway. There is an early Norman church and the dismantled castle of Millom, built in the 11th century and fortified in the 14th century. The park of the castle was turned into farm lands early in the 19th century. The largest known deposits of red hematite in the country are located here, and a seawall and embankment have been built for the mine's protection as part of it lies under the Duddon estuary. There are smelters in the neighborhood and the town owns its water and gasworks, and has a technical school. Pop. (1951) 13,424.

MILLS, Albert Leopold, American army officer: b. New York City, May 7, 1854; d. Washington, D.C., Sept. 8, 1916. He was graduated from the United States Military Academy at West Point in 1879 and was commissioned in the cavalry. He served in several campaigns against the Indians and in 1894–1898 was instructor in the United States Military School at Fort Leavenworth, Kansas. Upon the opening of the war with Spain he was ordered to the front, where he rendered distinguished service at the battles of Las Guasimas and Santiago and was brevetted major and lieutenant colonel. From 1898–1906 he was superintendent at West Point. On July 28, 1902 he was awarded the Congressional Medal of Honor for distinguished gallantry in action near Santiago de Cuba, July 1, 1898, for encouraging those about him, though shot through the head and practically sightless. He was commandant of the Department of Visayas (1907–1908), of the Department of Luzon (1908–1909); of the Department of the Gulf, Atlanta, Ga. (1909–1912); and president of the Army War College after 1912.

MILLS, Benjamin Fay, American clergyman. b. Rahway, New Jersey, June 4, 1857; d. Grand Rapids, Michigan, May 1, 1916. He was graduated from Lake Forest University, Lake Forest, Ill., in 1879, having been ordained to the Congregational ministry a year previous. He held pastorates at Rutland, Vt., Albany, N. Y., and other places; and was a prominent evangelist from 1886 to 1897. In 1897 he withdrew from the Congregational denomination because of disagreements, and for two years held independ-

ent religious meetings in Boston. He was then minister (1899–1903) of the First Unitarian Church in Oakland, Calif., founder and minister (1904–1911) of the Los Angeles Fellowship, and founder and leader (1911–1914) of the Chicago Fellowship. In 1915 he was received into the Chicago Presbytery and became active in interdenominational evangelistic work, advocating broad principles of religious faith rather than dogmus or creeds. Among his books are *Power from on High* (1890); *Victory Through Surrender* (1892); *God's World, and Other Sermons* (1894); *Twentieth Century Religion* (1898); and *The Divine Adventure* (1905).

MILLS, Clark, American sculptor and bronze founder: b. Onondago County, N.Y., Dec. 13, 1810; d. Washington, D.C., Jan. 12, 1883. After learning the trades of cabinetmaker and millwright, he became a worker in stucco in Charleston, S.C. In 1835 he became interested in modeling busts in clay and devised a means of taking casts from the living face. Next he studied marble-cutting and in 1845 completed a bust of John C. Calhoun, which was bought by the Charleston city council. Encouraged to devote himself to sculpture, Mills went to Washington to study the statues there and was offered an opportunity in 1848 to design an equestrian statue of Andrew Jackson. He accepted a contract for $12,000, prepared a full-scale plaster model, and set about to cast it in bronze. He was obliged to learn casting, for no foundry was then prepared to handle such work. Congress appropriated an additional $20,000 for the sculptor, and this first American equestrian statue was placed in Lafayette Square, across from the White House, in 1853; copies of the statue were purchased for New Orleans and for Nashville. Congress then commissioned Mills to make an equestrian statue of George Washington, which was unveiled in Washington on Feb. 22, 1860; and also ordered from the sculptor a bronze casting of Thomas Crawford's colossal statue representing Freedom or armed Liberty, which was placed on the dome of the Capitol in 1863. Mills made many portrait busts, and took a life mask of Abraham Lincoln shortly before the president's death. The sculptor's last work was a design for an elaborate Lincoln memorial, to contain at least 36 heroic statues, but none of the plans materialized.

MILLS, Darius Ogden, American financier and philanthropist: b. North Salem, N.Y., Sept. 5, 1825; d. Millbrae, Calif., Jan. 4, 1910. At 22, he became cashier and partner in the Merchants' Bank of Erie County at Buffalo, N.Y., and in 1848 he set out for California to establish a trading and banking agency. In 1850 he founded the Bank of D. O. Mills & Company at Sacramento, accumulating a large fortune in the succeeding decade. He helped organize the Bank of California at San Francisco in 1864, serving as its president until 1873. When the bank failed two years later, he resumed the presidency for a year and re-established its finances, then removed permanently in 1878 to New York to engage in other financial, railroad, and industrial activities. His philanthropies included the University of California, the Lick Observatory, the San Francisco Protestant Orphan Asylum, and the Metropolitan Museum of Art; but most notable perhaps were the hotels he built for the inexpensive accommodation of people of limited means.

MILLS, Enos Abijah, American naturalist and writer: b. near Kansas City, Kans., April 22, 1870; d. near Estes Park, Colo., Sept. 21, 1922. Known as the Father of the Rocky Mountain National Park, he spent his adult life exploring nature, chiefly in the Rockies of Colorado, and writing or lecturing on his observations. In 1886 he settled in a log cabin near Long's Peak, Colo., and guided visitors to the peak. He traveled in the mountains in all seasons, making photographs which he used to illustrate his books and articles. He was a lecturer on forestry for the federal government from 1907 to 1909, and in the same period was a snow observer for the state of Colorado. Mills' long agitation for the creation of a national park in Colorado led to the establishment of the Rocky Mountain National Park in 1915. Many of his magazine articles were reprinted in such collections as *Wild Life in the Rockies* (1909) and *The Adventures of a Nature Guide* (1919). His other works included *In Beaver World* (1913); *Rocky Mountain Wonderland* (1915); and *The Grizzly, Our Greatest Wild Animal* (1918).

MILLS, John, English translator and writer on agriculture: d. about 1784. He translated (1745) into French, with the assistance of Gottfried Sellius, the English *Cyclopaedia* (1728) of Ephraim Chambers. Mills was cheated out of his rights to the work by the bookseller, André François Lebreton, who ultimately turned the editorial labors over to Denis Diderot and others and formed of it the famous *Encyclopédie* (1776–1777). Mills wrote many books on agriculture, the chief one being *A New System of Practical Husbandry,* 5 vols. (1767). This was the earliest complete treatise on the subject and brought together the observations of many agriculturists.

MILLS, Lawrence Heyworth, American Orientalist: b. New York, N.Y., 1837; d. Oxford, England, Jan. 29, 1918. He was graduated from the University of the City of New York in 1858 and from the Protestant Episcopal Theological Seminary in Alexandria, Va., in 1861. He preached until 1870 in Brooklyn, N.Y., and in Hartford, Conn., and from 1873 until 1877 in the American Episcopal Church in Florence, Italy. After 1877 he devoted himself to the study of Vedic and Iranian literature. Having established his reputation as an authority on the Zend-Avesta, the sacred writings of Zoroastrianism, he was invited by Friedrich Max Müller to complete the translation of the texts left unfinished by the French Orientalist James Darmesteter. These were published in 1887 as volume 31 of Max Müller's *Sacred Books of the East.* Mills became professor of Zend philology at Oxford in 1897. His many publications include *A Study of the Five Zarathushtrian Gâthâs, with Texts and Translations* (1894); *The Creed of Zarathushtra* (1916); and *The Vital Necessity of Persian Theology to All Biblical Study* (1916).

MILLS, Ogden Livingston, American lawyer and politician: b. Newport, R.I., Aug. 23, 1884; d. New York, N.Y., Oct. 11, 1937. A grandson of Darius Ogden Mills (q.v.), he was educated at Harvard University and the Harvard School of Law, graduating from the latter in 1907. He was admitted to the New York bar in 1908. He became active in Republican political affairs, was defeated as a candidate for Congress

in 1912, but was elected to the New York Senate in 1914 and again in 1916. In 1921 he was elected to Congress as representative from New York, continuing through three terms. He was appointed undersecretary of the treasury in 1927, then succeeded Andrew Mellon as secretary of the treasury in 1932 and served until the administration terminated a year later. An expert on finance and taxation, Mills was highly critical of New Deal policies. His views were expressed in *What of Tomorrow?* (1935) and in *The Seventeen Million* (1937), the latter an effort to guide those who voted against the New Deal in 1936.

MILLS, Robert, American architect and engineer: b. Charleston, S.C., Aug. 12, 1781; d. Washington, D.C., March 3, 1855. The first native American professional architect to study exclusively in the United States, Mills served his apprenticeship under James Hoban, Thomas Jefferson, and Benjamin Latrobe. He established himself as an architect in Philadelphia in 1808 and in 1817 moved to Baltimore, his work including the Washington monument in Baltimore (1815–1829), as well as many churches and other public buildings. He was state engineer and architect of South Carolina from 1820 to 1830 and designed some of the state's most important public structures. From 1836 until his retirement in 1851, Mills was United States architect of public buildings in Washington, D.C. He designed and built the Treasury, Post Office, and Patent Office buildings in the national capital, as well as customhouses, hospitals, penitentiaries, and other structures throughout the United States. His most memorable work is the Washington Monument (1848–1885); his design for it included a circular colonnade at the base, but this was omitted from the completed structure. Among his books are *Internal Improvement of South Carolina* (1822) and *The American Pharos, or Lighthouse Guide* (1832).

Consult Gallagher, Helen, *Robert Mills, Architect of the Washington Monument, 1781–1855* (New York 1935).

MILLS, Roger Quarles, American politician: b. Todd County, Ky., March 30, 1832; d. Corsicana, Tex., Sept. 2, 1911. Admitted to the Texas bar at 20, he was elected to the state legislature in 1859, advocating secession. He spent four years in the Confederate army. A stanch Democrat, he was elected to Congress as a representative (1873–1892) and as a senator (1892–1899); as chairman (1887–1889) of the House Ways and Means Committee, he was an important member of Congress at a time when the tariff issue was prominent. The Mills Bill, which he introduced in 1888 calling for reduced tariff on manufactured goods, was defeated.

MILLS, Susan Lincoln Tolman, American missionary and educator: b. Enosburg, Vt., Nov. 18, 1826; d. Oakland, Calif., Dec. 12, 1912. After graduating from Mount Holyoke Seminary in 1845 and teaching there three years, she married Cyrus Taggart Mills and went with him as a missionary to Ceylon. They spent six years there at Batticotta Seminary, then from 1860 to 1864 were at Oahu College, in the Hawaiian Islands, where Mrs. Mills taught English and natural science. In 1865 the Millses bought a girls' seminary at Benicia, Calif., and moved it to Oakland in 1871. It developed into what is now Mills College. Mrs. Mills, succeeding her husband as trustee upon his death in 1884, is recognized as the college's founder.

MILLS COLLEGE, in Oakland, Calif., a nonsectarian, private college of liberal arts for women. The first women's college in the Far West, Mills had its beginnings in 1852 in the Young Ladies' Seminary at Benicia, Calif. Cyrus and Susan Mills purchased the seminary in 1865, and in 1871 moved it to Oakland, changing the name to Mills Seminary, then to Mills Seminary and College (1876); the present name was adopted in 1885 at the time when the college was chartered. The seminary was discontinued in 1911. Departments of study are organized into four schools: Home and Community Services, Fine Arts, Humanities, and Natural Sciences. The graduate school was started in 1920, and the summer session began in 1926; both are coeducational. Bachelors' and masters' degrees are awarded. Enrollment averages about 560 students.

MILLSAPS COLLEGE, in Jackson, Miss., established in 1890 and opened for instruction in 1892. A private, coeducational college of liberal arts under the joint control of the Mississippi and the North Mississippi conferences of the Methodist Church, Millsaps enrolls about 850 students annually and awards bachelors' degrees in the arts and sciences. It was named for Reuben Webster Millsaps, a Jackson banker and founder of the college.

MILLSPAUGH, mĭlz'pô, **Arthur Chester,** American political scientist: b. Augusta, Mich., March 1, 1883; d. Kalamazoo, Mich., Sept. 24, 1955. He graduated from Albion College, Albion, Mich., in 1908 and received his doctorate in philosophy from Johns Hopkins University in 1916 and taught political science there for a year. In 1918 he joined the staff of the State Department in Washington. He was administrator general of finances in Iran (1922–1927; 1943–1945) and financial adviser in Haiti (1927–1929). From 1929 to 1949, except for his second trip to Iran, he was a research assistant for the Brookings Institution in Washington. During the last six years of his life he wrote editorials for the *Kalamazoo Gazette.* Among his books are *The American Task in Persia* (1925); *Public Welfare Organization* (1935); and *Toward Efficient Democracy* (1949).

MILLSPAUGH, Charles Frederick, American botanist: b. Ithaca, N.Y., June 20, 1854; d. Chicago, Ill., Sept. 15, 1923. He was graduated from the New York Homeopathic Medical College in 1881 and practiced medicine at Binghamton and Waverly, N.Y., for 10 years before devoting himself chiefly to botany. His interest lay in the application of botanical knowledge to medicine and to economics. In 1891 he became professor of botany at the University of West Virginia, and from 1893 until his death was curator of the department of botany at the Field Museum of Natural History, Chicago. Here he developed the herbarium and was noted for his lectures and exhibits. He was also a professor of botany at the University of Chicago and at the Chicago Homeopathic Medical College. An explorer of and authority on plant life, Millspaugh wrote *American Medicinal Plants,* 2 vols. (1887).

MILLSTONE, either of the two cylindrical stones used to grind grain into flour. The best rock for the purpose is buhrstone (q.v.). The lower stone is usually fixed; the upper is the "runner." Each stone is deeply scored with furrows, which lead the milled grist away from the center; the intervals are styled "land"; and the hole in the center is called the "eye." A depression about the eye is the "bosom." The scheme for scoring the stone varies greatly. In the United States, millstones have been almost entirely superseded by steel rollers in the manufacture of flour.

MILLSTONE GRIT, a hard, siliceous conglomerate (q.v.) found, in the United States, at the base of the Pennsylvania coal measures series of the Carboniferous (q.v.) system. The formation occurs practically throughout the Appalachian Range. In Pennsylvania the beds are coarse and over 1,200 feet thick; the rock is light in color and is called Pottsville conglomerate. It is interstratified with some sandstone, thin beds of carbonaceous shells, and thin beds of coal.

MILLTOWN, borough, New Jersey, in Middlesex County; altitude 50 feet; 3 miles south of New Brunswick. Manufactures include textiles, clothing, furniture polish, cables, and paper products. It was incorporated in 1889. Government is by mayor and council. Pop. (1940) 3,515; (1950) 3,786.

MILLVALE, borough, Pennsylvania, in Allegheny County; altitude 900 feet; on the Allegheny River, opposite Pittsburgh; served by the Pennsylvania Railroad. It has a meat-packing plant and manufactures iron and steel products. It was incorporated as a borough in 1868. Pop. (1950) 7,287.

MILLVILLE, city, New Jersey, in Cumberland County; altitude 35 feet; at the head of tidewater on the Maurice River, 10 miles southeast of Bridgeton, on the Pennsylvania-Reading Seashore Lines Railroad. There are river fisheries, and manufactures include glass, textiles, bricks, concrete products, and fertilizers. When first settled in 1720 it was important as a market for sea fish. In 1806 German glassmakers established a glass factory here. Millville was incorporated as a town in 1801 and received its city charter in 1866. Government is by a commission. Pop. (1940) 14,806; (1950) 16,041.

MILMAN, Henry Hart, English historian and divine: b. London, Feb. 10, 1791; d. near Ascot, Sept. 24, 1868. He graduated at Brasenose College, Oxford University in 1814, and was professor of poetry at Oxford from 1821 to 1831. Ordained in 1816, in 1835 he was made rector of St. Margaret's and canon of Westminster; and he was dean of St. Paul's from 1849 until his death. He wrote dramas, epic poems, and hymns, but was best known for his historical works. His *History of the Jews* (1830) gave offense by his treatment of Jewish history from the secular point of view. He wrote *A History of Christianity to the Abolition of Paganism in the Roman Empire* (1840). His greatest work was *A History of Latin Christianity down to the Death of Pope Nicholas V* (1855). In 1838 he edited *The Decline and Fall of the Roman Empire,* by Edward Gibbon and wrote a *Life of Gibbon* (1839). One of his best-known hymns is *When Our Heads Are Bowed with Woe.*

MILMORE, Martin, American sculptor: b. Sligo, Ireland, Sept. 14, 1844; d. Roxbury Highlands, Boston, Mass., July 21, 1883. He moved to Boston in 1851 and in 1860 began studying sculpture under Thomas Ball. Later he studied in Rome where he made a bust of Pope Pius IX. His Soldiers' and Sailors' Monument on Boston Common, generally regarded as his greatest work, was dedicated in 1877. He also executed the Soldiers' Monument at Forest Hills Cemetery, Roxbury, Mass. His portrait bust of Charles Sumner was placed in the Metropolitan Museum, New York City; that of George Ticknor, in the Boston Public Library; and a bronze copy of that of Wendell Phillips is also in the Boston Library, to which it was presented by the Phillips Memorial Association in 1900. One of his best-known works (made in collaboration with his brother Joseph) was the huge granite Sphinx in Mount Auburn Cemetery, Cambridge, Mass.

MILNE, mĭln, **A(lan) A(lexander),** English poet and playwright: b. London, Jan. 18, 1882. He was educated at Trinity College, Cambridge University, where he edited *The Granta.* From 1906 to 1914 he was assistant editor of *Punch;* a collection of his contributions to that weekly was published under the title *Those Were the Days* (1929). He achieved wide popularity with his volumes of verse and prose for children which include: *When We Were Very Young* (1924); *Winnie-the-Pooh* (1926); *Now We Are Six* (1927); *The House at Pooh Corner* (1928). His son was the model for Christopher Robin.

Among his adult prose works are *The Day's Play* (1910); *Once on a Time* (1917); *The Red House Mystery* (1921); *Two People* (1931); *Four Days' Wonder* (1933); *It's Too Late Now* (1939); *Behind the Lines* (1940); *Birthday Party* (1949); *A Table Near the Band* (1950).

His comedies, successful on both the New York and London stages, include: *Belinda* (1918); *Mr. Pim Passes By* (1919); *The Romantic Age* (1920); *The Truth About Blayds* (1921); *The Ivory Door* (1927); *Michael and Mary* (1930); *Toad of Toad Hall* (1930); *Miss Elizabeth Bennet* (1936); *Sarah Simple* (1937); *Gentleman Unknown* (1938).

MILNE, John, English geologist and seismologist: b. Liverpool, Dec. 30, 1850; d. Isle of Wight, July 30, 1913. He was educated at King's College and the Royal School of Mines, London, and practiced as a mining engineer in Cornwall, Lancashire, central Europe, and Newfoundland, besides accompanying an expedition to Arabia as geologist. In 1875 he was appointed by the Japanese government to the chair of geology and mining in the Imperial College of Engineering at Tokyo, where he married a Japanese lady and remained nearly 20 years. In 1880 he founded the Seismological Society of Japan from which hundreds of observing stations sprang up all over the country—a land subject to perhaps a thousand earthquake shocks a year. With the assistance of English colleagues, Milne was the first to devise instruments for recording these shocks, and his investigations led to the precision now obtaining

in the science of seismology. Shortly before leaving Japan his residence was destroyed by fire; all his books, instruments and 2,000 volumes of the *Transactions of the Seismological Society of Japan* were lost. Returning to England in 1895, Milne and his wife settled in the Isle of Wight, where he erected a famed seismological observatory and equipped it with instruments that recorded shocks in any part of the globe. His principal works, *Earthquakes* (1883) and *Seismology* (1898) became standard textbooks.

MILNE-EDWARDS, Henri, French zoologist: b. Bruges, Belgium, Oct. 23, 1800; d. Paris, July 29, 1885. His parents were English. He studied medicine in Paris, taking his degree in 1823. Soon he turned his attention to zoology. After teaching for several years in the Collège de Henri IV, he was elected in 1838 a member of the Académie de Sciences. His *Recherches anatomiques sur les crustacés,* published in 1828, attracted attention, and from that time until his death he published books and essays on his specialty. He taught natural history, and became a noted educator, as well as an original investigator. In 1837 he became editor of the zoological department of the *Annales des sciences naturelles,* which he held for 50 years, and to which he was a contributor. In 1841 he became professor of entomology in the Jardin des Plantes (Museum of Natural History), Paris, where, 21 years later, he succeeded Étienne Geoffroy Saint-Hilaire (q.v.) in the chair of zoology. In 1864 he became director of that famous institution. The Royal Society of England honored him in 1850 with the Copley Medal for his zoological work. Milne-Edwards was the first to describe the important biological principle of the physiological division of labor. Although a contemporary of Charles Robert Darwin and Thomas Henry Huxley, Milne-Edwards was little influenced by those men of science and held to the doctrine of special creations instead of the evolution theory. In the work of his latest years he was assisted by his son, Alphonse (1835–1900), who was a specialist in the study of fossil birds and deep-sea exploration. Milne-Edwards published *Éléments de zoölogie ou leçons sur l'anatomie, la physiologie, la classification, etc., des animaux* (1834–35), which had an enormous circulation, and was much used as a basis for manuals of zoology; a revision of Lamarck's *L'histoire naturelle des animaux sans vertèbres* (1836–45), and with Dehayes *Leçons sur la physiologie et l'anatomie comparées de l'homme et des animaux* (1855–84); *Histoire naturelle des crustaces* (1834–40) and *Histoire naturelle des corallinaires* (1857–60) were noteworthy. His *Lectures on the Physiology and Comparative Anatomy of Man and the Animals* (14 vols., 1857–81) were valued for their great fund of information and ample references. He also published *Natural History of the French Coasts* (1832–45) and *Natural History of the Mammalia* (1871).

MILNER, Alfred, 1st Viscount Milner, British statesman and colonial administrator: b. Giessen, Germany, March 23, 1854; d. Canterbury, Kent, May 13, 1925. He studied in Germany, where his father was instructor in English at the University of Tübingen, and at King's College, London, before entering Balliol College, Oxford University. Graduating in 1877, he was elected to a fellowship at New College, Oxford, and in 1881 he was called to the bar at Inner Temple. In 1886, after five years on the editorial staff of the *Pall Mall Gazette,* he became private secretary to George Joachim (later Viscount) Goschen (q.v.), and in 1889 he was appointed undersecretary of finance in Egypt. His *England in Egypt* (1892), published following his return to Britain, was an important account of the occupation of the country. During 1892–1897 he served as chairman of the board of inland revenue, in 1895 receiving a knighthood for his services. In 1897 he was sent to South Africa as governor of the colony of the Cape of Good Hope and high commissioner for South Africa, and in the latter capacity he was the principal British representative in negotiations with the government of the South African Republic (Transvaal) respecting the demand of the Uitlanders (q.v.) for the franchise in that country. The discussions culminated in a conference at Bloemfontein, in June 1899, between Sir Alfred Milner and President Paul (Stephanus Johannes Paulus) Kruger (q.v.), and with its failure the South African War (q.v.) ensued. With British annexation of the Transvaal and the Orange Free State in 1901, he relinquished the governorship of the Cape of Good Hope to become administrator of the two states, and when the war ended the next year he drafted the terms of surrender which were signed at Pretoria on May 31. Created a viscount, he served as governor of the Orange River Colony and the Transvaal until December 1905, laying the groundwork for the self-government which they secured two years later. In the years that followed he took a prominent part in advocating an imperial federation, tariff reform, and compulsory national service. When David Lloyd George became prime minister of Great Britain in December 1915, in the midst of World War I, he chose Lord Milner, for long a bitter political opponent, to be a member of his small War Cabinet; appointed secretary of state for war in April 1918, he continued to hold office until victory had been achieved. After the general election in December 1918, he became colonial secretary; in this capacity, during 1919, he attended the Paris Peace Conference and was a signatory to the Treaty of Versailles, and late in the year he headed a special mission to Egypt which reported in favor of granting that country's independence. When he retired from public life in 1921, the Order of the Garter was conferred upon him. Although possessed of high administrative gifts, a certain reserve, sometimes called harshness, prevented Lord Milner from ever becoming a popular figure. He was accused of being a bureaucrat of the Prussian type, while with equal unreason he was regarded as opposed to progress of all kinds. His death was due to sleeping sickness, contracted while on a visit to South Africa. His *Credo* (1925), found among his papers, was published posthumously. Consult Headlam, C., *The Milner Papers* (London 1931–33).

MILNES, Richard Monckton. See Houghton, Richard Monckton Milnes.

MILO, mī'lō, or **MILON,** ancient Greek athlete of late 6th century B.C. He was a native of Crotona, in Magna Graecia, Italy, and cele-

brated for his great strength. He bore off the prize six times in the Olympic games, and on an equal number of occasions at the Pythian. Many anecdotes are related of him. He once carried a heifer of four years to the sacrifice on his shoulders, killed it with a blow of his fist, and afterward, it is added, ate the whole of it on one day. His death is characteristically related. When enfeebled by age, he attempted to rend open the trunk of a tree partially split by woodcutters, but the wood, closing on his hands, held him fast, and he was attacked and devoured by wolves.

MILO, Titus Annius Papianus, Roman tribune and political leader: b. Lanuvium 95 B.C.; d. district of Thurii, 48 B.C. In 57 B.C., when tribune of the plebs, his quarrel with Publius Clodius (q.v.) began. Seeking preferment in the state, he became the ally of Gnaeus Pompey, urging the recall of Cicero from exile, whither he had been sent at the instance of Clodius, as a pretext for their acts. Bands of gladiators in the employ of Milo and of Clodius kept Rome in constant terror by their skirmishes. Finally, in a clash at Bovillae, on the Appian Way, Clodius was murdered Jan. 20, 52 B.C. Milo was impeached for acts of violence in occupying public places and going about under arms, and for bribery in his canvass for the consulship. His trial began April 4, 52 B.C., Cicero undertaking his defense, but the hostility of the Clodius faction was so marked that his speech was not delivered. In a revised and enlarged form it was sent by Cicero to Milo at Massilia (Marseilles), whither he had gone into exile upon his condemnation under the first count. In 48 B.C., Milo returned to Italy and joined Marcus Caelius in rebellion against Julius Caesar.

MILO, or MILOS. See MELOS.

MILORADOVICH, myĭ-lŭ-rä′dŭ-vyĭch, **Mikhail Andreevich,** Russian army officer: b. 1771; d. St. Petersburg (later Leningrad), Dec. 26, 1825. He fought in the wars against Turkey (1787–1791), Poland (1793), and Italy and Switzerland (1799); and in 1805, as a lieutenant general, he commanded a division at Austerlitz. In 1812 he was in command of a corps at the indecisive Battle of Borodino, and in the subsequent retreat of Napoleon's Grand Army from Moscow he was active in destroying the rearguards. In 1819 he was appointed military governor of St. Petersburg, and he met his death there while attempting to put down the rising of the Decembrists (q.v.).

MILOS, mē′lôsh, prince of Serbia, founder of the Obrenovich dynasty: b. 1780; d. Belgrade, Sept. 27, 1860. In early life a herdsman, he became a leader of the opposition to the Karageorgevich faction. Although given an official post by the Turks, he turned against them because of their cruelties and in 1815 conducted the Serbian war of liberation. In 1817 he made himself ruler of Serbia; a national assembly, in 1827, proclaimed him hereditary prince, and this was formally recognized by the Turks in 1830. The people revolted because of his tyrannical methods, and forced his abdication in 1839. He was succeeded by his son, Milan, who died the same year; a second son, Michael, then ruled until 1842, being followed by Alexander, son of Karageorge, who was deposed by the national assembly in 1858. Milos was then recalled to power, but did not live long to exercise it.

MILOVANOVIC, mē′lô-vä′nô-vĭch, **Milovan,** Serbian jurist and statesman: b. Belgrade, March 2, 1863; d. there, July 1, 1912. The first Serb to obtain a doctorate of law at the University of Paris, he was appointed professor of international law at Belgrade University. He had a considerable share in drafting the Serbian Constitution of 1888, and became minister to Rome in 1901; despite the overthrow of the Obrenovich dynasty in 1903, he retained his diplomatic post, continuing as minister until 1907. In that year he represented Serbia at the Second Hague Conference, and was named a member of the Permanent Court of Arbitration, and in 1908 he became minister of foreign affairs. He guided the country through the crisis which followed annexation of Bosnia and Hercegovina (q.v.) by Austria-Hungary in the fall of that year. From 1911 until his death he served as prime minister; he concluded a treaty with Bulgaria which paved the way for creation of the Balkan League (q.v.).

MILREIS, mĭl′rās, formerly the monetary unit of Portugal, and also of Brazil. The word *milreis* is Portuguese for thousand reis, name of an earlier monetary unit displaced because of its depreciation. The Portuguese milreis was replaced by the escudo in 1911; and the cruzeiro was substituted for the Brazilian milreis in 1942.

MILTIADES, mĭl-tī′ä-dēz, Athenian general: b. ? 540 B.C.; d. ? 489 B.C. He was a descendant of the Philaïdes and, after being archon at Athens in 524, inherited a minor principality in the Chersonese in 518. He governed well there; accompanied Darius against the Scythians in 515, and being left at the bridge across the Danube, urged its destruction in order that Greece might thus be rid of a possible Persian enemy. This plan was vetoed by Histiaeus, another Greek tyrant. In 493 he left his kingdom for fear of the Persians, and upon their invasion of Greece in 490 became one of the 10 generals of the Athenian Army. Each of the other generals retired in Miltiades' favor, but he refused to lead the army until his own day of command came. Then he won the great Battle of Marathon, routing the Persian land forces. The victorious general in the next year asked the state of Athens for a fleet of 70 ships, and got his request, but did not explain that he wished to punish the people of Paros from motives of private revenge; when his expedition failed and its purpose became known, he was impeached, fined 50 talents, and imprisoned for lack of ability to pay. He died in prison of a wound received at Paros.

MILTIADES, Saint (also called MELCHIADES), pope or bishop of Rome from c. 310 to 314. He is best known as having sat as presiding officer at a synod held at Rome in 313, by desire of the Emperor Constantine, to hear a petition from the Traditones or Catholics in North Africa who had, on demand of the Emperor Diocletian, given up their sacred books and thus, in the opinion of those who resisted the demand, forfeited the rights and privileges of church membership. The action of the Traditones split the church

into two bitter factions, a condition that continued for more than a century. Nothing is known of the early life of Miltiades, save that he was born in Africa, and the date of his death is uncertain. See also DONATISTS.

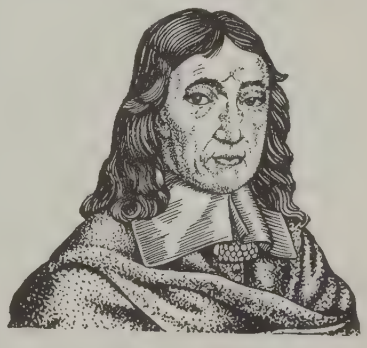
MILTO. See ASPASIA THE YOUNGER.

MILTON, John, American politician: b. Jefferson County, Ga., April 20, 1807; d. near Marianna, Fla., April 1, 1865. He was educated in Louisville, Ga., where he studied law and, following his admission to the bar, practiced for two years. He practiced law in Columbus, Ga., Mobile, Ala., and New Orleans, La., until 1846, when he settled in Florida on a plantation near Marianna. In 1849 he was elected to the state Senate, and in 1861 became governor. As chief executive of Florida during the Civil War, he did not always agree with the Confederate military authorities as to the best means of defending the state, but he raised, outfitted, and dispatched troops for the Confederate Army, provided hospital supplies, and met Confederate requisitions for money promptly. As the war drew to an end, he became mentally ill at the prospect of the defeat of the South and committed suicide.

MILTON, John, English poet: b. London, England, Dec. 9, 1608; d. there, Nov. 8, 1674. He was the son of John Milton (1563?–1647), who had come up to London from his ancestral home at Stanton St. John near Oxford and risen to prosperity as a scrivener or law writer. Richard Milton, the poet's grandfather, was a Roman Catholic and is said to have disinherited his son for deserting the ancient faith. The elder Milton, like other scriveners, was also a money broker. We have records of his career in the form of lawsuits growing out of this activity. Milton himself inherited investments and was involved to some extent in legal matters. He was later to thank his father for not forcing him to go into law or business, but encouraging him rather in his propensity for the pursuit of humane letters. It is an important fact of Milton's early environment that his father was an accomplished musician, having perhaps been educated as a chorister at Christ Church College, Oxford. He was associated with some of the outstanding composers of the day in the publication of both secular and religious part songs and is said to have been honored by Continental patrons. A number of his compositions remain in manuscript. The poet himself pursued music as an avocation throughout his life. He was afterward to speak of his father as a fellow artist and to have as an early friend and collaborator Henry Lawes, the chief successor of the great Elizabethan and Jacobean school of madrigalists, whom it is natural to suppose he had met as one of his father's younger associates.

Milton's mother, Sarah Jeffrey, was the daughter of a merchant tailor. Of her personality we learn only that she was a woman of "incomparable virtue and goodness," and that she was known throughout the parish for her charities. The poet had an elder sister, Anne, who married when he was 15, and a younger brother, Christopher, born in 1615 after the deaths of two earlier children. The usual opinion that the Milton home was Puritan rests on plausible conjecture. The house in Bread Street, where Milton was born, was in the parish of All Hallows. The minister, Richard Stock, was an eminent member of the preaching brotherhood who were in the poet's early life laying the foundations for church reform. The choice of Young, a minister of Presbyterian leanings, as Milton's tutor and of Cambridge, where the Puritan tradition was strong, as his university, is also evidence of the affiliation of the family with the rising movement.

Education.—Milton's education was very carefully looked after. He was sent to St. Paul's School, perhaps as early as the usual age of 7, but the fact that he was some two years older than the average student at the time of his graduation suggests either that he began late or that his schooling was interrupted. Thomas Young, the Puritan minister already mentioned, was certainly his tutor at some time. There is every evidence that Milton was an eager and proficient student. He says of himself that from his twelfth year he rarely went from his lessons to bed before midnight, and adds that this was the first cause of injury to his eyes. He speaks also of a great enthusiasm for the study and imitation of the Roman poets and the early discovery by his elders of a genius for composi-



John Milton, from a portrait dated 1670.

tion in prose or verse. The biographer John Aubrey says that Milton was already a poet by the age of 10. Milton maintained a companionship in Latin poetry with Alexander Gill, son of the headmaster and himself an instructor in the school. His other great friend there was Charles Diodati, whose father was a distinguished physician of Protestant Italian ancestry.

Milton took up residence at Christ's College, Cambridge, in the spring of 1625 at the age of 16. He is said by Aubrey on the authority of Christopher Milton to have quarreled with his first tutor, William Chappell, and to have received corporal punishment. There seems to be an allusion to this event in the first Latin elegy, written perhaps toward the end of his second year, in which he speaks of being about to go back to his forbidden college room, but the incident is a rather shadowy one. He was thereafter transferred to another tutor, and there is no evidence of further trouble. Cambridge was at that time already the scene of ideological contention. Milton belonged to the more progressive humanistic group, and his letters and college exercises record disapproval of scholastic study and of those students who devoted themselves to shallow disputation at the expense of solid learning in the ancient authors. Milton was intending at this time to go into the min-

istry and would naturally have shared the rivalry between the Anglican and Puritan groups. His deepest interest, however, was in literature and learning. He distinguished himself in Latin poetry, writing Ovidian elegies and other imitations, including a poem in hexameters on the Gunpowder Plot, and in the academic orations which were the test of proficiency in rhetoric and logic. In one of these orations he breaks off his Latin to deliver himself of an apostrophe to his mother tongue written in English couplets, and to declare his intention of composing an epic poem on some lofty theme. At about the same time, in 1628, he wrote an English elegy on the death of his sister's child. These two compositions definitely mark the beginning of his career as an English poet. The great ode *On the Morning of Christ's Nativity* followed in December 1629. In an epistle to Charles Diodati, *Elegy VI,* written at the same time, he declares that he is done with lighter themes and intends henceforth to devote himself to the heroic muse.

Milton continued at the university for three years after taking his B.A. in March 1624, and received his M.A. in July 1632, still intending, so far as we know, to enter the church. The literary work of this period includes the lines on William Shakespeare prefixed to the Second Folio, two humorous epitaphs in octosyllabic couplets on the death of the marchioness of Winchester, and perhaps the famous companion lyrics, *L'Allegro* and *Il Penseroso* (qq.v.). Nothing in this late university writing matches the *Nativity* in high Miltonic seriousness, but the poetry exhibits increasing versatility and skill. There are evidently various literary influences at work in Milton, notably that of the Spenserian school represented by Giles and Phineas Fletcher and that of the more classical Ben Jonson. He was already deeply interested also in Italian poetry and had written a group of sonnets in imitation of Petrarch. There is a strong erotic vein in Milton's poetry written before *Elegy VI* and the *Nativity* ode. According to his own account, enthusiasm for the sensual Romans gave way to an appreciation of the idealism of Dante, Petrarch, and Edmund Spenser, then to an interest in the Platonic philosophy of love in the *Symposium,* and finally to the religious ecstasy of the mystic marriage in the Book of Revelation. To what extent the record of his own affairs of the heart in the elegies and Italian sonnets is autobiographical must remain a question.

Residence at Horton.—On his graduation from Cambridge, Milton went into residence at his father's recently acquired house in Horton, Buckinghamshire, and remained there for almost six years. The reasons for his doing this are given in a letter to an anonymous friend who had expostulated with him about the apparent idleness of his way of life. He says that it is not mere love of study which kept him from entering upon the active duties of life, but the desire to be better prepared for them. He speaks as if he were still intending to enter the church, and he confesses that he has noted a certain belatedness in his own development. The conscientious earnestness of his attitude is confirmed by a sonnet written apparently on his twenty-fourth birthday and expressive of his sense of a lack of inward ripeness and of his acceptance of God's will concerning the seasons of his service. At some time during the Horton period he must have definitely given up the church as a career. A Latin epistle to his father, written probably somewhat later than the sonnet, implies that his dedication is to poetry. It is an expression of gratitude for the indulgence which has thus far been accorded him and a plea for its continuance. The elder Milton was by this time retired from business. The poet says he is but following his father's example in his devotion to the arts. In commenting later on his decision, Milton says that to enter the establishment was to subscribe himself slave, and he speaks of himself as being "church-outed by the prelates." William Laud had been made archbishop of Canterbury in 1633 and was rigorously enforcing conformity on the clergy. That Milton's sympathies were strongly on the side of men like Young is evident. He was in the process of working out for himself another kind of ministry, the nature of which remained to be defined by circumstances.

Milton's actual occupations during this period of studious leisure are pretty well established. He devoted himself, he tells us, to the study of Greek and Latin authors, visiting London occasionally to buy books or to learn something new in music or mathematics. Volumes which have survived from his library contain elaborate and minute scholarly annotations of classical texts, as if he were preparing editions of these authors. A notebook of his readings shows that he pursued a systematic course of historical study from the downfall of the Roman Empire to modern times. The emphasis on ecclesiastical history and the church fathers suggests that he was concerned with the religious issues of the time.

While engaged in these serious studies, with whatever end or ends in view, Milton continued to write English poetry as he had done in his later college years. The two masterpieces of his youthful art, *Comus* and *Lycidas* (qq.v.), were written in the years 1634 and 1637, respectively. The first of these pieces is a masque, composed for performance at the inauguration of John Egerton, 1st earl of Bridgewater, as lord president of Wales. This nobleman's stepmother, the countess dowager of Derby, had her estate at Harefield only a few miles from Milton's residence. Both her family and her stepson's were patrons of the musician Henry Lawes, and it was doubtless at his suggestion that the poet was invited to supply the text for an entertainment of which he himself was the producer. An earlier experiment in this collaboration was *Arcades,* a pastoral presentation acted by members of the countess' household. *Comus,* a much more elaborate affair, was performed at Ludlow Castle, the principal parts being taken by Lawes himself and three of the earl's children, Lord Brackley, Lady Alice, and Thomas Egerton. It is not known whether Milton himself was present, nor can we be sure how close a social relationship he may have had with these great families. The masque, besides being a work of delicacy and charm, contains Milton's most serious moral and religious convictions and is everywhere stamped with his personality. The theme is the security of the virtuous mind under divine protection against all the powers of evil. More specifically, it is the virtue of chastity. There was nothing surprising in any poet taking this for a motif, but biographers and critics have attached special and personal significance to it

in the case of Milton. They remember that he was called the Lady at Christ's College and was later said to have been thought prudish by his acquaintances in Italy. There is data also regarding Milton's ascetic inclinations and ideals in both the poetry and the prose: *Elegy VI,* for example, and the long personal defense in the *Apology for Smectymnuus* against Bishop Joseph Hall's charge of immorality. The interpretation of such material in its relation to Milton's personality is always open to question, and the suggestion that too much has been made of it is worth pondering. What is very clear and certain is that Milton's convictions regarding love and purity were both strong and individual, and that he found the interfusion of Christian and Platonic ideas which characterizes the philosophy of *Comus* an inspiring theme of poetic eloquence.

There is apparently a gap in Milton's literary activity between *Comus* and *Lycidas,* the last published work of the Horton period. This elegy, by general agreement the finest in the English language, was prompted by the death of a college classmate, Edward King, in whose memory an anthology of tributes, including Milton's poem, appeared in 1638. The author makes the cutting off of one who was both a fellow of the college and a brother poet the occasion for a seemingly very personal meditation on fate, fame, and immortality, as well as for the expression of tenderness and sorrow. An invective against the corrupt clergy, prompted by King's clerical status or perhaps by Milton's own decision against taking orders, is the poet's first great utterance of this kind.

Continental Travel.—Milton's mother died in 1637, and his brother Christopher, now married and a lawyer, settled with his new wife at Horton. In the following April the poet left England for a year and three months of foreign travel. The experience, though brief, was ever memorable to him. He went rather as a mature man of letters than as a pupil, seeking contact with outstanding personalities in the international community of scholars and actually participating in the intellectual and cultural activities of which they were the leaders. His itinerary led him first to Paris, where he was introduced by the English ambassador to Hugo Grotius, the great Dutch jurist and statesman, and then to Florence, where he was at once accepted by a congenial group of scholars, writers, poets, and patrons of the arts, most of whom were members of the Accademia degli Svogliati, one of the numerous cultural organizations which flourished in Italy at that time. On two occasions, Milton was invited to read poems at meetings of this organization, and with one of its younger members, Carlo Roberto Dati, he formed a lasting friendship. The dramatic episode of the Florentine visit was an interview with Galileo, then confined to his house by order of the Inquisition and much restricted in his intercourse, particularly with foreigners. Milton himself mentions this episode in *Areopagitica,* but for some reason omits it in his detailed account of the Italian journey in the *Defensio Secunda.* There are references to Galileo's telescope in *Paradise Lost,* and Milton shows acquaintance with the new system of astronomy, though he taught the old in his school and used it as the cosmological basis of his epic.

After two months in Florence, Milton went on south to Rome and thence to Naples, where he was entertained by a well-known patron of letters, Giambattista Manso, whose distinction and hospitality he celebrated in a Latin poem. This and some epigrams in praise of the Italian singer Leonora Baroni are the only compositions known to have been written during the period of foreign travel. In Naples he received news from home which interrupted his plan for going on to Sicily and Greece. "I thought it base to be travelling for amusement abroad," he wrote afterward, "while my fellow citizens were fighting for liberty at home."

Journeying northward, he stopped again at Rome, this time to make the acquaintance of the papal librarian, Lukas Holste, and through his influence that also of Francesco Cardinal Barberini, in whose palace he attended a brilliant operatic performance. After a second stay of two months at Florence and one month in Venice, he crossed the Alps to Geneva, where he was entertained in the house of Giovanni Diodati (uncle of Charles), one of the most distinguished Calvinist theologians of the day. He arrived in England in the summer of 1639, amidst the turmoil of Charles I's efforts to force obedience on the Covenanting Scots and a little over a year before the king was compelled to summon the Long Parliament. At some time during his absence, Milton had learned of the death of his friend Charles Diodati; he commemorated this event after his return in a beautiful Latin elegy, *Epitaphium Damonis,* similar in form to *Lycidas* but more concretely personal. Milton had already in the poem on Manso spoken of his plan of writing an epic on the legendary history of Britain culminating in the reign of Arthur. Now in the *Epitaphium* he says that he has begun such a poem but found his pastoral style inadequate for its requirements. A set of manuscript notes, drawn up within a year or so after his return to England, shows that the subject of the fall of man, now conceived as a drama, was beginning to claim his interest.

Teaching and Public Affairs.—Milton had already embarked on activities which were to carry him far from poetry for many years. Taking a house in London, he set up a school with his two nephews, Edward and John Phillips, and a few others as pupils, and at the same time began to contribute pamphlets to the great controversy which was then raging over the abolition of episcopacy. Between May 1641 and April 1642, he published five tracts against the bishops and in favor of the Presbyterian system. The first and fourth of these, *Of Reformation Touching Church-Discipline in England* and *The Reason of Church Government Urg'd Against Prelaty,* are the longest and the most weighty. The last, *An Apology Against a Pamphlet Call'd a Modest Confutation of the Animadversions upon the Remonstrant Against Smectymnuus* (*Apology for Smectymnuus*), was written after a personal attack by Bishop Hall, a defender of episcopacy, whom Milton himself had ridiculed in the third tract, *Animadversions upon the Remonstrants Defence, Against Smectymnuus.* The controversy became highly vituperative on both sides.

At the conclusion of this controversy, in the spring of 1642, Milton married Mary, the 17-year-old daughter of Sir Richard Powell, an Oxfordshire squire of Royalist sympathies who was in debt to the poet's family. The disparity

of age, politics, and probably of temperament and education was not the best basis for a happy marriage, and there was almost immediate trouble. Mary sought relief from the sobriety of Milton's household by returning to her parents for a visit and staying beyond her appointed time. War had already broken out, and Oxford had become a royal camp. What complications there may have been in the situation we do not know, but the story of the early biographers is that Milton was very angry at what he interpreted as desertion and began to pay court to another woman. A new outburst of pamphlet writing followed on the subject of divorce. Without alluding in any specific way to his own case, Milton attacks the canon law which admitted divorce only for adultery, setting forth a spiritual ideal of marriage and insisting, with much use of scriptural and other authority, that incompatibility, because it defeats these higher ends, should be admitted as a sufficient ground.

This crusade against the law of divorce, unlike Milton's earlier campaign against episcopacy, was a purely individual affair, but he carried it on with even greater energy. *The Doctrine and Discipline of Divorce,* originally issued in 1643, was amplified the next year to a length almost twice as great as any of the ecclesiastical pamphlets. Three other pamphlets on the subject followed: *The Judgement of Martin Bucer, Concerning Divorce* in 1644; and *Tetrachordon* and *Colasterion,* a reply to an anonymous writer who had taken issue with the first tract, in 1645. In maintaining the doctrine of divorce, Milton had written himself heretic from the point of view of the Presbyterians whose cause he had defended. He was indignant at the opposition which arose against him and from now on his role was that of an Independent, combating the new tyranny which was endeavoring to maintain its hold on the affairs of church and state. The passing of a licensing law by Parliament in 1643 was to him a reactionary step, threatening the very liberty for which the English people had engaged in battle with their king, and Milton paused in the middle of the divorce argument to write *Areopagitica* (published November 1644, q.v.) in defense of freedom of the press. This eloquent oration is the most notable of his prose works, or at least the one which best represents his moral and political philosophy to the modern mind. Though it fell on deaf ears in its own time, the arguments have proved to be of perennial validity, and the work is universally regarded as one of the great charters of democratic thought. In 1644 also he published a treatise in the form of a letter to Samuel Hartlib setting forth a very thorough and liberal program of humanistic education.

After the publication of the last divorce tracts, Milton desisted from pamphlet writing for nearly four years. His wife returned to him in the summer of 1645, and his eldest daughter, Anne, was born a year later. With the surrender of Oxford to the forces of Parliament in 1646, the Powell family took refuge for a time in Milton's household. On the death of his father in 1647, the poet gave up his school and moved to a smaller house. A second child, Mary, was born in 1648. His intellectual activity in this period included work on a history of Britain which remained unpublished until 1670. The publication of his poems in 1645 and the writing of a half dozen sonnets, together with a series of Psalm translations, in the three years following suggest a renewal of his creative interests.

Commonwealth Service.—The trial and execution of Charles I in 1649 brought Milton again into action as a publicist and is a major turning point in his career. Before the judgment was delivered, he wrote *The Tenure of Kings and Magistrates,* maintaining the theoretical right of the people to bring their governors to account and, after due trial, to depose and even to execute a monarch who has become a tyrant. The exercise of this right belongs, he declares, "to any who have the power." The treatise is therefore a justification of extralegal revolution. Milton does not deal directly with the case of Charles, but in one passage inveighs against the Presbyterians, who, having taken arms against the king, now protest against the talk of bringing him to justice. The pamphlet was published in February 1649, just after the execution. As an immediate result, Milton was appointed Latin secretary (secretary for foreign tongues) to the Council of State, an office which he was to continue to exercise until the Restoration. The regular duties of this office consisted in drafting the foreign correspondence, translating, and communicating in person with envoys, but Milton was expected also to defend the new regime by propaganda. Thus he prepared and published *Eikonoklastes,* the first of a new series of prose works, on order of the council within seven months after his appointment. This was a severe indictment of the personality and career of Charles I in answer to *Eikon Basilike* (q.v.), a work of powerful appeal to popular feeling purporting to have been written by the king's own hand.

The next year saw the beginning of the greatest literary battle of Milton's career. Again by order, he undertook to answer the French scholar Claudius Salmasius (Claude de Saumaise), who had become the official spokesman of the royal cause on the Continent. *Pro Populo Anglicano Defensio Contra Claudii Anonymi, Alias Salmasii Defensionem Regiam* appeared early in 1651, addressing itself to the court of learned opinion throughout Europe and containing, besides the already familiar political arguments of *The Tenure of Kings and Magistrates* and *Eikonoklastes,* a wealth of personal abuse of his opponent. Salmasius, discredited and disgraced, as rumor had it, by Milton's scathing treatment of his work and character, retired temporarily from the arena, but his cause was vigorously taken up in Peter du Moulin's *Regii Sanguinis Clamor ad Coelum Adversus Parricidas Anglicanos* (1652), in which Milton himself is made a victim.

The poet's answer to this work was delayed nearly two years, perhaps by a series of crises in his own life. A third child and only son, named John, was born to him in 1651, but died within a few months. A year later, Mary Powell herself died, three days after giving birth to a third daughter, Deborah. Milton was thus left alone with three young children. He was, moreover, burdened at this time by sickness and by increasing trouble with his eyes. His sight had been failing for some time, and he had been warned by his physicians of the danger of continuing to work on the first *Defensio.* Blindness became complete early in 1652. In December of that year, he speaks in a letter of "what is now an

almost perpetual enemy of mine, ill health." Further evidence of relative incapacity is afforded by his increasing absences from council meetings, by the appointment of an assistant to him in office, and a little later (1655) by the reduction of his salary and further relief from responsibility. By this time, however, Milton had apparently recovered much of his energy. He published the monumental *Pro Populo Anglicano Defensio Secunda* in May 1654, castigating the personality of Alexander More, whom he supposed to be the author of the *Clamor,* setting forth the ideals which had governed his own career and paying noble tribute to the great leaders of the revolution. He had celebrated Oliver Cromwell and Sir Henry Vane in sonnets written in 1652, and there is a new outburst of utterance in this form in 1655, notably the sonnet on the massacre of the Waldenses in Piedmont and one at least of the two sonnets on his blindness, in which Milton speaks of his personal tragedy with noble pride and resolution. A long personal statement in the *Defensio Secunda* reveals his thought and feeling on this subject even more deeply. He was convinced that his great affliction was not, as his enemies had intimated, a judgment of God against him, but rather a trial of faith—something which set him apart from other men and entitled him to special favor from on high. In taking away his outward sight, God had vouchsafed him an inner illumination of the spirit. It was his duty to cherish this gift by spiritual communion with the divine and at the same time to persevere in the daily tasks appointed him.

Though his great day as the defender of English liberty was now over, he continued to carry on foreign correspondence in Cromwell's name throughout the protectorate and, as we shall see, to rally his forces for further controversial writing in the moment of defeat.

The true inwardness of Milton's domestic life in this period is something we really know very little about. He was not friendly with his mother-in-law, to whom he might naturally have turned for assistance with the children after Mary's death. There is little evidence of intimacy with his brother Christopher, who was now in London trying to make composition as a Royalist for his sequestered estate. On the other hand, Milton was rich in devoted friends and felt very warmly towards them. His greatest intimacy was with Cyriac Skinner, a former pupil to whom two of the sonnets of 1655 are addressed.

On Nov. 12, 1656, Milton contracted a second marriage, with Katherine Woodcock, who lived only a year and four months, giving birth to a daughter on Oct. 19, 1657, and dying, with the child, early in the following winter. It is generally believed, though positive evidence is wanting, that the beautiful sonnet to his deceased wife which stands last in the series of sonnets in the Trinity manuscript and in the published poems was addressed to her, and on the basis of this description rests the assumption that this marriage was romantically happy. According to the authority of Edward Phillips and Aubrey, Milton again took up work on *Paradise Lost* at about this time (1658). He had now decided that the material could best be handled in epic form. How far he proceeded with it while still occupied in the secretaryship is a matter of conjecture.

With the death of Oliver Cromwell in 1658, Milton again undertook to exert an influence on politics by addressing himself to Parliament in behalf of religious liberty. *A Treatise of Civil Power in Ecclesiastical Causes,* holding that it is unlawful for a magistrate to enforce conformity of belief, and *Considerations Touching the Likeliest Means to Remove Hirelings out of the Church,* advocating a voluntary and unpaid clergy, appeared in 1659. Finally, in 1660, amidst the political confusion of the last days of the Puritan regime, he drafted a plan of republican government in *The Ready and Easy Way to Establish a Free Commonwealth,* proposing the establishment of a self-perpetuating Parliament and protesting with all his eloquence against the movement, now inevitable, toward the restoration of the house of Stuart. A month after the appearance of a second edition of the work, Charles II landed in England, and Milton's public career was at an end.

Post-Restoration Period.—The effects of the Restoration on Milton's personal fortunes, as well as his hopes for England, were little short of ruinous. Losing not only his salary of £200 a year, but a considerable investment in government securities, he became almost overnight a relatively poor man. More than that, he was henceforth the relic of a treasonable cause, which every possible means was employed to discredit and root out. Many of the men with whom he had been most closely associated were exiled or put to death, and Milton's name, so far as he was noticed publicly at all, was mentioned only with execration. Except for a brief imprisonment and the burning of *Eikonklastes* and the first *Defensio,* he himself escaped punishment. He lived quietly and simply thereafter, industriously engaged in literary work of many kinds, but finding his deepest satisfaction in his devotion to poetry. His own activity in the composition of *Paradise Lost* was essentially religious. The muse who inspired him was none other than the spirit of the Almighty, and his meditations on the truth revealed to him by Scripture were a continuous prayer.

In February 1663, he married for the third time, his bride, Elizabeth Minshull, being but 24 years old. She evidently proved a good wife to him and lived to cherish his memory and to report to John Aubrey many details of his later life. The daughters of his first marriage, at least the two elder ones, seem to have been unfriendly. Milton is described by Phillips as trying without success to make them read and write for him in languages which they did not understand and finally apprenticing them to the trade of lace-making. There was a controversy after Milton's death between the children of his first marriage and his widow respecting his property. The poet's brother and a former maidservant testified to the effect that the girls had exhibited great hostility to their father and that he had intended to disinherit them. Though the picture may be somewhat overdrawn, there can be little doubt that relations were strained, particularly after the third marriage. The youngest daughter, Deborah, nevertheless professed great affection for her father when she was interviewed about him in the 18th century, and he may have had satisfaction in her society in his later years. Anne, the eldest daughter, was a cripple and whether for this or some other reason was, according to Phillips, excused from service as an amanuensis. The other two were 12 and 8 years old, respectively, at the Restoration and may have come to be of some assistance before they left the household.

In this last period of his life, Milton, after changing residences many times, was finally established in a house near Bunhill Fields on the eastern edge of London. He corresponded with foreign scholars and continued to enjoy the friendship of such old associates as Andrew Marvell, and from time to time exchanged instruction with young men for the literary assistance he so sorely needed. In this respect, his chief dependence was probably on the elder of his two nephews, Edward Phillips, who became his literary executor.

Paradise Lost was completed about 1665 and published two years later by Samuel Simmons. The original contract, which still exists, provided for a payment of £5 down and a second £5 when the first impression of 1,500 copies should have been sold. This second payment was made in 1669. All rights to the poem were ultimately sold by Milton's widow for £8. In its final form as an epic, *Paradise Lost* is cosmological in its scope, an epic of creation and the wonders of the universe, as well as of the fall and the regeneration of mankind. In this respect, it has much in common with the type of Biblical paraphrase known as hexaemeron, which takes the first chapter of Genesis and Scripture generally as a basis for the exposition of scientific and philosophical lore of every sort. The most popular work of this kind in England was the translation of a Huguenot poem, *La Semaine,* by Guillaume de Salluste, seigneur du Bartas. Milton had been familiar with this from youth and was undoubtedly much influenced by it. His version of the world system is, however, both more artistic and more individual than its English predecessor. Many years of study and meditation had gone into it, and it reflects the whole of its author's experience of life. In the invocations, Milton speaks of his long devotion to the subject, of the difficulties imposed upon him by his loss of sight, and of the assurance given him by the divine spirit whose aid he implores. Other less tangible biographical elements have been found in the poem, particularly in the portrayal of the relations of Adam and Eve, and Milton's psychological attitudes with reference to his imaginative projection have been complexly explored. There is, however, no agreement in such matters. Reflections of his politics, on the other hand, as in his reading of the history of the Christian Church, are obvious enough. Theologically, Milton rejected the Calvinistic view of predestination and the dogma of the Trinity in its orthodox form. His anti-Trinitarian position, set forth explicitly elsewhere, is obscured in *Paradise Lost,* and the doctrine of the poem has been generally acceptable to Protestant readers. (See also PARADISE LOST.)

Milton's last two poetical works appeared in 1671 in a single volume bearing the title *Paradise Regain'd. A Poem. In IV Books. To Which is added Samson Agonistes.* No positive evidence of the date of their composition is available. The natural inference that *Paradise Regained,* being as it is a kind of sequel to *Paradise Lost,* would have followed it immediately, is supported by Thomas Ellwood's account of the part which he himself played in suggesting it. The story of Milton's acquaintance with this Quaker boy is famous in literary history and deserves special notice as giving the only intimate view we have of the poet in the moment of fulfillment of his most cherished literary hopes. Ellwood had sought Milton's instruction in 1662 and been admitted through the mediation of Dr. Nathan Paget "not as a servant, which at that time he needed not, nor to be in the house with him, but only to have the liberty of coming to his house at certain hours when I would and to read to him what books he should appoint me." As commonly happened with Milton and his pupils, the two became warm friends. In the summer of 1665, when the poet was living at Chalfont St. Giles to escape the plague, Ellwood was allowed to read the manuscript of *Paradise Lost,* returning it with the remark: "Thou hast said much of Paradise lost, but what hast thou to say of Paradise found?" When the new poem was handed him at some later time in London, Ellwood reports Milton as declaring: "This is owing to you; for you put it in my head by the question you put to me at Chalfont, which before I had not thought of." It would appear from this plausible account by a person of unquestionable veracity that Milton went on immediately from the poem of highest inspiration and hardest achievement, which had been meditated for so many years, to one which was an afterthought. *Paradise Regained* is, indeed, a beautiful and serene work by no means unworthy of its author, but in one sense it is little more than an amplification of a theme already incorporated in the other. Milton is prolonging the kind of poetic meditation represented in the more didactic passages of the earlier work, and his imagination is much less deeply engaged. (See also PARADISE REGAINED.)

The origin and significance of *Samson Agonistes* (q.v.) is something different. The common view is that it represents a new and final creative moment in Milton's poetic history and is, like *Paradise Lost* itself, the fulfillment of a long-cherished purpose. Subjects from the life of Samson had been included in the early literary plans for tragedies, and the Hebrew champion had come to be for Milton an important symbol. His own blindness and the failure of his cause, together with his abiding faith in God's ultimate triumph, make it difficult for us to dissociate his treatment of the Biblical story from his personal experience. The analogy, of course, is not complete. Samson's weaknesses are those of England rather than of Milton himself, and his great vindication represents something which the poet could hardly expect to witness. Whatever its validity as a biographical document, *Samson Agonistes* is a work of great imaginative intensity, and if it was actually written after *Paradise Regained* it shows that Milton's poetic powers were still undiminished.

Last Years.—In the years which remained to him after the composition of his major poems, Milton continued busy with a variety of literary tasks. He published his *History of Britain* in 1670, an early work on logic in 1672, a second edition of the minor poems with the addition of earlier and later lyrics in 1673, and a volume of his college exercises and Latin letters and the second edition of *Paradise Lost* in 12 books in 1674. He was at work also on a Latin dictionary and on the final revision of a great theological manuscript which remained unpublished until the 19th century.

More surprising than any of these evidences of the persistence of Milton's energies and purposes is his return at this eleventh hour to his old role as a publicist. He did so in a pamphlet entitled *Of True Religion, Heresy, Schism, Toleration, and What Best Means May Be Used*

Against the Growth of Popery, which appeared in 1673 amid the storm of popular opposition to Charles II's efforts to secure favor for the English Roman Catholics. Its announced purpose was to lend a hand to the efforts of those who, alarmed at the growth of Catholicism, were exhorting the public to "beware the growth of this Popish weed." The proposition is that Catholicism, "false religion," can be stopped only by true religion and that, in rallying their forces to oppose the common enemy, Protestants must need tolerate each other. The essential thing is not that the sects should hold the same beliefs but that they should jointly have the moral force to regenerate a people which had fallen into the bondage of sin, and was not unlikely as a consequence to lose even the remaining vestiges of its liberty.

Milton died of gout in 1674 and was buried in St. Giles, Cripplegate, beside his father. Had he lived long enough to witness the outcome of the new struggle against the Stuart autocracy, he would have seen his name restored to honor as a party hero. His real work had, however, been accomplished in another form. He once said that in prose he had the use, as it were, only of his left hand. It is fortunate for mankind that enforced retirement from the heat and dust of politics enabled him to fulfill the aspiration of his early life by leaving something so written to later times that they would not willingly let it die. Yet the greater achievement includes the lesser. Milton believed that he who would speak worthily of worthy things must himself be a man of lofty virtue. He could not have written the great poems without having done what he conceived to be his duty as a servant of the will of God. What that duty was he never doubted, and this is at once his weakness and his strength. Though he was a man of singular urbanity and charm, not lacking even in a sense of humor, there were in him elements of harshness and egocentricity which have not been spared by some biographers. On the other hand, he exemplified the moral discipline and the spiritual elevation of the Puritan character in so enlightened and humane a form that many admirers are loath to admit even his obvious imperfections.

Bibliography.—The accounts of Milton by Edward Phillips, John Aubrey, and other near contemporaries may be read in Helen Darbishire's *Early Lives of Milton* (London 1932). Joseph Milton French's *Life Records of John Milton,* vols. 1-3 (New Brunswick, N.J., 1949–54) gives the documentary material in great detail. David Masson's *Life of John Milton,* 6 vols. (London 1859–94), though out of date in some respects, is still the great authority for all aspects of Milton's career. A variorum edition of the poems is in preparation by members of the Modern Language Association, and an annotated edition of the prose, *Complete Prose Works* (New Haven 1953–), is being published by the Yale University Press. The Columbia edition of *The Works of John Milton,* 20 vols. (New York 1931–40) is the only complete collection of both the poetry and the prose of Milton.

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MILTON, town, Florida, seat of Santa Rosa County; on the Blackwater River, 18 miles northeast of Pensacola. Founded about 1825, it is a lumbering center. Pop. (1950) 2,042.

MILTON, town, Mass., Norfolk County, 6 miles south of Boston, on the Neponset River and the New York, New Haven and Hartford Railroad. It manufactures chocolate, crackers, and metal products and has an engraving plant. Part of the Blue Hills belongs to Milton. On Great Blue Hill (625 feet) fires were kindled on the news of the repeal of the Stamp Act; of the adoption of the Declaration of Independence; and on the surrender of Gen. John Burgoyne and Gen. Charles Cornwallis. Beacon fires burned here during the Revolutionary War. At an early date an observatory for tourists was erected on Great Blue Hill and in 1885 the Blue Hill Observatory for meteorological investigations was established by Abbott Lawrence Rotch (1861), who made important investigations regarding clouds. Milton Academy was founded in 1798 and a public library was opened in 1871. Milton owns two granite quarries and two public parks: Cunningham Park and Hutchinson Field, the latter on a portion of the estate of Thomas Hutchinson, a colonial governor of Massachusetts.

Milton was settled in 1640. It was originally a part of Dorchester and was called Uncataquisett. The town was separated in 1662 and incorporated. It owes its name either to Milton Abbey, Dorset, from which members of the Tucker family emigrated, or to the number of mills established here—Mill Town. It was the residence of two colonial governors—Jonathan Belcher and Thomas Hutchinson. In 1712 the Blue Hill lands were divided between Milton and Braintree. In 1868 part of Milton was given to the new township of Hyde Park. Milton now includes the village of East Milton and Milton Lower Mills. Milton was brought into political importance during the early days of the Revolution by the passage of the famous "Suffolk Resolves." These bold resolutions were passed on Sept. 9, 1774, at a meeting of the citizens held in the house of Daniel Vose, these men having adjourned from Dedham. The "Suffolk Resolves" declared that a sovereign who breaks his contract with his subjects forfeits their allegiance; that the repressive measures of Parliament were unconstitutional; that tax collectors should not pay over money to the royal treasury; that the towns should choose public officers from the patriot party; that they would obey the Continental Congress; that they favored a provincial congress; that they would seize Crown officers as hostages for any political prisoners arrested by the governor; and they recommended that all persons in the colony should abstain from lawlessness. Pop. (1950) 22,395.

MILTON, now **MILTON WEST,** town, Ontario Province, Canada, capital of Halton County, is located 29 miles southwest of Toronto, on the Canadian Pacific and Canadian National railways. Its manufactures include lumber, flour, butter, pressed brick, crushed stone and lime, screws, rivets, and rugs. There is also a spinning mill which makes sweaters, socks, and other knit goods. The town has two parks, waterworks and electric lighting. Pop. (1951) 2,451.

MILTON, borough, Pa., Northumberland County, is located on the West Branch of the Susquehanna River, the Pennsylvania and the Reading railroads, 11 miles northeast of Sunbury. Products of its industrial plants are railroad tank cars, bolts and bars, nails and nuts, hosiery, chemicals, food products, shirts, silk, and wooden articles. The old Pennsylvania Canal ran past the town. Milton was partly destroyed by fire in 1880. The town is four miles from Bucknell University, at Lewisburg. Settled shortly after

the Revolutionary War, Milton was incorporated in 1817. In 1890 it received a revised charter. A burgess and borough council administer the government. Pop. (1950) 8,578.

MILTON, village, Wisconsin, Rock County, altitude 877 feet, 8 miles northeast of Janesville, on the Chicago, Milwaukee, St. Paul and Pacific Railroad. It is in a grain-growing district, and has manufactures of electrical medical equipment. It is the seat of Milton College (q.v.). Pop. (1950) 1,549.

MILTON COLLEGE, Milton, Wis., a coeducational institution, was founded in 1844 by pioneers from Eastern states, most of whom were Seventh-Day Baptists. It was first known as Du Lac Academy; in 1848 it became incorporated; in 1854 the name was changed to Milton Academy; and in 1867 it received its charter as a college. The influence of Milton College is Christian rather than sectarian, although it has always maintained a closely sympathetic relation to the Seventh-Day Baptist people. It is strictly a college of liberal arts, granting the bachelor of arts and bachelor of philosophy degrees only. Graduates are admitted to the graduate school of the University of Wisconsin. Chapel attendance is compulsory. The institution has the usual arts and science departments, and occupies five buildings. In 1952 the enrollment was 288 students.

MILVIAN, mĭl'vĭ-ăn, **BRIDGE,** ancient bridge over the Tiber at Rome built in 109 B.C. by Marcus Aemilius Scaurus on the famous Flaminian Way. Here Cicero had the ambassadors of the Allobroges arrested (60 B.C.) who were conspiring with Catiline; and here Maxentius was drowned after his defeat by Constantine (312 A.D.). The modern Ponte Molle now spans the Tiber in place of the Milvian Bridge.

MILWAUKEE, mĭl-wô'kē, Wisconsin, metropolis of the state, seat of Milwaukee County; located on the west shore of Lake Michigan 88 miles north of Chicago, at the confluence of the Milwaukee, Menomonee, and Kinnickinnic rivers. Milwaukee is one of the most important Great Lakes ports and one of the world's chief centers for heavy machinery production. It is the thirteenth largest city in the nation (1950 census) and ranked eighth in the value of its manufacturing in the 1947 Census of Manufactures.

Geography.—The city has (1950) an area of 50.4 square miles. Roughly crescent shaped, it is bounded on the east by a beautiful bay six miles wide. The Milwaukee River winds in from the north, roughly paralleling the curve of the bay, and is joined by the Menomonee flowing from the west and the Kinnickinnic from the southwest, just before entering the bay. The bay is outlined a short distance inland by bluffs varying in elevation from 85 feet to nearly 150 feet above Lake Michigan. Bold and steep at the north and south headlands, these bluffs have been modified in the thickly settled heart of the city to slopes gradually descending toward the level of the rivers. The bottom lands along the river valleys and lakeshore delta were, in early days, mainly tamarack swamps and marshes abounding in wild rice. Leveling and filling for building purposes and street grading have converted them to "made land" on which stands much of the business district. On gently rolling higher land between the river valleys to the north, west, and south are extensive and unusually attractive residential areas. Some of the finest homes are found, however, in the residential suburbs of Shorewood, Whitefish Bay, Fox Point, and River Hills along the lakeshore to the north, and in Wauwatosa to the west. West Allis, Cudahy, and South Milwaukee are industrial satellite cities to the southwest and south. Milwaukee's average altitude above sea level is 581.22 feet. The proximity to the lakeshore modifies the climate, reducing extremes of temperature. The mean average monthly temperature (1870–1949) ranged from 21.2 degrees in the coldest month (January) to 70.7 in the warmest (July). The average annual precipitation over the same period was 30.16 inches. The snowfall (unmelted) averaged 45.3 inches per year.

Population.—In 1950, the decennial census showed Milwaukee to have a population of 637,392. This represented a considerable growth over the 1940 census figure of 587,472. A local enumeration in 1838 gave the village of Milwaukee 700 residents, and the 1840 census showed 1,712 persons living there. When the city was incorporated in 1846, there were 9,666 residents. The 1900 census showed a phenomenal growth to 285,315 persons, and in the next half century this figure was more than doubled. In the mid-19th century, German immigrants came to Milwaukee in great numbers, giving a distinct Teutonic flavor to the city's culture and institutions and earning it the sobriquet, The German Athens of America. The later decades of the century brought a large immigration from Poland, Austria, Scandinavia, Russia, and Italy, but the Germans remained the leading foreign group. There has been comparatively little immigration since 1920, however, and by the 1940 census Milwaukee had a higher percentage (84.2) of native-born white persons than any city over 500,000 in the United States. Milwaukeeans have traditionally taken pride in home ownership and the beauty of their residential areas. Blighted sections are less extensive than in most other large cities. More than 43 per cent of families owned their own homes in 1950, and more than 80 per cent lived in single family or duplex dwellings. Milwaukee industries draw upon an extraordinarily large reservoir of skilled workers, and average income per family in the metropolitan area in 1948 was estimated at $7,510, or nearly 50 per cent over the national average (Federal Reserve figures, 1948).

History.—Probably the first white man to visit the site of Milwaukee was Father Jacques Marquette (q.v.) who stopped at the mouth of the Milwaukee River Nov. 23, 1674, on his way south to visit the Illinois Indians. Marquette's name is memorialized in Marquette University at Milwaukee. In 1679, Father Zenobius Membré, a missionary with the exploratory party of René Robert Cavalier, Sieur de la Salle (q.v.), noted in his journal a visit to an Indian village "on the banks of the river called Melleoki." This is probably the first written record of Milwaukee's name, whose original meaning was "pleasant land." The next recorded visit is that of Father Jean François Buisson de Saint Cosme, on his way from Quebec to Illinois to found a mission in October 1699. "On the seventh," he wrote, "we arrived at Melwarik . . . a river where there is a village which . . . [is] inhabited by the Mascoutens, Foxes and . . . Pottawattamies." Col. Arent Schuyler de Peyster, British commandant

at Michillimackinac, had a low opinion of the Milwaukee Indians, who were reluctant to help the British fight the Americans. He wrote in 1779 of "those runegates [renegades] at Milwakie—a horrid set of refractory Indians." By the mid-18th century, Milwaukee was the occasional stopping place for several fur traders. One, St. Pierre, was living among the Indians there as early as 1764; and before 1800, other white men came as resident traders. Capt. Thomas Gummersal Anderson, who arrived at Milwaukee in 1803, noted that there was "quite a society of its kind" among the several traders residing at the mouth of the Milwaukee River. Solomon Juneau, a French Canadian usually regarded as the founder of Milwaukee, found only an Indian village when he arrived there in 1818 to operate a branch of Jacques Vieau's Green Bay trading post of the American Fur Co. Juneau built a cabin on the east side of the Milwaukee River, and in 1819 bought out Vieau and became the proprietor of the Milwaukee post. His cabin was the nucleus of a permanent settlement which became known as Juneautown. Byron Kilbourn, a New Englander, who arrived in 1834, started a settlement on the west side of the river, Kilbourntown; and George H. Walker, a Southerner, the same year founded Walker's Point, south of the Menomonee. The rivalry among the three settlements was keen, but on March 11, 1839, the village of Milwaukee was incorporated with Juneautown as the east ward and Kilbourntown as the west ward. Walker's Point was added as the south ward in 1845. Still the sectional rivalries smoldered, and in May 1845 flared up in the Bridge War in which several bridges joining the wards were demolished and armed mobs rioted, with some bloodshed but no fatalities. By 1846 differences had been compromised and on Jan. 31, 1846, Milwaukee was incorporated as a city. Juneau became the first mayor. The man who played the largest single role in the development of Milwaukee into a major city was probably Alexander Mitchell, a Scot who came to Milwaukee in 1839. He developed a pioneer bank, at a time when banking was unconstitutional in Wisconsin. The certificates of deposit of Mitchell's company were the soundest banknotes in the west in the mid-19th century. The bank later became a thriving state bank of which Mitchell was president and principal owner. Mitchell was also instrumental in the development of Wisconsin's railroads. He was a director of the Milwaukee & Waukesha Railroad, Wisconsin's first, which made its maiden run of 12 miles on Feb. 25, 1851. Before Mitchell's death and largely through his genius, this line grew into the important Chicago, Milwaukee & St. Paul. By 1869, Mitchell, president of both that road and the Chicago & Northwestern, was popularly known as "railroad king of the world." He later served his district as congressman. Descendants of Mitchell—John L., his son, and Gen. William (Billy) Lendrum Mitchell, his grandson, played important roles in later history.

During the first half of the 1800's, shipbuilding became one of Milwaukee's important industries and a Milwaukee-built ship carried a cargo of wheat directly from the port to Liverpool in 1856.

Like every other American city of the 1850's, Milwaukee was affected by the slavery problem. The reaction to the fugitive-slave law (q.v.) was sharp and when an escaped slave was caught in Wisconsin and held in a jail in Milwaukee in 1854, Milwaukee citizens freed him and helped him into Canada. The Civil War stimulated Milwaukee's manufacturing industries and changed many of them from small shops that produced handmade goods to large factories with machine-made products. Two years after the war's end, Milwaukee's first labor union of national scope—the Knights of St. Crispin—was organized among the city's boot and shoe workers.

After the Civil War, Milwaukee became the greatest wheat market and wheat port in the nation, and a newspaper boasted: "Wheat is king and Wisconsin is the center of the empire!" Beer became Milwaukee's chief product in the late 1880's, but after the turn of the century, machinery and metal goods manufacture, meat packing, and leather products took the supremacy away from brewing. During the latter half of the 19th century the German flavor of Milwaukee's institutions was pronounced. German immigration had begun in 1838; by 1900, 72 per cent of the city's population was of German birth or descent. There were twice as many German language as English newspapers in the city, the German theater and orchestra flourished, and German singing and marching societies and *turnvereins* were numbered in the dozens. Beer gardens and coffee houses played a distinctive part in the city's social life. The anti-German feeling during World War I wiped out many surviving manifestations of Germanic tradition in the city. In 1910, the Socialists won control of Milwaukee's city government and elected the first Socialist mayor of any large American city. Another followed him in 1916 and held the office for 24 years. Under the Socialist mayors Milwaukee made an enviable record for good city government.

Government.—The city has a mayor-council form of government. The mayor, and an alderman elected from each ward, all serve four-year terms. The city wards are coextensive with the state assembly districts. The city attorney, treasurer, and comptroller are elective officers. The major appointive officers include the commissioners of public works, health, taxation, the fire and police chiefs, city engineer, and the building inspector. Milwaukee has long had a national reputation as a well-governed city because of the freedom from municipal corruption, its debt-free status, and exceptionally high records among large cities in health, fire prevention, traffic safety, and crime control. For 16 years prior to 1950, for example, Milwaukee had the lowest traffic death rate in the nation for cities of its class.

The city's reputation of being debt free stems from the creation in 1923 of an amortization fund to meet principal and interest charges on the city's outstanding general obligation bonds. A policy was also established of paying for permanent improvements by the accumulation of funds in advance. By 1944, the amortization fund equaled all city bonded debt; but since some of the bonds were not to mature until 1952, the city was not yet debt free in a literal sense. The city administration elected in 1948 departed from the pay-as-you-go plan in financing some permanent improvements, however. Exceptions were made for municipal housing projects built by the Milwaukee housing authority. These included Hillside Terrace, a 232-unit project completed in 1949 to eliminate a blighted area in a Negro district; and three veterans' housing projects, Northlawn and Southlawn, totaling 585 units (completed in 1949), and Berryland, 392 units (com-

pleted in 1950). Parklawn, an older housing project (1937) of more than 500 units and built by the federal government, is leased by the Milwaukee housing authority. The city owns a $32,000,000 water works and purification plant, and a metropolitan sewerage commission created in 1921 operates a modern $17,000,000 sewage disposal plant. By treating sewage by the activated sludge method this plant manufactures a commercial fertilizer, the sales of which return to the commission nearly $2,000,000 yearly. A movement toward consolidation of civic units to increase efficiency and reduce overlapping of functions among the governments of the city, county, and 18 suburban communities, resulted in 1934 in the appointment of a joint committee on consolidation. In an advisory referendum that year, the citizens endorsed the principle by large majorities. Progress toward consolidation has been slow, however, and the most important step in that direction was the merger of the city and county park systems under the county park commission in 1937. The county institutions, on a 1,100-acre site west of the city, include a 1,000-bed general hospital, an infirmary, an asylum for the insane, a hospital for mental diseases, a home for dependent children, and a tuberculosis sanitarium. A county emergency hospital is centrally located in the city. The city operates another emergency hospital and an isolation hospital. The growth in the city's overall services since its incorporation in 1846 is indicated in the expansion of the municipal budget from approximately $5,000 to more than $65,000,000 in 1950. Despite the long tenure of Socialist mayors in Milwaukee (26 years prior to 1940), the public utilities have been left mainly to private enterprise. Thus, electric power, public transportation, and gas and telephone service are all privately owned. The Socialist influence in Milwaukee city government is often exaggerated. The Socialists held an actual majority in the common council only from 1910 to 1912, and the city's charter would not have permitted any thoroughgoing socialization even had the local lawmakers wanted it. In the writer's opinion, the Socialist influence made itself felt mainly in high standards of honesty and efficiency in performing the ordinary municipal functions.

Industry and Business.—Milwaukee's widely diversified manufacturing activities add nearly $1,000,000,000 a year to the total value of its products, which in 1949 was an estimated $1,800,000,000. In 1947 the Milwaukee industrial area, coextensive with the borders of Milwaukee County, had 1,963 manufacturing establishments employing 177,202 workers, according to the United States Census of Manufactures. More than a quarter of the output was in machinery (other than electrical), including engines, turbines, construction and mining equipment, machine tools, pumps and compressors. The next most important manufacturing category was food and kindred products, of which malt beverages made up almost half the total value. Electrical machines ranked next and, in descending order, were fabricated metal products (other than machinery); primary metal industries (mainly foundries); transportation equipment (mainly motor vehicles and parts); printing and publishing; and leather and leather goods. Milwaukee leads (1950) all other manufacturing centers in the world in the manufacture of Diesel engines, certain types of gasoline engines, and outboard motors, motorcycles, tractors, wheelbarrows, and padlocks; it leads the nation in the production of silk hosiery, work shoes, leather gloves, tin and enamelware, and sawmill and flour mill equipment; it is the biggest veal-packing center and barley market, and the home of four of the nation's seven largest breweries. While Milwaukee's importance in manufacturing overshadows its commercial position, the retail sales in the Milwaukee area totaled $921,300,000 in the 1948 federal census of business, and wholesale sales were $1,417,000,000. The service trades accounted for another $61,400,000. Employment in retail and wholesale sales and service trades was 84,064 workers.

Milwaukee inventors have contributed much to business and industrial development. Among them was Christopher Latham Sholes who, with the assistance of Samuel W. Soule and Carlos Glidden, patented in 1868 the first practical typewriter. Other Milwaukee inventors include Gottfried Schloemer and Frank Toepfer who built a gasoline automobile in 1889, claimed locally to have been the first in the United States; Ole Evinrude, inventor of the outboard motor; Niels A. Christensen, of a type of air brake generally used in 1950; and Edward A. Uehling, of a recording meter, a pig iron casting machine, and some 25 other widely used devices.

Transportation.—Milwaukee's excellent location (particularly its harbor) and its fine transportation facilities, have been major factors in the city's industrial and commercial growth. Milwaukee is not only a leading Great Lakes port, but an ocean port as well, served by ship lines operating directly between it and coastal ports of the Atlantic Ocean and Gulf of Mexico, and others in the Caribbean Sea, South America, Europe, and the Mediterranean Sea. More than 50 ship lines call (1950) at Milwaukee, including four plying between the United States and Europe. Milwaukee is the principal machinery export point on the Great Lakes, the second most important coal receiving port on Lake Michigan, and one of the largest grain shipping ports on the Great Lakes. Besides the excellent outer harbor, the three rivers emptying into the bay are all navigable by vessels of draft up to 22 feet; with their connecting canals and slips they provide about 23 miles of water front. The rivers are crossed by 31 bridges; those in the path of navigation are drawbridges which can be raised to permit passage of ships. The federal government has spent about $7,000,000 in Milwaukee harbor improvements, mainly for four miles of breakwater, forming a 1,200-acre anchorage basin. The city harbor commission has spent about $9,000,000 additional for port improvements, and operates open docks, a car ferry terminal, transit shed, mooring basin, and a lake front landing strip, Maitland Field. This unusual field, within 10 minutes' walk from the downtown business district, was the first of its kind in the United States when it was opened in 1927. It has a 2,900-foot hard surface runway, longest of any lake front landing strip on the Great Lakes. It is equipped to handle amphibian and seaplanes, as well as land planes. The harbor is considered the most beautiful on the Great lakes. A concrete breakwater protects it, together with its docks, lighthouses, and other installations.

Municipally-owned and private harbor facilities together include some 90 dock terminals of all types, serving as many as 6,000 ships in a

season. Coal furnishes the bulk of the cargo received at the port, and the other principal shipments are petroleum, building materials, iron and steel, grain, flour, feed, and package freight. The annual inbound and outbound cargo totaled (1940's) between 8,000,000 and 9,000,000 tons, with a value of approximately $500,000,000. Milwaukee's harbor is equipped with large cranes for handling heavy machinery, and two car-ferry lines maintain year-round service, carrying railroad cars to and from ports on the east shore of Lake Michigan where they connect with several railroads. One steamship line operates passenger and freight steamers to Michigan ports practically throughout the year. Milwaukee is unique among Great Lake cities in having most of its lake shore area municipally owned. Areas not developed as harbor facilities have been made into scenic shore drives, public bathing beaches, and beautiful parks. The city is served by three major steam and Diesel railroads; the Chicago, Milwaukee, St. Paul & Pacific; the Chicago & North Western (q.q.v.), and the Minneapolis, St. Paul and Sault Ste. Marie. Electric lines serving the city and suburban areas are operated by the Chicago, North Shore and Milwaukee Railroad, and the Milwaukee Electric Railway & Transport Co. As of 1950, more than 50 motor carriers operated from Milwaukee. Air transportation was being furnished by four major airlines with nearly 50 scheduled daily outbound flights a day from Milwaukee's chief airport, General Mitchell Field. Feeder lines also connect Milwaukee with 14 other Wisconsin cities. General Mitchell Field, 2½ miles square, with three directional runways ranging in length up to 6,700 feet, is operated by the county and was built at a cost of $9,000,000.

Communications.—Milwaukee is served by two large daily papers. The larger is *The Milwaukee Journal,* an independent, largely employee-owned paper with a daily circulation of 325,039 and Sunday circulation of 431,610 (ABC average for six months through March 1950). The other is the *Milwaukee Sentinel,* with a daily circulation of 169,445 and Sunday circulation of 298,661. There is also a Polish language daily, the *Kuryer Polski,* and other small weekly and semiweekly foreign language papers. As of 1950, the *Journal* owned radio station WTMJ and television station WTMJ-TV, the only television station in Wisconsin; the *Sentinel* owned radio station WISN. Five other Milwaukee radio stations also served the area.

Education, Culture and Recreation.—Milwaukee's schools rank high. Among the nation's 20 largest cities, Milwaukee has (1950) the highest percentage of school attendance in the 16-20 year age bracket, the second highest rank among the 13 largest cities in per capita high school attendance, and the highest per capita night school enrollment in the United States. Milwaukee's public school system had a total enrollment of 69,063 in May 1950. There were 98 public schools in the city: 75 elementary, 4 junior trade, 4 junior high, 11 high, 2 technical high schools, and 2 special schools. There were also 92 parochial schools enrolling 36,417 pupils. On the collegiate level, the largest institution in Milwaukee is Marquette University (q.v.). Its enrollment, including the liberal arts college and the schools of medicine, dentistry, law, and engineering, was 8,745 in 1949. The University of Wisconsin's extension division in Milwaukee had an enrollment of 6,346. Milwaukee State Teachers College had 1,710 students. Other smaller institutions of higher learning include Milwaukee-Downer College (for women); Concordia College (Lutheran); Mount Mary, Alverno, Cardinal Stritch colleges and St. Francis Seminary (Catholic); the Wisconsin College of Music, the Milwaukee School of Engineering, and several business and specialized schools of collegiate level. Vocational and adult education, administered by a separate school board, is centered in the Milwaukee Vocational School, largest of its kind in the country. Occupying an entire city block, this school has day and evening classes, several hundred classrooms, two auditoriums, dozens of manual art shops, 350 teachers and 1,100 courses. Milwaukee's municipal recreation department conducts an extensive program of cultural and recreational activities in social centers and on school and municipal playgrounds. It sponsors such theater groups as the Milwaukee Players and the Municipal Children's Theater; such musical groups as the Civic Light Opera Company, the Andrew Jackson Chorus, the Florentine Opera Chorus, and the All City Ballet Group. It sponsors the Municipal Folk Council. The county-sponsored symphony orchestra presents an annual summer concert series, starring nationally known guest artists, in the Blatz Temple of Music, an outdoor amphitheater in Washington Park. The county also sponsors an extensive program of other musical and theatrical events in Milwaukee's parks. In 1950, the Milwaukee Public Library and its 19 branches had a collection of more than 1,200,000 books, most of which were on open shelves. The library board operates the Charles Allis Art Library in the former home of a leading industrialist of the past. The Milwaukee Public Museum is one of the finest municipally-owned natural science and history museums in the country. Art museums include the privately endowed Layton Art Gallery and the Milwaukee Art Institute. The county historical society operates a museum in the courthouse and another in the Falk House, former home of another pioneer industrialist.

Milwaukee's county park system is outstanding. The system includes 75 parks, parkways and squares, totaling 6,349 acres. The parks contain seven public golf courses, eight swimming pools, eight beaches and many tennis courts; baseball, football, and soccer fields; skating rinks, toboggan slides, and boating lagoons. The conservatory in Mitchell Park and the Botanical Gardens in Whitnall Park are nationally known. The zoo in Washington Park occupies 22 of the park's 149 acres and displays more than 1,000 animals and birds, many in settings simulating their natural habitats. Land had been bought by 1950 for a zoological garden of more than 100 acres on the city's outskirts. The largest parks are Whitnall, 634 acres; Brown Deer, 365; Grant, 360; Lincoln, 309 and Greenfield, 278. Juneau Park along Lincoln Memorial Drive is an outstanding example of lake-front park development; and Root River and Menomonee parkways, of river bank development. The city operates seven indoor swimming pools.

Many of the governmental offices of city and county are centralized in a civic center, along a broad landscaped boulevard, Kilbourn Avenue, near the heart of the city. The first unit of the civic center was the Public Safety Building, housing the police and fire department administration, built in 1929. The $8,000,000 Milwaukee

County Courthouse was finished two years later. Other structures in the area include the Milwaukee Public Library and Museum Building, the municipal auditorium, and an arena (seating 13,000) completed in 1950 at a cost of $5,100,000. Milwaukee County has 380 churches, of nearly all denominations, and is the seat of a Catholic archdiocese and an Episcopal bishopric. The Roman Catholic church has by far the largest membership in Milwaukee County, its 259,682 members in 1949 outnumbering all Protestant denominations combined. The largest Protestant denomination was the Lutheran, with 106,024 members. The Methodist and Evangelical denominations ranked next with nearly 12,000 members each.

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H. Russell Austin,
Book Editor, "The Milwaukee Journal"; Author of "The Wisconsin Story."

MILYUKOV, myĭ-lyōō-kôf', **Pavel Nikolaevich,** Russian historian, educator and political leader: b. near Saint Petersburg (now Leningrad) Jan. 28, 1859; d. Aix-les-Bains, France, March 31, 1943. Educated in Moscow he became a tutor in history at the university in 1886–1895. Because of his liberal views regarding political reforms he was banished from Russia. He then went to Bulgaria and became professor of history at the University of Sofia. In 1897–1898 he traveled in Europe and then came to the United States. Settling in Chicago he lectured on Russian subjects at the University of Chicago. A course of lectures delivered there was published in 1905 under the title of *Russia and Its Crisis.* In 1905 Milyukov returned to Russia on the outbreak of the revolutionary movement to further the cause of liberty. He was imprisoned for a while, but on his release resumed his activities and was instrumental in forming the Union of Unions (composed of the educated and professional classes). He was elected to the first Duma as a Constitutional Democrat, which party (universal suffrage and constitutional government) he had created. While the Duma was in session he was arrested. After a month's imprisonment he was liberated. He was a member of the Balkan Committee of Inquiry which investigated the conduct of the war of 1913. Milyukov edited the Constitutional Democrat papers, the *Free Nation* and *Popular Rights,* until they were suppressed, and the Petrograd newspaper called *Rech.* Besides a vast number of essays and magazine articles he has published many books. These include *Main Currents of Russian Historical Thought* (1893–1895); *Sketches of the History of Russian Culture* (1895–1896); *Russia and its Crisis* (1895); *Democracy and the Second Duma* (1905); *A Year of Struggle* (1907); *The Balkan Crisis and Politics* (1910); and *Russia's Catastrophe,* 2 vols. (1927).

MILYUTIN, myĭ-lyōō'tyĭn, **Dmitri Alekseevich,** Russian field-marshal: b. 1819; d. Yalta, Crimea, Feb. 5, 1912. The son of poor parents, he entered the army in 1833 and studied at the Military Academy in Saint Petersburg (Petrograd), where he became professor of geography. His first active service was in the Caucasus against Schamyl. From 1861 to 1881 he was minister for war, during which long period he introduced important reforms, especially the establishment of conscription in 1874. He took part in the Russo-Turkish War in 1877–1878 and for a time added the duties of foreign minister to his own. He retired in 1881 and devoted himself to writing military history.

MIMANSA, mē-mān'sä (from the Sanskrit *man,* to investigate), investigation, is the collective name of two of the six divisions of orthodox Hindu philosophy. The two Mîmânsâ divisions are: (1), the Pūrva-mîmânsâ (Prior Inquiry, or Karma-mîmânsâ), investigation concerning works that deal chiefly with the Vedic ritual and its significance; and (2), Uttara-mîmânsâ (Later Inquiry, or Brahma mîmânsâ), investigation concerning the Supreme Spirit, or, more commonly, Vedanta (see Vedanta Philosophy), dealing with speculations on the nature of the Supreme Spirit. The principles are embodied in a series of *Sutras,* or aphorisms, in 12 books, discussing the sacred ceremonies of the Veda and the merit accruing from their proper performance. Although the Mîmânsâ is ranked by all Indian writers with the other philosophical systems, the term philosophy can hardly be applied to it in the same sense as to the other systems of philosophy. The object of the Mîmânsâ is merely to lay down a correct interpretation of such Vedic passages as refer to the Brahmanic ritual; to solve doubts wherever they may exist on matters concerning sacrificial acts and to reconcile discrepancies (or *seeming* discrepancies) of Vedic texts. Jasmini, a sage, was the founder of this school of interpretation. The standard introduction to the study of the Mîmânsâ is by Mâdhava Achâeya.

MIMBRES, mĭm'brĕs, **RIVER,** a stream rising on the west slope of Mimbres Mountains in the northern part of Grant County, N. Mex., flowing south across Luna County near Deming and disappearing in the wide desert flat east of Florida Mountains. This flat is separated from Rio Grande Valley but to the south opens into the wide basin which contains Lake Guzman in Sonora, Mexico. The river has running water in Grant County, but excepting in time of freshet is dry in Luna County. The name is Spanish for osier or water willow which grows in the upper part of the valley.

MIME, mīm, a dramatic entertainment, native to Sicily and Magna Graecia, and appealing to popular taste by its scurrilous caricatures of low life. Originally performed in public squares on festival days, it was later developed into artistic form by Sophron Syracuse in the 5th century B.C. The *Mimiambi* of Herondas (q.v.), a Greek poet of perhaps the latter half of the 3d century B.C., representing the everyday life of the common people, furnish trustworthy examples of these literary mimes. The Romans adopted the mime in its unliterary form as early as the 3d century B.C., but it was not until Cicero's time that it received a place in literature at the hands of Decimus Laberius and Publius Syrus, of whose works we have fragments. As an after-piece, and under the empire as an

independent performance, it was as popular as it was indecent in words and action.

MIMETITE, mĭm'ê-tīt, a mineral consisting of a lead arsenate and chloride closely resembling pyromorphite, occurring in hexagonal crystals. In color mimetite is usually yellow, or brown, rarely white, or colorless. Like pyromorphite, mimetite is found in the upper parts of vein of lead ore where it has been formed by the oxidation of galena and mispickel.

MIMICRY IN ANIMALS. One of the ways by which species and groups of animals are perpetuated. Its effect is to assure the safety of individuals by reason of their having such a likeness to something else that the eye of another animal seeking to do them harm overlooks them, by mistaking their real nature for the object mimicked, so that the enemy passes on. This is one of the phases of protective resemblance, of which the two principal are: (1) *Mimicry,* similarity in form to some inanimate object; (2) *Imitation,* similarity to another animal that for some reason is immune from attack by the enemies of the imitating species. In both cases color is likely to serve as an important element in the practical deception. See also Coloration, Protective; Imitation.

These two phases, and other manifestations of deception for safety's sake, are regarded by the exponents of the Darwinian theory of organic evolution as results of the gradual and unconscious acquirement, through the process of natural selection, of changes advantageous to the animal in its struggle for existence. The present article considers such beneficial results as have been obtained by acquiring by certain animals a resemblance to some vegetable or inanimate article of no interest or value to the enemy.

It is plain that if a moth or a caterpillar sitting on a tree-trunk can be mistaken by a bird or lizard for a bit of lichen or a dried twig it may frequently be passed by, and thus allowed to live long enough, perchance, to perpetuate its species. This happens actually in nature. Mimicry is developed, however, almost exclusively in small creatures that are otherwise defenseless; and sometimes is restricted to the young of a species whose individuals when adult can either take care of themselves well or develop some special method of concealment or passive resistance. It also occurs in a few plants.

It is mainly exhibited by insects, but is manifest in some marine animals, for example sea anemones, which when closed are to all appearance lumps of mud; and many hydroids have a most deceiving resemblance (in our eyes, at least) to the seaweeds on or amid which they grow; while a pipe-fish, standing on its head, among the eel grass alongshore, as is its custom, is as effectually concealed as anything can be. A few large examples might be cited, as the mata-mata turtle of South American rivers, which is so tagged and fringed with outlying processes that it has the exact appearance of a weedy rock; but in this case, as in some others of mimicry, the advantage is more that the turtle's prey (fishes, etc.) will come near enough to be seized before they suspect its fatal presence, than that the turtle itself will be safer.

Mimicry is most prevalent, however, among insects and spiders. These are to be found in all countries with deceptive resemblance to withered, gnawed or moldy leaves; to bits of twig, particles of dung, cocoons whose contents are breaking out; or to any of various objects under which insects seek refuge or concealment, as flakes of bark or bits of stone. The records of observation in the books of Darwin, A. R. Wallace, H. W. Bates, Fritz Müller, and H. O. Forbes and other naturalists abound in instances, many of which were discovered by the merest accident. The classic example is the amazing likeness of a kind of butterfly of the East Indies, when at rest, to a leaf which extends not only to the general color of the under surface of the closed wings and their markings, but to the attitude of the insect as it alights, for it places itself in a relation to the branch to which it clings precisely similar to the natural arrangement of the real leaves about it; and, of course, frequents only the one kind of tree whose leaf is mimicked. A tropical walking-stick insect has flat extensions of the skin along its legs and body which are so shaped, and so mottled in color, that Wallace found even the sharp-eyed Dyak boys of the Bornean forest deceived into thinking this insect "a stick grown over by a creeping moss." But our own northern, greenish-brown walking-sticks are sufficiently deceptive in their twiglike aspect when, as is their custom, they sit on a bush-branch, holding their bodies stiffly out at an angle with their fore legs stretched straight in front of their heads; many must be overlooked for one that is detected. More familiar, perhaps, are the measuring-worms (hairless caterpillars of geometrid moths) which, clasping a branch firmly by their hind legs, will stand out rigidly from it, and maintain this attitude for hours. Their dull gray color gives them exactly the appearance of a broken twig, and as long as they remain motionless they are virtually safe. The whole race of mantids exhibit this character in a greater or lesser degree.

Another very striking example of mimicry is that first made known by H. O. Forbes who met with it in Java and in Sumatra. In the first instance, he noticed a certain butterfly perched, as often happens, on a white patch of bird's excrement dropped on a leaf. Approaching cautiously, he closed finger and thumb over the wings of the insect, which seemed glued to the sticky substance; "To my surprise, however," Forbes relates, "part of the body remained behind, adhering, as I thought, to the excreta. . . . I looked closely at, and finally touched with the tip of my finger, the excreta to find if it were glutinous. To my delighted astonishment I found that my eyes had been most perfectly deceived, and that the excreta was a most artfully colored spider lying on its back, with its feet crossed over and closely adpressed to its body." Forbes made the same mistake a second time, some months later in Sumatra; and speaks of this extraordinary spider as "a living bait so artfully contrived as to deceive a pair of human eyes even intently examining it."

Consult for the examples mentioned above Wallace, A. R., *Malay Archipelago* (New York 1869); Forbes, H. O., *A Naturalist's Wanderings* (New York 1885); Punnet, R. C., *Mimicry in Butterflies* (London 1915); Cott, H. B., *Adaptive Coloration in Animals* (New York 1940).

Ernest Ingersoll.

MIMIR, mē'mēr, in Scandinavian mythology, the god of wisdom, and most celebrated of the giants. "Mimir's Well" was the fountain of all wit and wisdom, in whose depths the future was clearly mirrored.

MIMNERMUS, mĭm-nûr'nŭs, the earliest writer of Greek erotic elegy, was born in Colophon or Smyrna, and lived in the last half of the 7th century B.C. His collection of love poems, called *Nanno* from the name of a flute player whom in his old age he courted in vain, survives only in fragments which may be read in a separate edition by N. Bach (Leipzig 1826) or in Theodor Bergk's *Poetae Lyrici Graeci.*

MIMOSA, mĭ-mō'sȧ, a genus of herbs, shrubs, trees and a few climbing species of the natural order Leguminosae. The species, of which more than 200 have been described, are natives principally of the American tropics. They have pinnate leaves, usually spicate clusters of small flowers, followed by flat, oblong or linear pods which when ripe break into one-seeded joints. Many of the species are noted for their sensitive leaves which at nightfall close and droop. Others respond to a touch. Of these the humble or sensitive plant (*M. pudica*) is perhaps the best known.

MIN, mĭn, Egyptian god of agriculture, typifying the generative forces of nature. Annual harvest festivals were held in his honor. He is represented as a human being with a headdress of two enormous feathers and in his right hand he holds a flail. Behind him is a shrine with trees. The ram is sacred to him. Min was the local god of Panopolis or Akhmin and of Koptos. In later times Min was identified with Ammon Ra. The Greeks identified him with Pan.

Consult Budge, A. Wallis, *The Gods of the Egyptians* (London 1904); Wiedemann, *Religion of the Ancient Egyptians* (New York 1897); Erman, A., *Life in Ancient Egypt* (London 1894).

MINA, mē'nä, **Francisco Espoz y,** Spanish guerrillero leader and general: b. Ydozin, Navarra, Spain, June 17, 1781; d. Barcelona, Dec. 24, 1836. As he sprang from the yeomen class, he naturally espoused radical and democratic ideas at an early age. When Napoleon tried to seize Spain, in 1808, Mina enlisted in Doyle's regiment and then passed into a band of guerrilleros commanded by his nephew, Xavier Mina. When Xavier was captured by the French in 1810, seven men of the band decided to follow Mina; and soon afterward the Junta of Aragon gave him command of all the guerrilleros of Navarra. The national government of Cadiz gave him rank and in 1812 he was promoted commander in chief in Upper Aragon and on the left bank of the Ebro. Mina was an excellent organizer and strategist. His position made it possible for him to confiscate war supplies imported by the French and to levy duty upon all imported war materials. This provided him with money to pay his troops regularly; and he was, therefore, able to maintain an excellent morale among his men and to please the countryside by avoiding a levy of taxes and contributions. Mina served with distinction under the duke of Wellington in the campaign of 1813–1814 and was frequently wounded. When Ferdinand VII was restored, he fell from favor, made an unsuccessful attempt to instigate an uprising among the Liberals at Pampluna and went into exile. The Revolution of 1820 brought him back and he served the Liberal party throughout northern Spain, resisting the French attempts to bring back the king. He was forced by the French to capitulate in November 1823, and the French allowed him to escape into England. In 1830 he made another attempt against Ferdinand; but notwithstanding this, on the death of Ferdinand he was recalled to Spain and the government of the regent, Cristina, gave him the command against the Carlists, in 1835, although fearing his radicalism. By this time his health was broken and he resigned his command in April 1835. A year later he took command in Catalonia and aided in forcing the regent to grant a constitution to Spain (August 1836). Mina was a brave man. Mention is made of him in all the histories dealing with Spanish matters in the early days of the 19th century. In 1825 he published *A Short Extract from the Life of General Mina.*

MINA, Francisco Javier, Spanish soldier: b. Ydozin, Navarra, 1789; d. Mexico, Nov. 11, 1817, nephew of Francisco Espoz y Mina (q.v.), with whom he served in the guerrilla warfare against the French in 1808–1810. Taken prisoner, he was detained four years in Vincennes. In 1814 he served against Ferdinand VII, and fled to France and thence to England. While in England he became interested in the cause of Mexican patriots, and, aided by some wealthy Englishmen, he organized an expedition. Arriving in the United States he received support. Two hundred volunteers followed him to Galveston in November 1816. More assistance came from New Orleans. His force landed at Soto Marina, province of Tamaulipas, in April 1817. With his 300 men he took the towns of León and Guanajuato with the fortress of Sombrero and defeated the generals Armiñán and Ordóñez; but he was deserted by his followers, surprised by an overwhelming force and taken to Mexico, where he was shot.

MINA, an ancient Greek denomination of money. The Attic mina contained 100 drachmae, and was valued at about $16.

MINA-BIRD, or **MYNA,** a starling or grakle (*Eulabes religiosa*), very familiar throughout India and eastward, nesting confidingly in gardens. Its color is a deep velvety black with purple and green reflections, and with a white mark on the base of the quills of the wing. The bill and feet are yellow, and there are two yellow wattles on the back of the head. The Hindus regard it as sacred to Ram Deo. Certain other similar species are also called mynas in some localities.

MINAEANS. See SABAEANS.

MINARET, mĭn-ȧ-rĕt', (Arabic, *minarat,* a lantern), a tower generally surrounded with balconies, and erected in connection with the mosques in Mohammedan countries, and peculiar to Mohammedan architecture from which the muezzin summons the people to prayer and announces the hours, bells not being used by the Moslems. The form is derived from the Pharos lighthouse at Alexandria. The earliest mosques had

MIMICRY IN ANIMALS

(1) The viceroy butterfly (right) is conceded to be protected by its close resemblance to the monarch (left) which is nauseous to birds and other enemies. (2) Diabolical specter, a mantis from East Africa, woos its insect prey by simulating a flower. (3) Tawny frogmouth, or morepork, of Australia, shown on nest. When brooding, it resembles the stub of a dead branch. (4) Australian leafy sea horse, or sea dragon, has many leaflike appendages which imitate the seaweed among which it lives. (5) White-tailed ptarmigan, in winter plumage, is camouflaged against the snow. (6) Walking-leaf insect of India and adjacent countries, simulates a leaf so closely in shape, color, and veining, that it can be located only when it moves. (7) This assassin fly (lower) closely resembles a bumblebee (upper).

Painted for The Encyclopedia Americana by Alexander Seidel of The American Museum of Natural History

MIMICRY IN ANIMALS

(1) Tree hopper, central South America. Insect resembles thorn of plants which it inhabits. (2) Looper caterpillar. Standing out at an angle from branch, it is mistaken for a broken twig. (3) Grasshopper, Brazil. Resembles leaf, even to apparent hole and rust spots. (4) Kallima butterfly, India. Wings, turned up, resemble leaf. Tips of rear wings form apparent stem of leaf. (5) Walking stick, Peru. Simulates twigs on which it rests. (6) American bittern. Pose and stripes camouflage bird among surrounding reeds. (7) Leaf fish, South America. Shape, color, and motion resemble dead leaf drifting through water. (8) Sargassum fish, tropical waters. Fantastic form and coloring blend with mass of sargassum in which it lives.

Drawn for "The Encyclopedia Americana" by Alexander Seidel of The American Museum of Natural History

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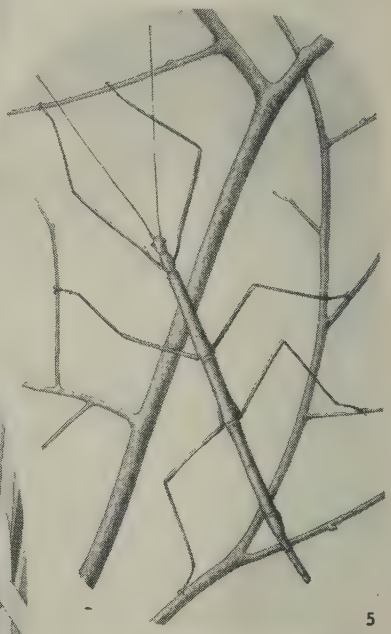

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no minarets, the first known being that of Damascus, erected about 705. They are a square construction up to the height of the wall of the mosque, with a winding stairway, and above they are octangular. The tower of the old Madison Garden in New York was copied from the Giralda of Seville, which is 308 feet high. See MOSQUE.

MINAS, Uruguay, the capital of the department of Lavalleja, 56 miles by rail northeast of Montevideo. It carries on a trade in the produce of the surrounding agricultural region, and in the marble and granite of the neighboring quarries. Pop. 8,955.

MINAS GERAIS, mē'näs zheh-rä'esh (meaning «general mines»), or **MINAS,** the most mountainous state of Brazil and its foremost mining zone. Located in the southeastern part of the country, Minas is bounded north and northeast by the state of Baía, east by Espírito Santo, southwest by São Paulo, and west by Goiaz. It is separated on the south from its port and chief gateway, the city of Rio de Janeiro, by the small state of Rio de Janeiro. Its area is 221,800 square miles.

Minas has over 200 *municípios,* or city-county political units. For statistical and geographical convenience the state is divided into the following large zones: Triángulo, Oeste, Noroeste, Norte, Nordeste, Sul, Mata, and Centro. The last three are the most populous and important, containing the largest cities and industrial and agricultural enterprises. Neither population nor economic activity is evenly distributed over the state. There is a tendency to overconcentration in southern Minas, which is closer to the city of Rio de Janeiro where much of the food and dairy products of Minas are consumed and from which its coffee and minerals are exported. Large areas of Minas possessing good soil, climate, and resources are still sparsely populated, mainly owing to lack of communications.

The terrain is generally rugged and is crossed from south to north by the Serra do Espinhaço (Spinal Range), highest in Brazil, and by many lesser ranges. The important Rio São Francisco rises in central Minas and is navigable for a great distance in the northern half of the state. Other important river basins are those of the Doce, Jequitinhonha, Paraíba, Paranaíba, Grande, Paraopeba, and Rio das Velhas. None of them has any long navigable stretch except the Grande and the São Francisco. The average elevation of the state is 2,000 feet, with large portions over 2,800 feet. This factor tempers what would otherwise be a subtropical climate. Frosts occur, as do occasional floods and droughts.

Minas Gerais' unusual variation in elevation, climate, and rainfall makes for a rich and diverse flora. Extensive grasslands and zones of scrub and brush have been increased by deforestation since the 18th century mining boom, and by repeated burning by farmers and cattlemen to clear land and improve pasturage. Large sections of the east and northeast are heavily forested, particularly in the tropical Doce Valley. Timber and tropical hardwoods of value are cut. Owing to the state's lack of coal and oil, much charcoal is prepared for the iron and steel industry.

The state is handicapped by its geography, for it is isolated from the modern world behind its ranges which have retarded transportation and trade, thus adding to the cost of all enterprises. On the other hand, Minas Gerais, because it is mountainous and rainy, has more hydroelectric potentialities than any other state —a quarter of the Brazil total. A number of power dams are in operation and several more are planned.

Brazilians consider Minas Gerais to be their most typical state as it contains every variety of climate, geography, agriculture, industry, and population to be found in Brazil.

History.—Minas was explored and partly depopulated of Indians in the 16th and 17th centuries by the hardy slave-raiding Paulistas, or people of São Paulo. They discovered gold in the late 17th century and started a gold rush to central Minas in the 1690's, which movement affected the course of Brazilian development by disrupting agriculture. Thousands of Portuguese adventurers swarmed inland from Rio, which grew rapidly as the port of Minas. Scores of thousands of planters and Negroes from the sugar plantations of the Brazilian coast plain stampeded to Minas to dig for gold and diamonds, discovered in the 1720's north of the gold fields. Brazil lost its importance as an exporter of sugar, and Minas became its richest province. The corrupt Portuguese monarchy in Lisbon victimized Minas with numerous soldiers, officials, and tax collectors. Diamonds were declared a royal monopoly, although smuggling was rife, and all economic life except mining was discouraged. Minas remained an illiterate, backward province till well into the 19th century; yet it had a golden age of architecture, poetry, and art in the 18th century when central Minas built many beautiful mansions and churches in the mining cities. The gem of these old towns is Ouro Preto, full of statuary and churches created by Antonio Francisco Aleijadinho, Brazil's leading sculptor. Ouro Preto has been made a museum city in the heart of Minas Gerais.

Minerals, Metallurgy and Trade.—Minas Gerais is one of the world's great storehouses of minerals. It contains over one-fifth of the world's iron ore. The Brazilian iron and steel industry, which at present is small but has great possibilties, is centered in Minas Gerais and the Paraíba Valley in the adjoining state of Rio de Janeiro. Brazil's per capita consumption of steel is only 20 pounds a year, as compared with 850 pounds in the United States. As recently as 1941 both the Brazilian and the United States banks and governments were co-operating in efforts to expand the iron and steel industry of Minas. Several large steel mills were under construction or were being expanded, and more were planned. The $45,000,000 Volta Redonda steel mill, starting operations in 1944 with iron from Minas, is considered by Brazil to be the most important plant in the country's program of development. The United States has co-operated with Brazil in supplying funds, technicians, and equipment. Steel expansion in Minas should raise the standard of living and increase the market for American products.

In 1941 Minas Gerais greatly increased its formerly modest exports of strategic minerals to the United States. The two countries, on 14 May 1941, signed an agreement whereby the United States was to take almost the entire out-

put of Minas; chromite, manganese of ferro grade, mica, bauxite, quartz crystal, nickel, tungsten, graphite, and a few others are shipped exclusively to the United States. Chief is manganese, of which Minas has ample reserves of high grade, often over 50 per cent metal content. In the first five months of 1941, over 150,000 tons were shipped to the United States through Rio de Janeiro. In August of 1941, it was planned to raise this total to over 450,000 tons of manganese ore by mid-1942, along with some 80,000 tons of bauxite and 5,000 tons of chromite ore, plus other minerals totaling more than $12,000,000. The second World War and rearmament made North American firms and banks, both private and governmental, more interested in Minas.

Minas has been the chief producer of gold and diamonds in Latin America since colonial days. The gold is bought by the Banco do Brasil, and the diamonds, chiefly industrials for machine tools, go to North America.

The central zone of the state is the most rugged and mineralized, and many of the ores mentioned lie in rough terrain served by neither rail nor highway. The United States Steel Corporation has an investment in the best manganese lands, valued at over $4,000,000, near Ouro Preto, some 300 miles north of Rio harbor, on the Central Railway which lacks the roadbed and equipment for really significant mineral shipments. Many more technical surveys, transportation improvements, and capital investments will be necessary before the minerals of Minas can be shipped or smelted in quantity. Since the United States has been consuming its own minerals at a rapid rate, and since Minas needs technical and financial aid and the machinery to industrialize, it might be assumed that a sound trade basis could well be established.

Agriculture.—Minas is overwhelmingly dependent on farming and livestock and is one of Brazil's three leading states in both. It is first in corn, hogs, beans, and dairy products, but suffers from agricultural backwardness, erosion, and inefficient methods. Minas needs many reforms before its agriculture will become really profitable, and its food supplies adequate. For one thing, the land must be distributed and a rural middle class fostered. More fruits, meat, dairy products, and fresh vegetables should be grown for Minas' own consumption, for canning or preserving, and for sale in Rio and abroad. The state has few canneries or packing plants as yet. As a rural region, Minas fails to secure its share of the national income, and its farmers and sharecroppers have pitifully low purchasing power.

Manufacturing.—Minas Gerais is far from being self-sufficient industrially, although it has a variety of small factories. The state has 16 per cent of Brazil's population, yet it produces only 6.5 per cent of the nation's textiles and light manufactures, almost entirely for consumption within the state. It has been importing manufactures from its more advanced neighboring states, notably São Paulo.

Pending publication of the results of the 1940 census, only estimates are available on many aspects of manufacturing. The state's manufactures rose steadily in importance in the 1930's, becoming 11 per cent of the national total in 1940, if heavy industry be included. But because it is an isolated inland state, Minas is much less geared to imports and exports of manufacture than most of Brazil. The state's purchasing power, like that of any predominantly agricultural area, is too low to stimulate much manufacturing, but Minas is trying to attract more factories, especially to the new industrial district outside the model state capital, Belo Horizonte. Cheap electricity is expected to be a stimulant. In 1937 Minas Gerais had over 7,000 small industrial establishments, with more than 78,000 workers. Including the large foreign-owned steel and mineral enterprises, the capitalization was above $44,000,000.

By using water power Minas should be able to attain industrial independence and a better-balanced economy, but capital and equipment are badly needed. Economists have commented for years on the state's unique resources and potentialities for industrialization.

Transportation.—One of the chief needs in Minas is for an adequate system of hard-surfaced highways and for an enlarged railway network unified with one gauge. Railroad improvement, electrification, and new construction have been inadequate, which fact handicaps industralization, trade, and mining. Funds are badly needed for construction of communications to link the several zones of Minas to each other and to Rio and São Paulo, although Minas leads Brazil in railways with 8,150 kilometers. It is second in roads with 38,000 kilometers, but 90 per cent of these are dirt and almost impassable in wet weather. Minas has relatively few trucks and automobiles, but there are some useful bus and truck lines.

Of the railways, the Central do Brasil serves Minas and is the nation's longest. Next is the state-built Rede Mineira de Viação. Third is the British-built Leopoldina Railway. Also important is the Vitória line connecting central and eastern Minas with the growing port of Vitória in Espírito Santo. Most lines are federally aided and controlled.

Air travel is centered principally at Belo Horizonte (behl'ō-rē-zōn'teh), the capital of Minas Gerais and the largest city in the state; its population in 1941 was estimated at about 200,000. It is an attractive modern city, situated in an agricultural and mining region, 376 miles north of Rio de Janeiro, on the Central do Brasil Railway. The climate is pleasant and the environs noteworthy. Points of interest include the magnificent public buildings and the municipal park. The public facilities of the city have been practically rebuilt since 1894. The chief airline is Panair do Brasil, part of Pan American Airways.

Population.—Estimates in 1939 gave Minas nearly 7,000,000 people, called *Mineiros*. Mineiros are peasants of mixed race, often a three-way blend of Negro, Indian, and Portuguese, but predominantly Portuguese, racially and culturally. They have many excellent qualities, including freedom from race prejudice.

Indian, Negro, and Caucasian bloods have blended more thoroughly in Minas than elsewhere in Brazil. It is the most populous state, and in it Brazil's two great regions, the North and the South, overlap: Mineiros are more Caucasian and suffer less disease, poverty, and illiteracy than the people of North Brazil; and they are less white and have less prosperity than the inhabitants of advanced South Brazil.

The population of Minas rose from 250,000

in 1750 at the end of the mining boom, to 1,000,000 in 1840, and to 2,000,000 by 1870. The state had approximately 3,200,000 inhabitants in 1890, and 5,880,000 in the census of 1920. Minas received possibly 300,000 Portuguese, Italian, Syrian, and other immigrants between 1880 and 1930, mostly from Latin Europe. Minas is but slightly urbanized. It has a few small cities, only two having over 100,000—Juiz de Fóra and Belo Horizonte.

Education.—Scant progress was made in education till recent years. As late as the 1930's, the high illiteracy of Minas (possibly over 70 per cent) was being reduced at only a slow rate because so few children attend school. By 1938, grade school registration in some 5,300 schools was over 430,000, but with thousands attending irregularly and for only a year or two. For a population of nearly 7,000,000, schools are small, few, and mediocre. Several good technical and special institutions were founded after 1936, however, and a strong effort is being made to improve education. The best schools and the professional faculties of the University of Minas Gerais are in Belo Horizonte. In 1936, only 98 of the over 200 *municípios* gave instruction beyond the seventh grade, and but 41 had full secondary education.

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MINAS DE RIO TINTO, Spain, town in the province of Huelva, 32 miles northeast of the city of Huelva. The mountainous country in which this town is situated contains rich deposits of copper ore which were worked by the ancient Phœnicians. In 1873 a London company took control of these mines and produced the ore by new methods. More than 10,000 workers are now employed. The ore produced averages over 1,600,000 tons yearly. In 1845 the town had only 800 inhabitants; in 1910, 12,626; in 1930 it was about 10,000.

MINBU. A district and division of Upper Burma. This district consists of 3,299 square miles with a population of 270,000. The physical features exhibit low plain land toward the Irrawaddy, and an undulating country inland, rising ever higher westward toward the Arakan hills. Between the plain and the Arakans run the Nwa-Madung hills, north and south. The chief rivers and streams are the Irrawaddy, the Môn, the Maw and the Salin. They are much used for irrigation. Along the Irrawaddy and in the lagoon fed by it, called Paughlin Lake, there are fisheries, the rights to which are sold yearly by public auction, and realize an average of $5,000. The valleys are cultivated, but are deadly except to natives. Oil has been discovered near the mud volcanoes of Minbu, but lies too deep to be profitably worked. Along the Môn River the betel-vine is cultivated. The district of Minbu contains much forest land. The chief crops are rice, millet, grain, beans, peas, sesamun and tobacco. The annual rainfall varies everywhere. In the hot months the thermometer rises to 100° F., and in December it falls to 49° F. The chief town is also called Minbu. It is situated on the Irrawaddy, which is here three miles wide with many islands and sandbanks. Pop. about 5,780. In the dry season the steamers cannot come nearer to the town than two miles. The division of Magwe consists of the districts of Minbu, Magwe, Thayetmyo, Pakôkku and the Chin Hills. Its area is 29,040 square miles. Pop. about 1,557,609.

MINCH, The, Scotland, the channel off the northwest coast between the mainland and the northern part of the Outer Hebrides; it is from 25 to 45 miles wide and has a very rapid current, and on either side are numerous lochs or sea-arms penetrating inland. It is connected with the Sea of the Hebrides on the south by the Little Minch, the channel between the island of Skye and Long Island; it is from 14 to 20 miles wide.

MINCIO, mĭn'chō, Italy, a river, the ancient Mincius, which flows from the south extremity of Lake Garda, near Pescheria, and after forming the lake and marshes that surround Mantua, falls into the Po eight miles below the city. Its banks are remarkably fertile, and celebrated for their beauty by Virgil, who was a native of this country. It formed an important base of operations in the wars between France and Austria. The length of its course is about 115 miles.

MINCOPIES, min-kō-piz, natives of the Andaman Islands. They are typical Negritos, averaging less than five feet in height with cephalic characteristics similar to those of the negro. Their condition is low. They live in open huts (called chongs), consisting of a roof on four stakes, and subsist on roots, wild fruit and game. In hunting they use a peculiar S-shaped bow. There are 12 tribes of Mincopies, all descended from a common stock but each with its own dialect and tribal habits. Consult Deniker, 'Races of Man' (1901); Brown, A. R., 'Notes on the Language of the Andaman Islands' (1914) and 'Aborigines of the Andaman Islands' in the *Journal of the Anthropological Society* (Vol. XI, London 1882).

MIND. See PSYCHOLOGY.

MIND-CURE. See MENTAL SCIENCE SUGGESTION.

MIND READING. See Hypnotism; Telepathy.

MIND-STUFF. See Panpsychism.

MINDANAO, mēn-dä-now′, Philippines, the most southeastern and second largest island of the archipelago, lying between lat. 5° 35′ and 9° 50′ N. and between long. 121° 53′ and 126° 28′ E., about 220 miles northeast of Borneo. It is bounded on the east by the Pacific Ocean and on the west by the Sulu Sea; area, 36,906 square miles; with its dependent island, 37,742 square miles.

Topography and Climate.— The outline of the island is very irregular and the coast is uneven and much indented with deep bays and inlets; the shore line is 1,592 miles and the width of the island from east to west 386 miles. The island is very mountainous, particularly in the interior, the mountain system consisting of a number of irregular ranges extending generally north and south, and as a rule approaching near the coast. The mountain formation shows the effect of earthquake and volcanic action, and there are many volcanoes, some of which are active. The principal peaks are Apo (10,312 feet), near the southeastern coast, and Malindang (8,560 feet) in the northwest. The island is drained chiefly by two large rivers, both over 200 miles long, the Grande de Mindanao (q.v.), flowing southwest and west, on the western side of the central mountain range, and the Butuán or Agusán, flowing northwest, on the eastern side of the same range. There are numerous other small streams and nine large mountain lakes. There are iron springs at Placer, in the province of Surigao; sulphur springs at Mainit, Surigao and Balingasag, Misamis, and medicinal thermal springs at Malibato. As the island is within 10° of the equator, the climate is hot and humid, but more equable than that of Luzon; rains are frequent and heavy, the annual fall being 100 inches.

Forests and Fauna.— The island is covered with forests of valuable woods for ship and house-building and furniture making; among these are the molave narra (similar to the yellow pine), teak, ebony and cypress; the gum and resin-producing trees and medicinal and dye plants also grow abundantly. Animal life is abundant in these forests; over 200 species of birds have been classified, of which 17 species are peculiar to Mindanao and Basilan; deer, wild hogs, monkeys and the haguang or colugo (q.v.) are numerous. Reptiles, including the giant lizard, iguana and large snakes, particularly the boa, also infest the forests and crocodiles the river.

Industrial Resources.— The staple, agricultural products are rice, sugar, cotton, corn, tobacco, indigo, coffee and hemp; other products of special value are cloves, nutmegs, cinnamon and other spices, betel nuts and betel peppers. The most important industry is the cultivation and shipment of hemp and forest products; large herds of cattle and horses are raised; and there is a little weaving of hemp and cotton fabrics for home use. Less than 2 per cent of the land is under cultivation. Edible birds' nests are also gathered and exported. Communication is largely by water, as there are few roads except in the immediate vicinity of the chief towns, and the towns and villages are situated on the coast or on the large lakes and rivers. Gold is obtained in small quantities by the natives, and is doubtless abundant; coal, sulphur, copper and platinum are also reported.

People and Government.— About a third of the population of Mindanao is composed of Christianized Malays; there are also tribes of the Moro race who are Mohammedan in religion; the interior is peopled by pagan tribes and the northern and eastern coasts by Visayan Filipinos. The island was first occupied by United States troops in 1899. Civil government was provided for Mindanao and adjacent islands under the Philippine Commission in 1903, under the name of the Moro Province. In 1914 the department of Mindanao and Sulu was created, the military governor of the old Moro province giving place to a civil governor invested with wide powers and whose constructive task it will be to bring a turbulent and suspicious Mohammedan population into harmonious relations with the Christian Filipinos. There was a serious outbreak of cholera in 1915. Pop. 499,634. See Philippine Islands; Moros.

MINDANAO, Grande de, grän′dā dā mēn-dä-now′, a large river of the island of Mindanao, Philippines. It rises in the Rangayán Mountains, flows south to the Lake of Liguasan, and passing through this lake flows northwest to Illana Bay. About 25 miles from its mouth it divides into two branches, which enter the bay about five miles apart, with a large delta between them; the north arm is the larger and more navigable; the south arm is narrow and only five feet in depth. The river is navigable for 70 miles for small vessels not drawing over four feet. Its course is mostly through a very fertile region and it drains an extensive plain with several large lakes; in length and volume it is the largest river of the Philippines. In the upper part of its course it is known also as the Pulangui.

MINDEN, Nebr., city and Kearney County seat; alt. 2,165 feet; 32m. SW. of Hastings; on the Chicago, Burlington and Quincy Railroad. It is in a fertile agricultural area producing wheat, corn, hay, livestock, poultry, and dairy products. It has a school book publishing plant and manufactures of neon signs, automobile repair tools, and butter. Pop. (1930) 1,716; (1940) 1,848.

MINDEN, Prussia, a town of Westphalia, on the left bank of the Weser, 35 miles southwest of Hanover. It is one of the oldest towns in Germany and the streets in the ancient parts are narrow and crooked. It has a fine cathedral of the 13th century, in the early pointed Gothic style, a gymnasium and an orphan hospital; manufactures of linen and cotton, tobacco, chicory, chemicals, soap, lamps, machinery, etc., and an important transit and general trade. It was made the seat of a bishopric by Charlemagne, was afterward a member of the Hanseatic League, became a possession of the Elector of Hanover and finally passed into the possession of Prussia in 1814. On 1 Aug. 1759 the French were defeated here by an Anglo-Hanoverian army during the Seven Years' War. Pop. about 27,000, predominantly Protestant.

MINDEN, Battle of. This noted action of the Seven Years' War (q.v.) was fought on Aug. 1, 1759 between the Anglo-German army commanded by Duke Ferdinand of Brunswick and the French army under Marshal Inuis Georges Erasme de Contades. The British and Hanoverian infantry signally defeated the French cavalry. However, Lord George Sackville, commander in chief of the British contingent, flatly refused to obey the order of Ferdinand to send Lord Granby's English cavalry squadrons into the fray. Consequently the Allied victory was indecisive.

MINDORO, mēn-dō'rō, Philippines, an island lying south of Luzon, a little north of the center of the archipelago; length, northwest to southeast, 110 miles; width, northeast to southwest, 56 miles; area, 3,928 square miles, with dependent islands, 4,024. The island, which is oval in outline, is mountainous, the general topographical features consisting of several high broken ranges, forming an elevated plain in the interior; and from this plain sierras extend in different directions toward the coast, which is mostly low and marshy, especially on the north and east; on the west coast along Mindoro Strait is prairie land. The culminating point of the mountain system is Halcón Mountain in the north (8,800 feet). There are numerous small rivers, but no general river system of main stream and tributaries. The climate is variable; the rainfall heavy and monsoons frequent; the western coast is temperate and healthful, but the northern and eastern coasts are hot.

At one time, before the decay of the Spanish monarchy, the rice yield was so abundant that Mindoro was called "the granary of the Philippines"; but the frequent attacks of Moro pirates destroyed the prosperity of the island, and the agricultural products are now unimportant, being almost entirely for home consumption. Sugar cane is being profitably exploited; rice, cocoa, tobacco, hemp, cotton, etc., are raised; the cultivation of hemp is increasing and a small amount of cotton is exported to the island of Ipil. In the time of the early Spanish explorers reports of great mineral wealth, especially gold, were circulated; the real mineral resources are but little known, though as far as modern exploration has gone, copper, gold and coal have been found. The island is heavily wooded and its chief commercial wealth is in forest products; the trees include cedar, ebony, mahogany, gum trees, gutta-percha, palms and dye woods. Near the principal towns wood-cutting and rattan-splitting for the Manila market is the chief industry; rattan, buri, honey, forest gums, balao oil, pitch and other forest products are the chief articles of export; tortoise-shell, obtained from the small neighboring islands, and canoes cut from a single piece of wood are also exported; and there is a considerable production of sago. There are only a few roads, access to inland villages being by mountain trails or by river-canoes; the local trade between coastal towns is carried on mostly by native sailing craft; all exports for Manila and other islands are concentrated at ports of call for steamers.

In June 1902 civil government was extended to Mindoro and adjacent islands, and it was detached from the province of Cavité and made a subprovince of Marinduque (q.v.). The inhabitants of the interior are wild tribes, among whom the Manguianes (about 15,000 in number) predominate; the people of the north coast are mostly Tagálogs, those of the south coast Visayans. The population including the wild tribes of the interior (1939) 131,569.

MINDOVE, MENDOG or **MINDOG** (Lithuanian, MINDAUGAS), first historical sovereign of Lithuania, assassinated in 1263. The son of a certain Ryngold, his genealogy is mythical and little is known of his life. He achieved the unification of the Lithuanian tribes by murdering his brothers and nephews, and extended his sway to the south and east. He was baptised a Christian in 1251 and crowned in 1253. Subsequently he relapsed into paganism. He warred with the Teutonic Knights and the Sword-bearers (Portglaives). After his death Lithuania again fell into anarchy.

MINDSZENT, town of Hungary situated about 80 miles southeast of Budapest on the Tisza River in the district of Csongrad. It is a market town in a region devoted to agriculture and cattle raising. Pop. (1941) 9,630.

MINDSZENTY, Josef, Hungarian cardinal and primate of Hungary: b. Csehimindszent, Hungary, Mar. 29, 1892. He was ordained priest on June 12, 1915, was consecrated bishop March 3, 1944, and on Oct. 2, 1945 was appointed archbishop. On Feb. 18, 1946 he was created cardinal. During the German army's occupation of his country he was imprisoned by the Nazi allies of Hungary because of his outspoken opposition to fascism. After the Communist coup d'état of May 30-31, 1947 and the rigged elections of August 31 by which the Communists secured the levers of government, the cardinal realized that he must now battle the forces of communism in defense of Christian religion and morals. On May 23, 1948 he issued a pastoral letter condemning the proposed nationalization of Hungarian schools. On June 5 the Hungarian government responded to a radio appeal of Pope Pius XII to Hungarian Catholics, urging them to resist the Bolshevization of their country, by a peremptory order to Cardinal Mindszenty to stop his "agitation" against school nationalization. The following day the cardinal instructed the Catholics of his country to boycott pro-government newspapers and radio broadcasts which he denounced for their "falsehood, deceit and terror." On June 10 he informed the government that the church would discuss an agreement only if assured that its schools, the dissolved Bishops' Society, its property and newspapers would not be molested. To this proposal the minister of education replied that the church must recognize Hungary's "institutions, including land reforms and nationalization." There was a brief lull in the conflict between the Communist government and the ecclesiastical authorities. Then, on November 27, Deputy Premier Matyas Rakosi, secretary general of the Hungarian Communist Party, issued a violent denunciation of "spies, traitors, smugglers and Fascists dressed in the robes of a cardinal." On Dec. 27, 1948 it was announced that the cardinal had been arrested in his palace at Budapest and was imprisoned. The charges alleged against him were: plotting aginst the government, spying, treason and blackmarket dealings in currency. Thus was

fulfilled the cardinal's prediction made in a pastoral letter of November 20 that he would soon be silenced by the government. Arrested with him were his secretary, Dr. Andras Zachar, and 12 other alleged accomplices in the crimes, including priests and laymen. All were held incommunicado. On Feb. 2, 1949, the last opposition party in Hungary, the Democratic People's Party, expired, dissolved by its head, Istvan Barankovics who fled for sanctuary to Vienna. The trial of the Hungarian primate began the next day in the Communist People's Court of Budapest with Judge Vilmos Olti presiding. The prisoner, now viewed by foreign correspondents for the first time since his incarceration, had undergone such extraordinary physical changes in little more than a month that he was scarcely recognizable. It was widely believed that he had undergone tortures at the hands of both the Hungarian and the Russian secret police in order to force him to sign self-incriminating statesments for the use of the prosecution. On February 8, after three days of court proceedings, he was sentenced to life imprisonment, having been convicted of treason, trying to overthrow the republic, and foreign currency speculation. All his co-defendants were also adjudged guilty in various degrees.

MINE ACCIDENTS AND THE UNITED STATES BUREAU OF MINES. Notwithstanding the fact that state mine inspection work was started in Pennsylvania as early as 1869 and was adopted gradually by many other mining states well before the beginning of the 20th century, the mines of the United States, and more particularly the coal mines, had established an extremely bad record for accident occurrence, particularly mine explosions. The record became increasingly worse during the first decade of the century and especially during the 5-year period, 1906–1910, inclusive. In those 5 years, there were 84 major coal mine disasters (accidents in which 5 or more persons were killed), with a total of 2,494 fatalities, resulting chiefly from explosions and fires. In one year (1907), there were 18 major coal mine disasters with a total of 919 fatalities, an average of 1½ such disasters per month. In one month (December 1907), there were 5 major coal mine explosion or fire disasters (2 in Pennsylvania and one each in Alabama, New Mexico, and West Virginia), with fatalities totaling 702 or considerably more than the 669 for the entire six years, 1942–1947, inclusive, or the 596 in the 6 years, 1943–1948, inclusive.

Before the beginning of the century, the mining industry had been insistent in its demands for the establishment of a federal department of mines, the western metal-mining people being particularly interested, chiefly for economic reasons. Relatively little progress was made, however, until the epidemic of coal mine disasters in the first decade of the century convinced the entire country that the coal mine disaster problem was one too difficult for the individual states to handle. By 1910, it was the consensus, as expressed editorially in both the public and the technical press and through numerous other agencies, that the problem was one which required vigorous action by the nation as a whole.

At congressional hearings which preceded passage of the act creating the United States Bureau of Mines in the spring of 1910, approximately 100 persons testified or filed statements; they represented practically all phases of the mineral industry, as well as interests or organizations of a public nature, many of which were almost entirely unconnected with the mineral industry. While numerous matters pertaining to the mining industry were presented as reasons for establishing a federal department of mines, almost everyone gave specific attention to the mine safety feature. There is no doubt that the safety problem was the dominating factor in securing passage of the act creating the Bureau of Mines. The agency began to function officially on July 1, 1910, as a unit of the Department of the Interior.

The first annual report of the director of the Bureau of Mines, issued in 1911, states:

> The Bureau of Mines was established by an act of Congress (36 Stat., 369) approved May 16, 1910, and effective July 1, 1910. *The demand for special recognition and aid from the Federal Government for the mining industry had been increasing for a number of years,* especially among the metal-mining interests in the Western States, and from time to time bills looking to the creation of a national bureau or department of mines have been introduced in Congress by representatives of those States. *At the time of the passage of the act establishing the bureau, however, the factors that were most effective in calling attention to the advisability of action by the Government were disasters in coal mines and a growing realization of the waste of both life and resources in the varied mining and metallurgical industries of this country.*

Hence, from the earliest period of the existence of the Bureau of Mines, one of its main objectives has been the prevention of loss of life and limb, and the protection of the health of those who make available the mineral products that are one of the nation's most important sources of greatness, and which assume even greater importance in time of war. During the years that have intervened since the bureau's establishment in 1910, it has consistently and continuously conducted a campaign, primarily educational, designed to achieve the above-mentioned objectives. Educational procedures are used partly because the bureau has no legal authority to enforce suggestions or recommendations as to health, safety, or efficiency, but chiefly because it is believed that if those engaged in the mining industry are kept informed as to what can or should be done, eventually they will adopt and maintain such measures. The nationwide nature of the bureau's health and safety work permits its representatives to become better acquainted with matters pertaining to health and safety in the mines of the United States than can representatives of any other agency—private, industrial, state, or federal.

The health and safety work of the bureau is administered through field districts, and, although some changes have been made from time to time, the districting map of the bureau's Health and Safety Division showed, in 1949, that nearly all of the districts and district headquarters established in 1910 and early in 1911 were still in existence at the outbreak of World War II, and afforded an admirable framework for the administration of nationwide field activities of various kinds connected with mining and allied industries. This was especially so because all of the heads of the districts were engineers with 10, 15 or more years of experience in the work of promoting health and safety in the mineral industries. The organizational setup of the division lent itself admirably to rapid expansion to handle new agencies created to forward the interests of the United States in World War II. Three new branches aggregating nearly 400 persons were functioning effectively by 1942.

Before World War II, the field and adminis-

trative personnel of the Health and Safety Division (exclusive of clerks) totaled 70 persons, 35 of whom were engineers. This rather meager group was entrusted with all the bureau's educational and investigative field work among approximately 1,000,000 persons engaged in mining and allied industries—including coal and noncoal mining, quarrying, metallurgical plants, and the petroleum industry, as well as tunnelling. Approximately 17 persons of the Health Branch were engaged chiefly in laboratory work at the Pittsburgh (Pa.) Central Experiment Station of the bureau, and approximately 100 other persons —chemists, physicists, engineers, etc.—in the Technologic Division were also engaged in safety research laboratory or testing work at the Pittsburgh station or at the experimental mine near Bruceton, Pa.

Fundamentally, the bureau's work in health and safety is research and investigative (both field and laboratory), and educational and service (chiefly done in the field). Most of the laboratory research work is done at Pittsburgh and at nearby Bruceton, partly by employees of the Health and Safety branches of the Health and Safety Division, and partly by the Technologic Division; the field investigative work, up to the time of World War II, was done chiefly by Safety Branch employees, with a limited amount by the Health Branch and by the Technologic Division. Field investigation, as well as the educational and service work, was done principally by the employees of the Safety Branch until World War II. Since the addition of nearly 300 field employees in the Coal Mine Inspection Branch of the Health and Safety Division during and after World War II, almost that entire force has been engaged in educational and investigative field work in coal mining; most of the personnel of the Safety Branch have devoted their activities to noncoal mining. During World War II, the Safety Branch had assigned to it the Mechanical Electrical Section with about 16 employees, engaged largely in the testing of electrical mine equipment, the work being done chiefly at the Pittsburgh experiment station.

The bureau's accident prevention work is almost entirely educational, information being conveyed to those engaged in mining and allied industries partly by the field workers in person; partly through publications; and, to a limited extent, by motion pictures. By far the most effective method of getting this information to the workers has been through safety courses of various kinds, supplemented by other types of contact work done by the field personnel of the Health and Safety Division. These men annually talk to, or see or are seen by, several hundred thousand workers, and do educational work of some kind in at least 3,000 mines or mining communities or plants of mining and allied industries.

Experience has taught those engaged in the bureau's accident prevention work that a procedure which is effective with some workers, or under certain conditions, may be utterly futile with others; hence, numerous types of safety training have been used. From the viewpoint of reaching individual workers, the giving of courses in first aid and mine rescue has proved one of the most effective. More than 2,000,000 persons have taken full or partial courses, using the procedure outlined in the bureau's excellent First-Aid and Mine Rescue Manuals. It has been estimated that since about 1930, at least 200 lives have been saved annually in the mineral industries as the direct or indirect result of this one activity. Courses of accident prevention for mine workers (coal and noncoal), for mine officials, for those handling explosives, for the petroleum industry, and for numerous others, have been given to hundreds of thousands. Printed and multigraphed publications have been issued on several hundred subjects, covering almost every phase of accident occurrence and accident prevention in the mineral industries. The bureau's First-Aid Instruction Manual is known as one of the best available treatises on first-aid instruction; and approximately 2,000,000 copies of it have been issued.

Numerous other procedures are used by the bureau's personnel in their safety education work. They formulate and exhibit motion pictures on safety in the mineral industry; annually give scores of lectures on safety; form and foster safety organizations in mining communities; serve on committees of state agencies, mining institutes, technical societies, etc., engaged in safety work; assemble data on safety performance in the industry; and issue medals and certificates commemorating those safety records. These and many other activities supplement the usual mine and plant inspections, investigations, etc.

Before World War II, almost all of the field educational work was done by the approximately 70 field workers of the Safety Branch, working with an annual budget of less than $400,000.

The Bureau of Mines has been the sole nationwide agency continually and actively forwarding the prevention of accident occurrence in the mineral industries of the United States. It has actuated other agencies in trying to remedy the disgraceful conditions concerning accident occurrence in the mines and mining plants of the United States during the first decade of the century. During much of the bureau's work, those primarily concerned gave more opposition than cooperation. Notwithstanding the obstacles, the results have been gratifying in every phase of accident occurrence in the mineral industries of the United States.

The dread explosion disaster hazard has been brought almost to an irreducible minimum. Instead of an average of 17 major coal mine disasters per year, with approximately 500 fatalities as in the period 1906–1910, inclusive, there were 6 major disasters in 1948 with a total of 49 fatalities. In 1946, there were 2 major coal mine disasters with 27 deaths; in 1939, 1 with 28 deaths; in 1934, 2 with 22 deaths; in 1933, 1 with 7 deaths; and in the 13-month period, June 2, 1938 to July 14, 1939, there was no major coal mine explosion disaster in the United States. In the month of December 1907, there were more persons killed (702) in the United States in major coal mine disasters than in the 6 years 1943–1948, inclusive (596), and this includes the year 1947 in which the Centralia, Ill. disaster occurred.

Unquestionably the Bureau of Mines has succeeded in carrying out the mandate of the people of the United States, expressed through passage of the Act of May 17, 1910, that the federal government try to do what the states had utterly failed to do; namely, ascertain the causes of coal mine disasters and indicate to the states, as well as the coal mining people, the procedures which would bring these dreadful affairs under reasonable control. Major coal mine disasters have not

been eliminated and there is good reason to believe that they never will be if the United States continues to mine coal in the quantities now required. They have been very greatly reduced both in number and in their destruction of human life and property, as is evidenced by the following figures.

The total number of major coal mine disasters in the 5-year period, 1944–1948, inclusive, was 31 or 63 per cent fewer than the 84 in the 5-year period, 1906–1910, inclusive; and the 417 fatalities from the major coal mine disasters of the 5 years, 1944–1948, inclusive, is 83 per cent fewer than the 2,494 of the 5-year period, 1906–1910, inclusive. In other words, 6 coal miners were killed in major disasters in the 5 years, 1906–1910, inclusive, for every 1 in the 5 years, 1944–1948, inclusive, and the latter period includes 1947, with its Centralia disaster. It is also interesting to note that in the 5 years, 1944–1948, inclusive, the people of the United States had about 30 per cent more coal for their various uses than they had in the 5-year period, 1906–1910, inclusive.

In the 5 years, 1906–1910, inclusive, the coal mines of the United States suffered 13,288 fatalities in the production of 2,255,000,000 tons of coal; in the 5 years 1944–1948, inclusive, there were approximately 5,525 fatalities in the reduction of about 3,248,000,000 tons of coal; hence, there was a reduction of 58.4 per cent in the number of fatalities in the recent 5-year period and there was an increase of 44 per cent in the tons produced. The fatality rate per million tons produced in 1906–1910, inclusive, was 5.89 and the similar rate for 1944–1948, inclusive, was 1.70; hence, the fatality rate per million tons of coal was reduced 71.1 per cent in the 1944–1948 period, as compared with the 1906–1910 period; and the people of the United States had the use of nearly 1,000,000,000 tons increased production of coal in 1944–1948, inclusive, with 7,763 fewer lives lost than in the 1906–1910 period.

In 1911, the mining industry as a whole was charged with 3,351 fatalities; careful estimates for 1948 place the total fatalities at about 1,225. And the output of the mines of the United States was far greater in 1948 than in 1911. In 1907, the coal mines of the U.S. produced approximately 147,000 tons per fatality, while the estimated production in 1948 is approximately 640,000 tons. In the period 1930–1948, many underground coal mines produced several million tons per fatality and one produced more than 7,000,000 tons without a fatality. One coal mining company had nearly 200 employees who had worked in and around coal mines more than 35 years without a lost-time accident, several of them having worked more than 50 years. One cement plant with an open-cut quarry operated over 12 years without a lost-time accident in about 3,580,000 man-hours, and produced about 7,260,000 barrels of cement during the period. One underground metal mine worked about 300 men a full year without a lost-time accident and produced about 780,000 tons of rock. One small underground coal mine worked over 30 years (from its beginning to its abandonment) without a single fatality in its aggregate production of more than 1,000,000 tons of coal. There are hundreds of other records of remarkable safety achievement in mining; these are available in the files of the Bureau of Mines and elsewhere.

Twice in the first half of the 20th century, the United States was confronted with an emergency demanding maximum production of coal at a time when manpower was decidedly scarce. In the 3 years of World War I (1916–1918), coal production amounted to 1,920,000,000 tons, at a cost of the lives of 7,502 miners. In a similar 3-year period of stress in World War II (1944–1946), 1,910,000,000 tons of coal were made available at a loss of 3,351 lives. These two 3-year periods represent the largest production the coal industry of the U.S. has ever obtained in three consecutive years. The tonnage in both periods is essentially the same, but the number killed during the period 1944–1946, inclusive, was much less than half of the number sacrificed in the period 1916–1918 inclusive. The difference between the 7,502 killed in 1916–1918, inclusive, in mining virtually the same amount of coal as in the 1944–1946 period, when 3,351 men were killed, indicates a saving of 4,151 lives for the coal mining industry and the country at large. The saving was made at a time when the United States was confronted with the most critical shortage of manpower in its history.

The noncoal mines of the United States have also a notable record of decrease of fatal accident occurrence. In 1911, there were 695 fatalities and in 1945 approximately 112 in the noncoal mines; the fatality rate per thousand 300-day workers was 4.45 in 1911 and about 1.62 in 1945. This shows a reduction of 583 fatalities in comparing these two typical years and a decrease of 63.6 per cent in the fatality rate per thousand 300-day workers. The major disaster fire hazard in metal mines, which took an especially heavy toll of life from 1915 to 1925, has been practically eliminated.

Unquestionably, both coal and noncoal mines have done extremely well in their efforts to improve safety conditions for those engaged in mining work; this does not mean, however, that the ultimate in mine safety has been reached, since the industry still has about the highest accident rate of the major industrial occupations of the United States. However, much progress has been made and the foundation has been firmly laid for the continuance of the downward trend of mine accident occurrence, fatal and nonfatal, which started shortly after the creation of the Bureau of Mines. Mining is an inherently hazardous occupation and it is improbable that the accident rates will ever be brought as low as the average rate for the other major industries of the nation. While the irreducible minimum for mine accident occurrence is far from having been achieved, much progress has been made.

DANIEL HARRINGTON,
Former Chief, Health and Safety Division, U.S. Bureau of Mines.

MINE GAS. Many of the gases occurring in coal mines are of an explosive nature. The commonest of these is marsh gas, CH_4, which is highly explosive when mixed with the right proportion of air. This mixture is known to miners as firedamp. Among other gases occurring in coal mines may be mentioned carbonicacid gas, CO_2 commonly known as chokedamp or blackdamp, and carbon monoxide, CO, known as whitedamp. Afterdamp is a gas found in mines after an explosion has occurred.

MINE PLANTERS. The mine planter service in time of peace is organized for instruction purposes. In time of war the vessels of

this service are assigned to the various coast defenses for service in planting mines. The vessels for this service are known as United States army mine planters, and when not assigned to coast artillery districts, coast defenses or to the Coast Artillery School, are under the control of the quartermaster-general of the army.

MINE RUN, Campaign of. During the Civil War, on 7 and 8 Nov. 1863 General Meade crossed the Rappahannock at Kelley's Ford and Rappahannock Station, and concentrated his army of 70,000 men in the vicinity of Brandy Station, General Lee, with 50,000 men, withdrawing beyond the Rapidan to an entrenched line, the left of which covered some of the fords of the river, the right being perpendicular to it and extending to Bartlett's Mill on Mine Run. On 26 November Meade began the Mine Run campaign by sending the First, Fifth and Second corps to cross the Rapidan at Culpeper Mine and Germanna fords, and the Third and Sixth corps to cross at Jacob's Mill, all five corps to converge upon the old turnpike and the plank-road near Robertson's Tavern, both leading to Orange Court House, and turn the right of Lee's position. An early start was made on the 26th, but owing to delay in some of the columns, all were halted for the night but a short distance beyond the river. The march was resumed at daylight of the 27th. The Second corps reached Robertson's Tavern at 10 A.M., to find itself in the presence of a considerable body of Ewell's corps which Lee had hastened there, and it was ordered to remain on the defensive, until the Third corps, followed by the Sixth, came up on the right. But the Third corps was delayed. Lee, on discovering Meade's movement, had promptly ordered Early, commanding Ewell's corps, to move to the right. Part of his command had reached Robertson's Tavern and confronted the Second corps, and Johnson's division was moving in the same direction when it came into collision with the Third corps, on Payne's Farm, and a battle ensued, lasting until dark. Both sides claimed the advantage, but the engagement resulted in a delay to Meade's operations, and, as he claims, the failure of his campaign. The Union loss was 125 killed, 747 wounded and 71 missing. Lee reported a Confederate loss of 545. The Second corps was severely engaged during the day, and advanced some distance beyond Robertson's Tavern. At night the First corps moved up to the support of the Second. The Fifth corps, which had supported Gregg's cavalry division in an engagement at Parker's store, on the Orange plank-road, was brought over to support the Second, and next morning the Third and Sixth corps came up on the right of the Second. On the 28th Meade advanced to the attack, but on driving in the Confederate pickets it was found that Ewell's corps had fallen back. Pursuit was made, the Second corps in advance, and after a march of two miles Ewell was found in position on the west side of Mine Run. A. P. Hill had come up and formed on Ewell's right, covering the Orange plank-road. The line was very strong, and on it were 150 guns. It was after dark when the Second, Sixth and First corps, with part of the Third, fronted this position. An examination of Lee's position convinced Meade that there was no probability of success in an attack in his immediate front, and he determined to send General Warren, with his Second corps and a division of the Sixth, to feel for Lee's right flank and turn it if practicable. The 29th was spent in reconnoitring and demonstrations, while waiting for Warren's movement. Early in the morning of the 29th Warren started from Robertson's Tavern, crossed over to the plank-road, drove in the skirmishers of A. P. Hill's corps and late in the day came upon Hill's position across the road. Warren reported to Meade that the conditions were favorable for an attack, and personally assured him that he could carry everything before him. Meanwhile some of Sedgwick's division commanders had discovered weak points on Lee's left, no works being thrown up, and Meade ordered an attack for the morning of the 30th, the right and centre to open with artillery at 8 o'clock, at which time Warren was to make the main attack, and at 9 o'clock Sedgwick was to assault Lee's left with five divisions of the Fifth and Sixth corps. Two divisions of the Third corps were sent to Warren, thus increasing his command to six divisions of 26,000 men. The batteries on the right and centre opened a furious fire at 8 A.M. The skirmishers of the First and Third corps advanced across Mine Run and drove in those of the enemy, and Sedgwick was about to assault when Meade ordered him to desist. He had received a dispatch from Warren advising against an attack on Lee's right, as it could not succeed. During the night of the 29th Warren had made dispositions for an overwhelming assault, but on the morning of the 30th he saw on the heights before him a line of strong works thrown up over night, well filled with infantry, and heavy batteries covering the slope up which it was necessary to charge, and therefore he deemed successful attack impossible. Meade rode over to Warren, who proved unchangeable in opinion, and Meade tried to arrange for an attack later in the day, but found it impracticable. The armies remained confronting each other that day and the next, and on the night of 1 December Meade withdrew to his former position beyond the Rapidan. Lee followed part way on the 2d. The Union loss in the Mine Run campaign, 26 November to 2 December, was 173 killed, 1,099 wounded and 381 missing. The Confederate loss was 110 killed, 570 wounded and 65 missing. Consult 'Official Records' (Vol. XXIX); Humphreys, 'From Gettysburg to the Rapidan'; Pennypacker, 'Life of General Meade'; Wather, 'History of the Second Army Corps'; Powell, 'History of the Fifth Army Corps'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

E. A. CARMAN.

MINE SURVEYING. See SURVEYING.

MINE-SWEEPING. Almost immediately upon the development of the mine itself came the development of measures for combating of mines. From the very first the mine was used as a weapon of offense and it became necessary to find some means of protection against it. As early as 1777, Bushnell, an American inventor, devised moving machines which were discharged in the Delaware River against British ships. These were later ridiculed in a ballad called 'The Battle of The Kegs.' Later in the

blockade of American harbors by the British in 1813, and in the Crimean War, nothing more useful seems to have been employed in the detection and destruction of mines than dragging for them with nets, etc.

During the American Civil War, however, mines began to be used on so large a scale and so effectively that it became necessary for the Northern States to adopt adequate measures for protection against them. The first idea was to creep for the cable connecting the torpedoes, in the hope that the creep would break the cable or explode the mines. Later, chains towed between two vessels were used in an attempt to seize the moorings of the mines, the latter being then raised and rendered harmless. These methods do not appear to have met with any great measure of success.

In 1863, Ericsson constructed his mine destroyer, which consisted mainly of a strong float attached to the forward part of the ship and extending well to the front of the bow. At the extreme front end of the float and several meters under the surface of the water was fixed an explosive charge of 700 pounds of powder. In front of the charge were rigged two timbers which, upon engaging an obstacle, closed upon each other as do the parts of a parallel ruler, thereby igniting the charge. The important feature of the invention was the air chamber placed directly in front of the charge. This gave way at the push of the explosion and allowed the full force to be sent forward against the obstacle, thereby protecting the float itself from any damage. A large number of these mine-catchers were produced at that time, but for some reason or other no further use appears to have been made of the invention.

Mines had been used mostly as a weapon of defense for the protection of coastal localities and the blocking of channels, until the outbreak of the Russo-Japanese War. During this war, however, it became the custom to strew broadcast great numbers of unanchored mines, and it became necessary to find a means of searching out the location of these mines and destroying them.

The oldest method of protecting warships against mines was in the use of less valuable ships as exploders. One or more of these would go ahead of the battleships, in the hope of striking and exploding enough mines to make a breach in the minefield. The exploder had to be of draught at least equal to that of the ship to be protected, and also had to be so constructed that after the explosion of the first mine the engines would still drive it ahead to the destruction of others. To meet the latter requirement, the ship had to have its engines located aft, as in the case of tank steamers. Of course, the exploder was inevitably sacrificed, so that the method was a very expensive one. Other objections were that even a number of these ships might go through a field and miss mines that would sink the ships to be protected, and that success in the exploder's mission meant sure death to her crew.

For ways and means of detecting and destroying mines during World Wars I and II see the section on *Minesweeping* in the article on SUBMARINE MINES, MINELAYING, AND MINESWEEPING.

MINE WORKERS OF AMERICA, United. See UNITED MINE WORKERS OF AMERICA.

MINEOLA, mĭn-ē-ō'là, village, New York, and Nassau County seat, on Long Island, eight miles east-northeast of Jamaica, Long Island, and 20 miles east of New York City. It is at the junction of the main line and Oyster Bay branch of the Long Island Rail Road. The altitude is 106 feet above sea level. To the east are the fashionable villages of Westbury and Old Westbury.

The region is largely devoted to aviation. Here is located Mitchel Air Force Base (U.S. Army) named for John Purroy Mitchel, mayor of New York from 1914–1917, who was killed in an airplane accident in 1918. Roosevelt Field is nearby. Industries include the manufacture of clothing, radio parts, food products, machinery, and wood and metal products. Mineola is also a commercial center for the surrounding potato and truck farming area. The village was incorporated in 1906 and is governed by a mayor and board of trustees. Pop. (1950) 14,831.

MINEOLA, city, Texas, in Wood County; altitude 414 feet above sea level; 80 miles east of Dallas. It is served by the Texas and Pacific, the Missouri-Kansas & Texas, and the International and Great Northern railroads. Mineola is a busy transportation, trading, and produce marketing center for the surrounding area. Manufactures include tile, lumber products, cement blocks, and mattresses.

Founded in 1873, it was incorporated in 1913, and has a mayor-alderman form of government. Pop. (1950) 3,626.

MINER, Jack (John Thomas), Canadian naturalist, author, and lecturer: b. Dover Center, near Cleveland, Ohio, April 10, 1865; d. Kingsville, Ontario, Canada, Nov. 3, 1944. In 1878 he moved to Canada with his parents who settled in Essex County, Ontario.

On his farm at Kingsville, Ontario, he established a bird sanctuary in 1904 which soon achieved world-wide fame and Miner became known as one of the chief bird conservationists of North America. In 1931, his friends, in appreciation of his pioneering work, established the Jack Miner Migratory-Bird Foundation for the purpose of continuing the work of his bird sanctuary.

He lectured once or twice on conservation of bird life in every town and city of Canada with a population of 2,000 or more. He wrote: *Jack Miner on Current Topics* (1929); *Jack Miner and the Birds* (1934).

MINER, Roy Waldo, American curator: b. North Adams, Mass., Feb. 24, 1875. He was graduated from Williams College in 1897; from the General Theological Seminary in 1900; and took his Ph.D. at Columbia University in 1923. He was a master in Latin and biology at Berkeley School, 1900–1904; was associate headmaster, Kelvin School, N. Y., 1904–1905; and in the latter year became assistant curator of invertebrate zoology at the American Museum of Natural History. He was made associate curator in 1917, and in 1922 became curator of marine life in the same institution. He was a member of the International Fisheries Conference in Washington in 1909; and has participated in numerous scientific expeditions. His publications include *Animals of the Wharf Piles, Field Book of Sea Shore Life, Diving in Coral Gardens,*

The Kingdom of the Tides, A Transplanted Coral Reef.

MINER, William Harvey, American journalist and author: b. New Haven, Conn., March 5, 1877. He took a special literary course at Yale University in 1896 and was graduated at Columbian (now George Washington) University in 1899. For a time he was a staff member of the Lowell (Mass.) *Mail.* He traveled extensively in the Middle and Far West, in Canada and in Europe and published *George Catlin, a Memoir* (1900); *The Lewis and Clark Expedition* (1901); *Daniel Boone* (1901); *The Rowfant Club* (1903); *The Beginnings of American Science* (1906); *Savage and Chatterton* (1907); *Life of Charles Churchill* (1907); *The Iowa Indians* (1911); *History of the American Indians, North of Mexico* (1917). Died Feb. 10, 1934.

MINERAL ACIDS, Toxicology of. Poisoning by ingestion of sulphuric acid causes pain in mouth, nose, throat and epigastrium; bloody saliva; vomiting, bloody diarrhoea; feeble pulse; cold, damp surface; and collapse. Ulceration of stomach and larynx may occur and if the patient survives, a form of Bright's disease follows quickly. The antidote is any available alkali as soap, chalk, magnesia or whitewash, scraped, perhaps, from a wall. Hydrochloric acid (q.v.) causes similar though possibly less severe symptoms and recovery is more often possible. The antidotes are the same. Nitric acid (q.v.) exceeds sulphuric in the violence of the symptoms caused, with sudden death. Instead of black sloughs in the mouth, oesophagus and stomach, such as occur in sulphuric acid poisoning, in nitric acid intoxication yellow sloughs and stains are found after death. Nitromuriatic acid poisoning resembles poisoning by nitric acid in symptoms and pathological results. Similar yellow staining is found. The antidotes are alkalis. Phosphoric acid (q.v.) is not corrosive to animal tissues, though the glacial acid coagulates albumen. Its antidote is any alkali at hand, but its effects are not highly dangerous. See also Acid; Toxicology.

MINERAL COLORS, inorganic materials in the making of paint. They date as far back (or farther) in the history of coloring materials as organic materials, the paints used by primitive peoples for personal decoration being more commonly of this class. In Greek painting the main sources of coloring matter were carbonate of chalk for whites; red and yellow ochres; and carbon. Apparently these same colors were used in Egyptian wall-painting. The range was much widened at the beginning of the Christian era at Rome and the chemical activity of the last century has added largely to the mineral sources of colors. These may be roughly classified as follows: Whites from calcium, for example, carbonate and sulphate; from barium, for example, sulphate (natural and artificial) and tungstate; from lead, for example, carbonate, hydrocarbonate, sulphate, antimonite, tungstate; from zinc, the oxide, oxychlorine, etc.; from silicum and talc; from antimony; and from the hyponitrate of bismuth. Reds are based on iron, as sesquioxide and red ochre; on mercury; on lead, as minium; on arsenic, as arseniate of cobalt; on antimony and on gold. The greatest source of yellows is chromic acid derivatives; next the lead colors; and then the ochres and other minor sources. Blues are derived from copper (hydrate, arseniate, carbonate), from cobalt (aluminates and silicates) and from iron (phosphates, etc.); greens from chrome (notably sesquioxide), copper, manganese, etc.; and blacks mostly from carbons. An excellent handbook of the subject is Perret, *Couleurs Minérales* (1902).

MINERAL DRESSING. See Mining—*Mineral Dressing.*

MINERAL PHOSPHATES. See Fertilizers—*Phosphates.*

MINERAL PIGMENTS. See Mineral Production of the United States.

MINERAL POINT, Wis., city in Iowa County; alt. 944 feet; about 45m. SW. of Madison, on the Chicago, Milwaukee, St. Paul and Pacific Railroad. The great mineral deposits which gave the city its name were discovered in 1828, and boom days followed. By 1836 the population numbered 2,000. When the lead mines began to dwindle, zinc mining boomed, and when mining generally declined, the town turned to retailing, shipping, etc. Pop. (1950) 2,284.

MINERAL PRODUCTION OF THE UNITED STATES. The production of minerals, both metallic and nonmetallic, is one of the most important industries of the United States, and has been since early colonial days. An exploratory expedition sent out from England by Sir Walter Raleigh and commanded by Ralph Lane reported the discovery of iron ore in 1585 in the area that is now North Carolina, and the search for minerals, especially iron ore, was one of the functions of many of the early explorations. Attempts were made to establish the mining and smelting of iron ore at Falling Creek, Va., as early as 1619, but the first successful project was at Saugus Creek, Mass., in 1645. This date marks the beginning of an established commercial mineral production in the territory that was later to become the United States, although from the establishment of the earliest settlements, local artisans had mined and used such products as stone, sand, gravel, and clay. From these early beginnings the mineral production has grown with the passing years, at first slowly, and then more rapidly, with the bulk of the development in the past 100 years.

With the exception of products for purely local consumption (such as stone, sand, gravel, and clay), as distinguished from products for general commercial distribution, the mineral production of the United States prior to 1850 was largely confined to coal and iron. Lead had been produced on a small scale, and still smaller amounts of copper, gold and silver. But it was not until after the close of the Civil War that mineral production began the advances that pyramided so rapidly that the spectacular eventually became commonplace in the industry. By 1880, the first year for which full official records are available, the value of the total mineral production of the United States had grown to $367,000,000, and the closing years of the 19th century saw the valuation pass the billion dollar mark—a feat first accomplished in 1899. At the time, this was considered quite an accomplishment, but pro-

duction continued to expand so rapidly that in 1917, only 18 years later, the leading state (Pennsylvania) passed the billion dollar mark by a margin of over a third. Texas joined the "billion dollar club" in 1944, and in 1947, West Virginia was bidding for admission in the near future, and California was not far behind. In the meantime, Pennsylvania had passed the two billion dollar mark, and the national total had passed 12 billions with a margin larger than the 1880 total.

Before entering into any discussion of the growing magnitude of the mineral production, attention should first be centered on the fact that there is no means of securing any exact measure of that magnitude. One can add tons of coal and of iron ore, bauxite, stone, and other similar products, and secure a figure that is a real measure of the magnitude of production. One can convert barrels of petroleum and even cubic feet of natural gas into an approximate equivalent tonnage and include these figures in the total without causing serious discrepancies. However, if one includes the corresponding tonnage equivalents of ounces of gold and silver, the totals lose all real significance as a measure of magnitude, for between a ton of gold and a ton of coal the real measure is one of value, rather than of weight. On the other hand, there are also difficulties in the use of value as a basis of comparison. Shall we take the value of iron ore at the mine, or the value of the pig iron produced from the ore? For the purpose with which we are concerned, the ore seems more logical, but when we come to copper, gold, silver, and many of the other metals, there is little basis for determining the valuation of the ore at the mine. Few such ores are sold in the open market, as most of them are treated by the producer, who sells the resultant metal, rather than the ore. In determining the values of such products, it is therefore necessary to use the market value of the recoverable metal in the ore. Since such a valuation includes, in the result, the cost of transportation and of smelting, the figures are appreciably higher than the value of the ore at the mine, but are still usable for general comparison purposes, lacking a better basis.

Another difficulty encountered in using value as a basis for comparison is that changes in the physical volume of the products are so often masked by changing prices of the product. Hence, the total value of mineral production as used in this discussion can be considered only an approximate indicator and not a true measure of the physical volume of the products concerned. Commodity prices have also made extensive advances since 1880, and the fact that the 1948 valuation is 42 times that of 1880 does not mean that the tonnage output has increased in the same proportion. In normal times, the values for successive years are determined more by volume of output than by price, but in years such as 1947 and 1948, and to a lesser degree in 1920, the values are likely to represent price advances more than increased output. Likewise, during the depression years, prices and output were both decreasing, thus intensifying the decline as expressed in dollar value. On the other hand, one must not lose sight of the fact that as demand and production increased, many production costs were lowered, and the output was going up while prices were going down.

The annual records of the total value of mineral production in the United States, as compiled first by the United States Geological Survey and later by the United States Bureau of Mines, from 1880 to 1948, are shown in the accompanying Table 1, with totals broken down into the three major subheads—*Metallics, Fuels,* and *Nonmetallics.*

Table 1.—VALUE OF MINERAL PRODUCTS OF THE UNITED STATES, 1880–1948

(millions of dollars)

Year	Metallics	Fuels	Non-metallics	Total
1880	$190.9	$120.2	$56.3	$367.5
1881	192.7	149.8	60.7	403.1
1882	219.1	170.5	63.6	453.1
1883	201.1	185.8	61.2	448.1
1884	182.8	165.8	58.4	407.0
1885	174.7	183.1	61.8	419.6
1886	204.8	184.6	66.8	456.2
1887	241.2	217.3	77.2	535.6
1888	242.5	231.5	79.9	553.8
1889	250.8	208.3	83.2	542.3
1890	303.9	231.0	80.5	615.4
1891	281.0	237.2	82.7	600.8
1892	284.2	248.3	89.7	622.2
1893	223.7	251.7	70.1	545.4
1894	187.3	235.6	127.3	550.2
1895	248.5	268.4	125.7	642.7
1896	252.6	268.2	120.3	641.0
1897	270.4	253.6	127.6	651.6
1898	308.7	267.5	150.8	727.0
1899	484.0	340.8	185.3	1,010.1
1900	514.2	406.4	188.3	1,108.9
1901	493.8	442.4	218.9	1,155.1
1902	605.0	469.1	253.9	1,328.0
1903	589.3	634.2	271.9	1,495.4
1904	501.3	584.0	273.8	1,359.2
1905	702.8	602.3	318.7	1,623.8
1906	886.3	652.4	362.2	1,900.9
1907	904.2	789.1	376.3	2,069.6
1908	550.9	716.0	324.8	1,591.8
1909	755.1	746.2	385.8	1,887.1
1910	750.0	828.2	409.6	1,987.8
1911	681.0	835.8	407.3	1,924.1
1912	862.2	945.5	430.1	2,237.8
1913	879.1	1,087.8	466.6	2,433.5
1914	687.1	992.8	431.2	2,111.2
1915	993.4	972.6	428.7	2,394.6
1916	1,622.1	1,332.6	553.7	3,508.4
1917	2,088.9	2,237.8	665.7	4,992.5
1918	2,156.6	2,736.2	648.0	5,540.7
1919	1,361.1	2,510.9	751.8	4,623.8
1920	1,763.7	4,192.9	1,024.8	6,981.3
1921	654.7	2,703.5	780.3	4,138.5
1922	988.1	2,737.8	921.3	4,647.3
1923	1,511.9	3,317.1	1,157.5	5,986.5
1924	1,233.4	2,898.6	1,173.8	5,305.8
1925	1,382.2	3,058.7	1,236.8	5,677.6
1926	1,405.3	3,541.9	1,266.3	6,213.6
1927	1,220.6	3,060.0	1,249.3	5,530.0
1928	1,288.3	2,885.0	1,211.9	5,385.2
1929	1,480.4	3,190.5	1,216.7	5,887.6
1930	985.8	2,764.5	1,014.5	4,764.8
1931	569.8	1,892.4	704.4	3,166.6
1932	285.9	1,743.4	432.4	2,461.7
1933	417.1	1,683.4	454.6	2,555.1
1934	548.9	2,233.3	543.2	3,325.4
1935	733.1	2,330.0	586.9	3,650.0
1936	1,081.6	2,759.2	716.0	4,556.8
1937	1,468.2	3,200.5	744.7	5,413.4
1938	892.6	2,820.3	650.3	4,363.2
1939	1,291.7	2,834.3	788.2	4,914.2
1940	1,678.6	3,116,5	818.8	5,613.9
1941	2,132.0	3,708.1	1,037.9	6,878.0
1942	2,363.9	4,103.4	1,109.0	7,576.3
1943	2,488.0	4,608.3	975.5	8,071.8
1944	2,340.0	5,178.0	899.0	8,417.0
1945	1,975.0	5,212.0	954.0	8,141.0
1946	1,825.0	5,760.0	1,311.0	8,896.0
1947	2,915.0	7,843.0	1,635.0	12,393.0
1948	3,690.0	10,180.0	1,750.0	15,620.0
Total	$66,410.0	$130,498.3	$38,360.5	$234,998.8

Careful study indicates that the development of mineral production, as indicated by total value of the products, has been four distinct economic periods. The first of these periods, beginning in earlier years not covered by the data, and extending to 1897, exhibited a general but moderate upward trend that was intensified to an appreciable degree during 1898–1913. After the sharp increase developed by World War I, the total fluctuated from year to year, partly due to varying output, and partly to changing prices, but the slope of the general trend had dropped back almost to horizontal, and turned abruptly downward during the depression years. Then, just as production was coming back to normal after the depression, output was stimulated by World War II and the sharply rising trend that had been established during the recovery from the depression was continued on through the war period, and was even somewhat accentuated during the early postwar years. This period from 1932 to 1948 shows a rate of increase in total valuation that is not paralleled in any part of the previous record.

Before leaving the subject of value of mineral production, some attention should be given to a comparison of the values contributed to the totals by each of the three major subdivisions of the mineral industry. Up to the beginning of World War I, metallics and fuels were in constant competition for first place; for a time, one would be in the lead, and then the other. Although metallics led in more years, such margins of surplus as fell to fuels were larger, so that at the end of 1914 the two valuations, totaled since 1880, were almost identical, each having 40 per cent of the grand total since 1880. However, since 1917, fuels have been definitely in the lead, due chiefly to the steady expansion of petroleum production.

Nonmetallic minerals have, in general, ranked low in value in comparison with metallics and fuels, because many of the largest tonnage items, like crushed stone, sand, and gravel, are low-priced items, but from 1921 to 1934, nonmetallics made a better showing than metallics. In 1948, nonmetallics contributed 11 per cent of the grand total of value, as against 65 per cent for fuels, and 24 per cent for metallics.

In Table 2, the principal mineral products of the United States are listed according to the state of origin, and arranged roughly in decreasing order of value of the 1947 output; also the values of the state outputs in the more important years, according to the reports of the United States Geological Survey and the Bureau of Mines. Lack of space prevents the showing of values for more than a few years; hence, the years selected are those which show the scope of the changes that have occurred—that is, 1918, the peak year of World War I; 1926, the peak year of the postwar boom period; 1932, the low year of the depression period; 1939, the last year before production was affected by the World War II; 1944, the peak year of World War II; and postwar 1947. The data for these years show the extremes of fluctuations in mineral production as affected by the trend of current events.

Mineral Products.—The following paragraphs list the various mineral products of the United States, with brief notes on major uses and sources by states of origin. In general, states are listed in the order of decreasing output as of 1947, but in some cases, 1947 data are not available, and the order is based on earlier data. Usually no attempt is made to list all states contributing to the output, but only those responsible for the major portion of the total.

Aluminum.—Metallic aluminum is recovered from bauxite of domestic and foreign origin, imports being greater than domestic output. It is used in the making of lightweight machinery, equipment and utensils; in automotive and aircraft construction; and in electrical conductors and building construction. The leading producing states are Washington, Tennessee, New York, and Oregon, the shift of production to the western states being a wartime development.

Antimony.—Metallic antimony is produced more extensively from imported ores than from domestic production, which originates chiefly in Idaho, Nevada, Washington, and Alaska. The metal is used mainly as a hardener for lead, in storage batteries, bearing metals, type metal, and numerous minor uses. Some antimony is also recovered in the smelting of antimonial lead ores. Much ore also goes into the oxide, for use in ceramic frits and enamels, paints, flameproofing textiles, and minor uses. Smelters are located in Texas, California, and Idaho.

Arsenic.—Used in making insecticides, fungicides, drugs, chemicals, and dyes, arsenic is a byproduct recovered in the smelting of copper ores. The domestic output is largely in Montana and Utah, and must be supplemented by imports.

Asbestos.—Used as a heat and electrical insulator, and in building materials, it is mined in small quantities in several states, chiefly Vermont, Arizona, North Carolina, and Georgia, but only to the extent of about 3 per cent of the demand. The bulk of the asbestos consumed is imported, mainly from Canada.

Asphalt.—The bulk of the asphalt output is a byproduct in the refining of petroleum and is used as a paving material. Small amounts of the natural asphalts, gilsonite and wurtzilite, are mined in Utah, and considerable tonnages of bituminous rock are produced in Texas, Kentucky, and Oklahoma, with smaller amounts in several other states.

Barite.—Formerly used principally as a white pigment and filler in paints, barite became more important as a drilling mud in gas and oil wells. Smaller amounts are used in the glass and rubber industries. Domestic production is chiefly in Arkansas, Missouri, Georgia, Nevada, and Tennessee.

Bauxite.—The major use of bauxite is as an ore for the production of aluminum, with smaller amounts going into artificial abrasives and aluminum salts for industrial use. The major producing states are Arkansas, Alabama, and Georgia, but imports exceed the domestic output.

Bentonite.—Technically classed as a type of clay, bentonite is produced mainly in Wyoming, South Dakota, and Texas. Its uses are specialized, and differ widely from the usual uses of clay; these specialized applications include the bonding of foundry sand, filtering and decolorizing mineral and vegetable oils, and drilling mud for gas and oil wells, besides a number of minor uses.

Beryllium.—Used mainly in the production of alloys with copper and nickel, but chiefly copper. Domestic ores from South Dakota, New Hampshire, Connecticut, Colorado, and Maine supply only a fraction of the demand.

Bismuth.—The production of alloys with low melting points now takes a considerable proportion of the bismuth output. Supplies are largely imported, and the domestic output is mostly as a byproduct in the treatment of ores of other metals, especially lead and copper.

Boron Minerals.—Formerly obtained almost entirely from kernite, also known as rasorite, the commercial boron minerals now also include ulexite, colemanite, and boric acid, as well as dissolved borates in saline lake deposits. Borates are used extensively in ceramics, chiefly enamel coatings for iron and steel, and for certain types of glass. They are used to a lesser extent in the making of soaps; in dyeing and tanning; and as a larvacide, preservative, disinfectant, and a constituent in fertilizers. California supplies the entire domestic output, with a large surplus for export.

Bromine.—Formerly recovered only from the salt brines of wells in Michigan, Ohio, West Virginia, and California, the bulk of the bromine output is now obtained directly from sea water at plants in Texas. The major use is in the production of tetraethyl lead, the antiknock compound used in gasoline, but smaller amounts go into chemicals for industrial and medical use.

Cadmium.—Used as a protective coating for steel, in bearing metal for high speed engines, and in alloys for various other purposes, cadmium is recovered almost entirely as a byproduct from the treatment of zinc, lead and copper ores. Certain of the compounds are used as pigments.

Calcium and Magnesium Chlorides.—Used in stabilizing road surfaces, in cement mixes, in making heavy solutions for coal washing plants, and in melting

Table 2—PRINCIPAL MINERAL PRODUCTS AND VALUES OF OUTPUT FOR STATES OF THE UNITED STATES[1]

State	Rank (1947)	Per cent of total U.S. value (1947)	Principal mineral products roughly in order of value (1947)	Value of principal mineral products for various years (1918–1947) (thousands of dollars)					
				1918	1926	1932	1939	1944	1947
Alabama	15	1.64	Coal, iron ore, cement, clay products, stone, lime	$77,796	$83,710	$19,170	$52,158	$109,149	$159,788
Alaska	38	.19	Gold, sand and gravel, coal, stone, mercury, silver	28,217	17,607	11,526	25,674	6,903	18,387
Arizona	13	1.92	Copper, zinc, lead, silver, gold, sand and gravel, clay	203,993	115,048	15,204	75,088	115,592	186,751
Arkansas	23	.93	Petroleum, coal, bauxite, natural gas, natural gasoline	14,082	84,486	15,540	29,573	64,079	90,833
California	3	8.79	Petroleum, natural gas, natural gasoline, cement, clay, gold	204,674	524,282	286,683	467,612	506,216	855,553
Colorado	22	1.08	Petroleum, coal, zinc, molybdenum, gold, clay, silver, sand and gravel	79,004	65,597	25,800	64,145	79,137	105,135
Connecticut	46	.06	Clay products, stone, sand and gravel, lime, feldspar, peat	3,501	7,695	1,911	4,306	4,496	5,677
Delaware	50	.01	Clay products, sand and gravel, stone	373	376	300	401	182	613
Dist. of Col.	49	.01	Clay products, raw clay	99	987	1,819	592	111	746
Florida	28	.47	Phosphate rock, stone, cement, sand and gravel, clay	7,759	19,701	7,108	13,060	21,896	45,992
Georgia	33	.38	Raw clay, stone, clay products, cement, barite, iron ore	8,312	17,480	6,293	14,634	19,005	37,137
Idaho	27	.70	Lead, zinc, silver, phosphate rock, sand and gravel, gold, antimony	36,872	31,753	9,478	33,138	51,321	67,786
Illinois	5	4.40	Coal, petroleum, stone, cement, clay, sand and gravel, fluorspar	271,244	237,242	71,693	210,798	329,147	428,327
Indiana	17	1.45	Coal, cement, petroleum, stone, clay, sand and gravel, gas	96,559	118,692	34,603	53,885	89,760	141,086
Iowa	32	.41	Cement, clay products, stone, coal, sand and gravel	38,742	35,972	18,523	25,170	22,452	39,378
Kansas	10	2.75	Petroleum, cement, natural gas, zinc, coal, salt, stone, clay	147,902	165,061	58,471	122,960	170,560	267,020
Kentucky	7	4.07	Coal, petroleum, natural gas, stone, clay, fluorspar	104,166	146,768	59,076	112,841	250,735	395,745
Louisiana	6	4.08	Petroleum, natural gasoline, natural gas, sulfur, salt	54,769	62,204	61,097	168,903	217,733	397,312
Maine	45	.06	Cement, stone, sand and gravel, slate, clay, feldspar, peat	3,727	5,786	3,174	3,770	2,150	6,049
Maryland	35	.26	Coal, sand and gravel, cement, clay products, stone, lime	20,867	24,067	7,234	11,782	15,264	25,604
Massachusetts	41	.12	Stone, sand and gravel, clay products, lime	7,258	16,787	8,039	8,243	5,263	11,859
Michigan	14	1.75	Iron ore, petroleum, cement, salt, gas, stone, sand and gravel	158,312	130,861	34,714	116,088	140,520	170,616
Minnesota	11	2.26	Iron ore, sand and gravel, stone, manganiferous ore, clay	155,413	118,361	12,273	106,456	170,488	219,685
Mississippi	26	.70	Petroleum, natural gas, sand and gravel, clay products	925	1,883	2,719	5,192	18,675	68,092
Missouri	21	1.10	Lead, cement, coal, stone, lime, zinc, sand and gravel, clay	76,664	90,004	29,245	45,634	72,890	107,021
Montana	24	.90	Copper, petroleum, zinc, coal, gas, silver, gold, lead	139,332	79,766	19,023	63,344	82,290	87,167
Nebraska	44	.08	Cement, sand and gravel, clay products, stone, petroleum	6,513	3,322	1,548	4,390	5,060	7,383
Nevada	30	.44	Copper, zinc, gold, tungsten ore, lead, gypsum, silver	51,080	27,613	6,568	34,671	51,800	42,639
New Hampshire	47	.02	Sand and gravel, stone, clay products, feldspar, mica	1,454	4,145	1,352	1,187	1,164	1,574
New Jersey	29	.46	Zinc, clay products, sand and gravel, stone, iron ore	49,510	77,066	23,073	30,442	33,828	44,250
New Mexico	16	1.61	Petroleum, potassium salts, copper, zinc, gas, coal	40,631	28,514	20,264	69,988	112,180	156,554
New York	18	1.34	Cement, petroleum, iron ore, stone, salt, sand and gravel, zinc	52,769	112,016	50,176	78,410	84,286	130,735
N. Carolina	36	.24	Clay products, stone, sand and gravel, talc and pyrophyllite	4,973	10,993	2,466	18,534	22,199	23,699
North Dakota	43	.08	Coal, sand and gravel, clay products, natural gas	1,823	2,805	2,386	2,690	4,334	7,629
Ohio	9	3.04	Coal, clay products, stone, lime, gas, cement, petroleum, salt	246,162	253,884	87,997	120,682	174,582	296,147
Oklahoma	8	3.61	Petroleum, natural gasoline, natural gas, coal, zinc, stone	336,858	569,519	185,121	236,194	225,833	351,578
Oregon	39	.17	Sand and gravel, stone, cement, clay products, gold, mercury	4,192	6,941	2,989	8,637	9,657	16,658
Pennsylvania	2	13.02	Coal, cement, petroleum, stone, clay, sand and gravel, lime, slate	979,245	1,055,766	424,734	531,008	962,208	1,266,285
Rhode Island	48	.01	Stone, sand and gravel, graphite	761	1,339	506	981	612	785
S. Carolina	42	.11	Stone, clay products, raw clay, sand and gravel	1,559	3,677	951	5,423	4,192	10,362
South Dakota	37	.24	Gold, stone, raw clay, sand and gravel, feldspar, mica, silver	7,442	7,595	11,118	24,814	5,471	23,636
Tennessee	25	.87	Coal, cement, stone, phosphate rock, zinc, sand and gravel, clay	39,230	39,297	14,562	39,818	63,994	84,425
Texas	1	19.80	Petroleum, natural gasoline, natural gas, sulfur, cement	110,306	420,587	390,141	701,972	1,133,756	1,926,699
Utah	12	2.12	Copper, coal, gold, lead, zinc, silver, asphalt, iron ore, gas	105,785	98,985	22,620	80,128	148,308	206,639
Vermont	40	.15	Stone, slate, talc, copper, sand and gravel, asbestos	9,159	14,955	6,401	6,972	7,672	14,818
Virginia	19	1.32	Coal, stone, zinc, clay products, sand and gravel, lime, lead	37,639	46,136	16,927	43,903	86,951	128,700
Washington	31	.41	Cement, coal, sand and gravel, stone, zinc, clay, gold, copper	21,000	21,257	12,817	31,596	36,483	40,027
W. Virginia	4	8.79	Coal, natural gas, petroleum, natural gasoline, clay, lime	327,963	395,942	156,643	276,084	547,851	855,150
Wisconsin	34	.36	Stone, sand and gravel, iron ore, zinc, lime, clay, lead	20,091	20,712	7,414	12,705	22,798	34,942
Wyoming	20	1.22	Petroleum, coal, gas, natural gasoline, raw clay, stone	42,596	78,988	27,343	39,413	68,034	118,422

[1] In this table iron ore, not pig iron, is taken as the basis of iron valuation. The rank of natural gas in this table (in contrast to Table 1) is based on value at wells rather than value at points of consumption.

snow and ice on streets and roads. Production is mainly from well brines in Michigan, West Virginia, and California.

Cement.—Limestone and other raw mineral materials for the making of cement are available in all parts of the country, but in some locations slag from iron furnaces is used as a substitute. Cement production is highest in Pennsylvania, California, Texas, New York, Michigan, Ohio, Alabama, Missouri, and Kansas.

Chromite.—Used mainly as an ore for the production of chromium, but also as a refractory and a source of chromium chemicals. The supply is almost entirely imported; normally the small domestic output is usually confined to California, but there has been production in Montana, Oregon, and Alaska.

Chromium.—The metal is an important constituent in alloy steels, particularly of the stainless type, and in nonferrous alloys requiring high electrical resistance, high hardness, and resistance to oxidation and corrosion. (For the ore, see the article CHROMITE.)

Clays.—Clay for some type of use is listed in the mineral production of every state except Rhode Island. The ordinary types of clay are most widely distributed, while the special types, fire clay, kaolin and ball clay, are more restricted, in the order named. (For details, see the article on CLAY.)

Coal.—Coal is produced in 28 states and Alaska, but the four leading states, Pennsylvania, West Virginia, Kentucky, and Illinois, supply more than three quarters of the total, and the next four, Ohio, Indiana, Virginia, and Alabama, another 15 per cent. (See the article on COAL.)

Coke.—Used mainly as a fuel in the production of pig iron; as a domestic fuel, in gas manufacture, and in iron foundries; other industrial uses account for about a quarter of the total. About 90 per cent of the coke made from coal is produced in byproduct ovens, and most of the remainder in beehive ovens. Small amounts are made in gas retorts and special types of ovens. Relatively little coke is made in the distillation of petroleum or tar. Coke production is concentrated most heavily in the states consuming the product, rather than those producing the coal, and so follows the pattern of distribution of pig iron production.

Columbium.—Used mainly as an alloying agent in stainless steel, to improve corrosion resistance, columbium is chiefly imported. There has been a small domestic output of tantalum-columbium concentrates in New Mexico, South Dakota, North Carolina, and Virginia.

Copper.—Used in electrical work as a conductor, and in a wide variety of alloys, of which the most important are brass and bronze. The chief producing states are Arizona, Utah, New Mexico, Montana, and Michigan.

Diatomite.—Used as a filter aid, filler, insulating material, and abrasive. Production is mainly in California, Oregon, Nevada, and Washington.

Dolomite.—Sources of dolomite are widely distributed in many states. It is used as a refractory and as a source of magnesia and magnesium.

Emery.—Used as an abrasive, but artificial abrasives have largely replaced emery in industry. Domestic production is confined to a deposit near Peekskill, N. Y., with smaller amounts imported.

Feldspar.—Used for the most part in the making of glass, pottery, and enamels, with small amounts going into soaps and cleansers, where it serves as a mild abrasive. Domestic production is spread over a dozen or more states, with North Carolina, South Dakota, Colorado, and Virginia leading. Relatively small amounts are imported.

Fluorspar.—Used in the manufacture of steel, cast iron, hydrofluoric acid, glass and enamels. Clear crystals are used in optical instruments. The major producing states are Illinois, Kentucky, Colorado, and New Mexico.

Fuller's Earth.—A specialized type of clay, with specialized applications that differ widely from the usual uses of clay. The bulk of the output is used in the filtering and decolorizing of vegetable and mineral oils, but there is an increasing demand for it as an absorbent, to take up spilled oils and other liquids. The leading producing states are Florida, Georgia, Illinois, and Texas.

Garnet.—Used as an abrasive, where a material harder than quartz is required. The finer crystals are used as gems. Abrasive material is found in New York, Idaho, New Hampshire, and North Carolina, with commercial production limited to the first two.

Gem Stones.—No precious stones are recovered commercially in the United States, though deposits of sapphire are known to exist in Montana, and of diamonds in Arkansas. A wide variety of semiprecious and ornamental stones is produced, mostly in the Rocky Mountain and Coastal areas but to some extent in the eastern states. Most important of these stones are nephrite, agate, turquoise, and variscite.

Gold.—Although the bulk of the gold output is absorbed by the world's monetary system, appreciable amounts are used in jewelry, the arts, and industry. The chief producing states are California, Utah, South Dakota, Alaska, Arizona, Montana, and Nevada, but a large proportion of the output is obtained as a byproduct in the treatment of ores of other metals, rather than being mined primarily as a gold ore.

Graphite.—While the bulk of the graphite supply is imported, domestic deposits have been worked in Alabama, Texas, Pennsylvania and Rhode Island. Graphite is used in making crucibles and other refractory shapes, lubricants, dry batteries, and lead pencils. Artificial graphite is made in large quantities in the electric furnace, but mostly for uses for which natural graphite is not applicable.

Gravel.—Production of gravel is widely distributed and is reported from all states, but more than half the total is produced in 10 states—California, Wisconsin, Michigan, Illinois, Ohio, Pennsylvania, Iowa, Texas, Indiana, and New York. It is used largely in building and road construction.

Greensand.—See MARLS.

Grinding Pebbles.—Used in grinding ores and other products in tube mills, grinding pebbles are produced in Minnesota, North Carolina, and Wisconsin.

Gypsum.—Used in making building plaster and board shapes for building construction, gypsum as plaster of paris has numerous other uses. Ranking states, in order of production, are Michigan, New York, Texas, California, Iowa, and Nevada.

Helium.—Used in the inflation of balloons; in arc welding and other metallurgical operations requiring an inert atmosphere; in medicine to produce a special breathing atmosphere; as a tracer gas in oil and gas reservoirs; and in the production of low temperatures. The entire world production is in the United States, from natural gas reservoirs in Texas, New Mexico, Colorado, and Kansas. Normally, commercial production is limited to Texas. Production is held as a government monopoly, due to the strategic importance of helium in wartime.

Iodine.—Waste oil-well brines in California furnish the domestic iodine output, which is supplemented by imports from Chile. Iodine is used in medicine, industrial chemicals, fertilizers, and foodstuffs.

Iron Ore.—Minnesota produces about two thirds of the total output of iron ore, followed by Michigan, Alabama, Utah, and Wisconsin. This ore is used mainly in the production of pig iron and steel.

Kyanite Minerals.—Used in refractories. Kyanite occurs in Virginia, California, North Carolina, and Georgia; andalusite, in California and Nevada; and sillimanite, in Georgia and South Carolina. Domestic output is limited.

Lead.—Used in making paint pigments, storage batteries, cable coverings, plumbing and construction supplies, solder, bearing metals, and other alloys. About 10 per cent of the domestic consumption goes into antiknock compounds for automotive gasoline. Lead ore is produced chiefly in Missouri, Idaho, Utah, Arizona, Colorado, and Oklahoma.

Lime and Limestone.—Large quantities of lime, made by burning limestone, are used in the building industry, and increasing amounts are going into agricultural and industrial uses. Another extensive use is in the making of cement. (Limestone used as such, and not after conversion into some other product, is covered under the heading *Stone*.) Limestone production is reported from 44 states, Alaska, Hawaii, and Puerto Rico, but about two thirds of the total comes from 10 states—Ohio, Pennsylvania, Illinois, Michigan, New York, Virginia, Missouri, Indiana, Iowa, and Tennessee.

Lithium Minerals.—Used in the production of chemical compounds for specialized industrial and scientific use. Lepidolite occurs in Colorado, South Dakota, and New Mexico; spodumene, in North Carolina, and South Dakota; and amblygonite, in South Dakota. However, the direct mineral output from these sources is exceeded by the recovery of lithium salts as a byproduct from the potash operations at Searles Lake, Calif.

Magnesite.—Used as a refractory in steel and other high-temperature furnaces, and as a source of magnesia and magnesium. The mining of magnesite is confined to Washington, but magnesia may also be produced from bruceite, dolomite, well brines, sea water bitterns and raw sea water.

Magnesium.—Used in airplane construction and other applications where light weight is a controlling factor. Possible raw materials include magnesite, alunite, bruceite, natural brines, and sea water.

Manganese.—Used as a deoxidizer in the making of

ordinary steels, and as a constituent in many alloy steels and nonferrous alloys. The ore supply is mainly imported, but there is a limited domestic production in Montana, New Mexico, Arkansas, Arizona, and Washington.

Marls.—Greensand, once used considerably in agriculture as a source of potash, is now chiefly employed as a water softener, with production limited to New Jersey. Calcareous marls are produced in Virginia, Indiana, West Virginia, and Minnesota.

Mercury or Quicksilver.—Used in making pharmaceuticals, disinfectants, catalysts, fulminates, and dental alloys, and in a wide variety of electrical, scientific, and industrial control apparatus. Domestic output from California, Nevada, Oregon, Idaho, Alaska, Arizona, and Texas is supplemented by imports.

Mica.—In sheet or film form, mica is used as an electrical insulator. Scrap mica is ground and used in roofing materials, paints, rubber, wallpaper, and plastics. The domestic output of sheet mica, in North Carolina, South Dakota, Georgia, Maine, New Hampshire, Connecticut and other minor states, covers only a fraction of the demand, most of which must be supplied from imports. The supply of ground mica from scrap is supplemented by byproduct recoveries from kaolin and feldspar operations.

Millstones.—Natural grindstones for flour milling have largely gone out of use, but small tonnages of millstones and chaser stones are still quarried in North Carolina, New York, and Virginia.

Mineral Pigments.—These include ocher, umber, sienna, and other natural pigments with colors ranging from yellow through brown and red to black, in which some form of iron oxide is the coloring agent. The chief producing states are Pennsylvania, Illinois, New Jersey, and Virginia.

Mineral Waters.—Waters from mineral springs are bottled and shipped in most states, but production is no longer reported.

Molybdenum.—Used in making alloy steels and cast irons, and in high temperature alloys for use in jet engines and turbosuperchargers. The United States output usually accounts for about 80 per cent of the world total. Recovery from primary ore mined in Colorado and New Mexico is supplemented by concentrates recovered as a byproduct in processing copper ores in Utah, New Mexico, Arizona, Nevada, and California, and from tungsten ores in California.

Monazite.—A source of thoria, used in making gas mantles and refractory crucibles, and of cerium for pyrophoric alloys. The thorium content has lately become a factor in the development of fissionable materials. Formerly produced in North and South Carolina, domestic monazite recovery was discontinued after 1917, and supplies were obtained from imports. In 1948, commercial production was again started, this time in Idaho.

Natural Gas.—Used as a fuel, as a source of natural gasoline, and as a raw material in the synthesis of industrial chemicals. Production is reported from 26 states, two thirds of which is from gas wells and one third from oil wells. About half the total output is in Texas, and another third in Louisiana, California, and Oklahoma. Of the total, two thirds is marketed, and of the remainder, about half is returned to the ground and half is lost or wasted.

Natural Gasoline.—Most of the natural gas output is treated before use for the recovery of the small percentage of gasoline vapor it contains.

Nickel.—Used in making alloy steels and cast irons, nonferrous alloys, and in electroplating. The demand is met almost entirely from imports, the domestic output being limited to byproduct recovery in the electrolytic refining of copper.

Olivine.—Used in refractories for high temperature furnaces, and is also a possible source of metallic magnesium. Production is confined to North Carolina.

Peat.—In the United States, peat is not used as a fuel, but mainly as a soil conditioner, as litter for barns and poultry yards, and as a packing material. Production has been reported from 20 states, the more important of which are Florida, New Jersey, Ohio, Illinois, Maine, and Michigan.

Perlite.—Used, after expanding by heat, as a lightweight aggregate, heat insulation, and poultry litter. It is produced in Arizona, Oregon, and Nevada.

Petroleum.—Used as a source of gasoline, kerosine, lubricating and fuel oils. Production is distributed over 23 states, with nearly 80 per cent of the total from Texas, California, Louisiana, and Oklahoma.

Petroleum Gases.—The butane and propane content of the distillation products of petroleum are condensed under pressure and used for domestic and industrial heating, and as a raw material in the production of synthetic rubber and chemicals.

Phosphate Rock.—Used directly as a constituent of fertilizers, and as a raw material for the production of superphosphates and phosphoric acid. The chief producing states, Florida, Tennessee, Idaho, and Montana, supply the domestic demand, with a considerable surplus for export.

Pig Iron.—Used in making cast iron and steel. The chief producing states are Pennsylvania, Ohio, Indiana, Illinois, Alabama, New York, Maryland, Michigan, and West Virginia.

Platinum.—Used in chemical and electrical apparatus, dental and medical equipment, jewelry and the arts. The supply is largely imported, domestic production being limited to Alaska, California, and Oregon, plus byproduct recoveries in the electrolytic refining of copper and gold.

Potash.—Used in making fertilizers and industrial chemicals. Although formerly practically entirely dependent on imports, the United States has built up a self-sufficient domestic production, with a moderate surplus for export. The sources differ greatly. The bulk of the output is from natural salts mined in New Mexico; the California output is from natural brines at Searles Lake; Utah also utilizes lake brines as well as alunite; in Michigan, natural-well brines have been used, and in Maryland, potash has been recovered as a byproduct from cement kiln flue dust.

Precious Stones.—See *Gem Stones.*

Pumice.—The former predominant use of pumice in cleaning and scouring powders and as a mild abrasive has become secondary to its use in lightweight concrete aggregates and acoustic plasters. Production has also shifted, from Kansas and Nebraska to California, Idaho, New Mexico, Oregon, and Washington.

Pyrite.—Used as a source of sulphur, for making sulphuric acid, and of iron oxide. Production centers largely in Tennessee, California, Virginia, Montana, New York, and Wisconsin, but other states have incidental byproduct recoveries in the mining of coal. The domestic output is supplemented by imports, and in addition, considerable amounts of acid are made from sulphur gases produced in the roastings of sulphur-bearing ores of copper, lead, and zinc.

Salt.—Though more widely known for its use in the seasoning and preservation of foods, the greater portion of the salt output is a raw material for industrial processes. It is mined as rock salt or recovered by evaporation of salt-well brines or the waters of salt lakes or the sea. The chief producing states are Michigan, Ohio, New York, Louisiana, Texas, Kansas, and California, which account for about 95 per cent of the total output.

Sand.—Used in building and paving construction, as an abrasive, refractory, filter medium, and railroad ballast, as well as in the making of glass and of molds for casting metals. Production of some type of sand is reported from all states, but over half of the output originates in seven states—California, New York, Illinois, Ohio, Texas, Michigan, and Pennsylvania. Crushed sandstone and quartz are also used in many of the same applications as sand, especially in ceramics and abrasives.

Selenium.—Used, curiously enough, both as a coloring agent and as a decolorizer for glass; in making rectifiers for alternating electric current; in compounding rubber; making colored pigments; and as an addition to stainless steels and copper alloys to improve machineability. The entire output is a byproduct recovered in the electrolytic refining of copper.

Sharpening Stones.—Natural grindstones are quarried in Ohio and West Virginia; oilstones, in Arkansas; rubbing stones and whetstones, in Arkansas, Ohio, and Indiana; and scythe stones, in New Hampshire and Ohio.

Silver.—Used in coinage, jewelry, the arts, and numerous industrial applications. Silver is produced only to a limited degree from ores mined primarily for their silver content, the bulk of the output being recovered in the treatment of ores in which silver is associated with other metals, especially gold, copper, lead, and zinc. The domestic output comes mainly from Idaho, Utah, Montana, Arizona, Colorado, California, and Nevada.

Slate.—Used for roofing and paving, school blackboards, electrical insulation, and flagstones. Ground to granules or flour, slate is used to surface roofing materials and as a filler. Production is largely confined to Pennsylvania, Vermont, New York, Georgia, and Virginia.

Stone, Crushed.—Used in concrete, paving, railroad ballast, as well as specific uses for certain types of stone. Crushed limestone has uses not open to other varieties of stone, as metallurgical flux, soil conditioner, and in the production of cement, lime, alkalis, calcium carbide, glass, and sugar. Production is widely scattered, and varies greatly with the type of rock.

Stone, Dimension.—The chief building stones used in

the United States, and the states from which the bulk of the output comes are: Limestone—Indiana, Texas, and Wisconsin; Granite—Georgia, Vermont, Maryland, and Pennsylvania; Sandstone—Ohio, Pennsylvania, and New York; Marble—Georgia and Tennessee; Basalt—Pennsylvania.

Strontium Minerals.—Used in pyrotechnics, especially signal flares and fireworks, to produce a red flame. There is a small domestic production in California, Colorado, New Mexico, and Texas, but the bulk of the supply is imported.

Sulphur.—Used in the production of sulphuric acid and other chemicals, as well as in fertilizers, insecticides, pulp and paper, explosives, dyes and coal-tar products, rubber, paint and varnish. The bulk of the output is crude sulphur, from Texas and Louisiana, but small amounts of sulphur ores have been mined in California, Colorado, Nevada, and Utah. The domestic supply exceeds the consumption demand, and a considerable proportion of the output is exported.

Talc.—Used in the paint, rubber, roofing, ceramic, and paper industries, as well as in toilet preparations and insecticides. Ground soapstone, an impure form of talc, and the closely related mineral pyrophyllite may be substituted for talc in many of its uses. The chief producing states are New York, North Carolina, California, Vermont, and Georgia.

Tantalum.—Used as a "getter" in radio and radar tubes; as a catalyst in the production of synthetic rubber; as a constituent in superhard cutting tools; in corrosion-resistant chemical equipment; and in surgical instruments and supplies. There has been a limited production in New Mexico, South Dakota, North Carolina, and Virginia, but most of the supply is imported.

Tin.—Used in making tin plate, solder, bearing metals, bronzes and other alloys, tin coatings, foil, collapsible tubes, and numerous minor uses. There are no commercial deposits of tin ore in the United States, but there have been sporadic small outputs, mainly from Alaska. War conditions led to the establishment of a tin smelter at Texas City, Texas, using ores mainly from Bolivia, and small amounts of metal have been produced in other plants.

Titanium Ores.—Ilmenite is used mainly for the production of titanium dioxide for use in paints, and rutile for welding rod coatings; both are used in the production of ferroalloys and carbides. In addition to extensive imports, ilmenite is produced in New York, Florida, Virginia, and North Carolina, and rutile in Florida and Virginia.

Topaz.—Used industrially in refractories and as a thinner in open hearth slags. It is mined in South Carolina.

Tripoli.—Used principally as an abrasive or filler. It is mined in Missouri, Illinois, and Pennsylvania. The variety known as rottenstone occurs only in Pennsylvania.

Tube Mill Liners.—Used as a lining in tube mills for the grinding of ores and other products. Production is mainly in California, Minnesota, North Carolina, Texas, Washington, and Wisconsin.

Tungsten.—Used in the production of high-speed alloy-cutting steels and hard carbides, electric light filaments, contact points in electrical equipment, and other minor applications. Wolframite and scheelite are the more important ores. Concentrates from North Carolina, and from Nevada, California, Colorado, Idaho, and other western states are supplemented by imports.

Uranium.—Formerly used as a source of coloring agents for ceramic glazes, and to a minor degree in alloys, uranium has become best known as the source of material for atomic fission. In the United States, the metal is usually associated with ores of vanadium, in Colorado, Utah, and New Mexico.

Vanadium.—Used as an alloying agent in alloy steels and cast irons, as a deoxidizer and degasifier in steels, and as a catalyst. Domestic mine production in Colorado, New Mexico, Utah, and Arizona is supplemented by byproduct recoveries from phosphate rock mined in Idaho, and from imports from Peru.

Vermiculite.—Used as a heat and sound insulator, and as an admixture in concrete and plaster to produce porosity and light weight, as well as insulation. It is mined chiefly in Montana, South Carolina, Wyoming, Colorado, and North Carolina.

Wollastonite.—Used in thermal insulation, pottery glazes, and as filler in paints, rubber, and linoleum. It is mined only in New York.

Zinc.—Used in galvanizing and the making of brass and die-casting alloys. Ore production is widely distributed, with extensive outputs in 18 states from New Jersey down to Tennessee in the east, and extending to the west coast, with Idaho, New Jersey, Arizona, and Oklahoma in the lead. About 80 per cent of the metal content is converted to metal, the remainder going mainly into oxide and lithopone. Of the metal recovery, about two thirds is distilled and one third electrolytic. The leading smelting states are Pennsylvania, Montana, Illinois, and Oklahoma.

Zirconium.—The larger part of the zirconium consumption is in refractories and ceramics, only about one third of the total going into metal or alloys. Domestic production is limited to Florida, and equal or greater amounts are imported.

G. A. ROUSH,
The Mineral Industry.

MINERAL TALLOW, also called hatchettite, a yellowish-white, soft and inodorous mineral wax, or tallow, that melts at 115° to 170° Fahrenheit. It is composed of about 86 per cent carbon and 14 per cent hydrogen. The substance is closely related to ozocerite. It is found in Wales, Scotland, Moravia, Austria, Germany and Siberia.

MINERAL WATERS, a term used to designate such waters as have as constituents an unusual proportion of medicinal minerals. Mineral waters have been used as remedial agents from the earliest days of Greece and Rome. There were sulphurous thermal springs at Tiberius, which are still used by invalids from all parts of Syria, in cases of tumor, rheumatism, gout and other diseases. There are also warm springs at Calirrhoe, near the Red Sea, which are mentioned by Josephus as having been tried by Herod in his sickness. The Romans discovered the thermal springs in Italy, and the springs in other parts of Europe—Baden-Baden, Aix-la-Chapelle, the Spa in Belgium, and others. Pliny mentions mineral springs in various parts of Europe.

Classification.—No classification of mineral waters based upon their chemical composition can be strictly exact, because many springs are intermediate between well-characterized groups. The following classification is regarded as the most comprehensive:

The first general division is as to thermal or non-thermal. Waters which issue from the ground at a temperature above 70° Fahrenheit belong in the first class; those whose temperature is below 70° to the second class.

Four divisions are made as to the chemical constituents of the several waters: (1) the alkaline; (2) the alkaline-saline; (3) the saline, and (4) the acid. The *alkaline* waters are those which have an alkaline reaction and contain carbonic acid or bicarbonic acid ions in predominating quantities; or boric or silicic acid ions in predominating quantities, so that their alkalinity is evidently due to the presence of borates or silicates. The *saline* waters are those having an alkaline or neutral reaction and contain sulphuric, muriatic or nitric acid ions in predominant quantities. The *alkaline-saline* waters come between the two groups just described: they have an alkaline reaction and contain sulphuric, muriatic or nitric acid ions along with carbonic or bicarbonic acid ions; or they contain sulphuric, muriatic or nitric acid ions along with boric acid or silicic acid ions—both classes being present by predominating constituents.

Mineral waters are also grouped as to their gaseous constituents: (1) non-gaseous; (2) carbon-dioxidated—containing carbon dioxide gas; (3) sulphuretted—containing hydrogen sulphide gas; (4) azotized—containing nitro-

gen gas; (5) carbureted—containing methane gas, and (6) oxygenated—containing oxygen gas.

The scheme proposed by the United States Bureau of Chemistry for the exact classified descriptions of mineral waters is as follows:

Thermal or Nonthermal	Sodic	Carbonated or Bicarbonated
	Lithic	Borated
	Potassic	Silicated
	Calcic	Sulphated
	Magnesic	Muriated
	Ferruginous	Nitrated
	Aluminous	Sulphated
		Muriated
		Nitrated
		Sulphated
		Muriated

The description of a sample mineral water might read according to this schedule, "a nonthermic, calcic, bicarbonated, alkaline water"; or "a thermal, sodic, borated and carbonated, alkaline water"—and be exactly classified.

Geologists agree that the dissolved mineral substances in the water are obtained from the rocks through which the water has flowed. There is, therefore, undoubtedly more or less relation between mineral springs and the geological structure of a region. Waters which contain carbonic acid are greatly increased in solvent powers in the presence of lime, magnesia, iron, and even the rather insoluble silica. Many of the mineral waters, however, must be treated to remove excess minerals or salts before being used.

Physical Characteristics.—Although they sometimes have a greenish, opalescent hue due to their density, mineral waters are usually clear. Occasionally mineral waters are whitish, a condition due to suspended sulphur or suspended calcium carbonate; sometimes they are slightly bluish because of suspended slate or clay. A reddish tint may be due either to a suspension of particles of red oxide of iron or to the presence of minute algae.

Waters containing sulphureted hydrogen or particles of free sulphur have a most penetrating taste and smell. Mineral waters sometimes taste extremely bitter because of the presence of sodium or magnesium sulphate or magnesium chloride. Alkaline waters, which have a decidedly smooth feel, have a characteristic alkaline taste, while saline waters taste of ordinary table salt. Ferruginous waters have a definite styptic taste.

Of the thermal waters, those between 70° and 98° Fahrenheit are called tepid, while all exceeding the latter temperature are classified as hot springs. The following examples give the Fahrenheit degrees of temperatures found in different thermal springs: Warm Springs, Ga., 70° to 90°; Lebanon Warm Springs, N. Y., 75°; Hot Springs, Va., 110°; Las Vegas Springs, N. Mex., 110° to 140°; Hot Springs, Ark., 76° to 157°; San Bernardino, Calif., 108° to 172°; and Steamboat Geyser Springs, Calif., 212° with the water escaping as steam.

Therapeutic Action.—While often beneficial in cases of chronic disorders or in convalescence, the taking of mineral waters is certainly no panacea. In the past, widespread distrust has arisen of the use of mineral waters because of the extravagant claims which have so often been made by ruthless promoters of commercial waters and resorts. As a result the waters were often indiscriminately used and frequently did more harm than good. Mineral waters should only be taken under the orders of a competent physician

Alkaline	Arsenic	Non-gaseous
Alkaline-saline	Bromic	Carbondioxated
	Iodic	Sulphureted
	Siliceous	
Saline	Boric	Azotized
	Lithic	Carbureted
	Ferruginous	Oxygenated
	etc.	
Acid		

for a particular purpose and during a specified length of time.

The therapeutic action of mineral waters depends, in the first place, upon their chemical composition and to some degree upon their pressure and temperature. But other circumstances, also, such as the general physical environment, elevation, climate, and mean temperature of the region of the springs have an important bearing upon the success of the treatment. In addition, the habits and the temperament of the individual patient and the pathology of his particular ailment must be taken into consideration. Certainly, too, one of the more important—if not the most important—aspects of such treatment is the change in environment and pace of living that goes with a period of stay at a mineral-springs resort. The effects upon each individual are both constitutional and psychological, and a course of water beneficial to one person might be highly injurious to another.

The dosage of mineral waters, naturally, varies from spring to spring and from patient to patient, but relatively large quantities are usually most effective, hot waters are generally more beneficial than cold, and for the greatest effect waters are usually taken on an empty stomach. Light exercise is often prescribed, and a regulated diet is advised. Since the "water cure" should be continued for a sufficient length of time to give the particular waters a fair trial, it is usually felt that from six to twelve weeks are necessary.

In some cases bathing is of even greater importance as a remedial agent than is drinking. Here again the type of bath and the length of time in the bath vary from spring to spring and from patient to patient, and the directions of a physician should be strictly adhered to. Bathing stimulates the circulation of the blood and has an important tonic effect. Some gases dissolved in the waters and some of the trace elements, such as boron, bromine, and iodine, are absorbed directly through the skin.

Certain mineral springs contain radioactive mineral waters generally arising from the presence of radon or radium emanations. Though probably beneficial in some pathological conditions such as certain types of arthritic afflictions, the dangers in improper usage are very great. The dosage used should always be prescribed by a physician.

Alkaline Waters.—Simple alkaline acidulous waters are composed of carbonic acid and the carbonates, bicarbonates, borates, or silicates of alkali metals or alkaline earths. Important springs of this class are the thermal springs of Las Vegas, N. Mex., and the cold springs of

Sharon, N. Y. These waters are useful in certain forms of indigestion, jaundice, gallstones, gout, and chronic catarrh of the respiratory organs. Muriated alkaline acidulous waters, which differ from the preceding, contain a considerable quantity of sodium chloride. They are useful in chronic catarrhal conditions of the bronchial tubes, the stomach, and the intestines. Alkaline saline waters containing sulphate and bicarbonate of soda, such as the warm springs of Karlsbad (Karlovy Vary), Bohemia, Czechoslovakia, are of value to patients suffering from habitual constipation.

Bitter Waters.—The chief contents of these waters are sodium chloride and magnesium and sodium sulphate. Well-known springs of this class are those as Kissingen, Bavaria; Cherry Rock, Gloucestershire; and Mount Clemens, Mich. These waters act as purgatives and diuretics.

Muriated Waters.—Simple muriated waters contain a moderate quantity of sodium chloride or common salt. Important springs in this class are those in Germany at Wiesbaden and Baden-Baden, which are hot, and at Homburg, which are cold. Of the muriated saline springs at Saratoga, N. Y., some are chalybeate, others, sulphurous or iodinous; all of them are rich in carbonic acid gas. These waters are chiefly employed in cases of gout, rheumatism, and scrofula. Muriated lithia waters contain lithium and sodium chloride.

Earthy Waters.—These waters contain sulphate and carbonate of lime. The waters of Wildungen, Germany, are diuretic and also used for chronic catarrh of the bladder. The baths of Leuk, Switzerland, are chiefly used in chronic skin diseases.

Mild Thermal Waters.—Waters of this type contain only a small amount of saline constituents. Of the springs of this class, Hot Springs, Ark., and Hot Springs, Va., are very important. Their most striking effects are to stimulate the skin and excite the nervous system. They are especially used in chronic rheumatism, chronic gout, and diseases of the skin.

Chalybeate Waters.—Simple acidulous chalybeates contain carbonic acid and ferrous bicarbonate; carbonate, sulphate, and chloride of sodium are frequently present and may help in the cure. Although the quantity of iron present is generally very small, these waters are very valuable in cases of anemia. Two examples of chalybeate springs are the Chalybeate Mineral Springs, Mo., and the Chalybeate Springs, Ga. The largest number of mineral springs in the New England region are of the chalybeate class.

Sulphurous Waters.—These waters contain hydrogen sulphide or metallic sulphides (sulphurets), or both. Important sulphurous thermals are those of Aix-la-Chapelle, Germany; Baden, Austria; and Barèges, France. There are hundreds of these sulphurous springs in the United States, including Richardson Mineral Springs, Calif., and White Sulphur Springs, W. Va. These waters are used in skin diseases, gout, and rheumatism.

American Mineral Waters.—In the United States, Rock Spring at Saratoga, N. Y., like many other springs, was known among the Indians. Here friendly Mohawk Indians brought Sir William Johnson in 1767 to bathe in the waters. Virginia Hot Springs was visited as early as 1720 by white men, and a tavern was built there in 1766. White Sulphur Springs, W. Va., was first used by white men in 1778.

Particularly in the late 19th century the spots for taking mineral water became greatly in fashion with elaborate facilities set up to amuse the patrons, the waters usually being but an accessory to the social life carried on there. In general, however, American mineral springs have been much less extensively developed than those of Europe; furthermore, scientific research into the properties of these waters has been neglected in this country, though such research has had a definite place in European medicine. The State of New York, which purchased the spring area of Saratoga Springs making it a state reservation, however, did set up a research institute in balneology there in 1935.

The majority of the commercial springs of the United States are located in the older parts of the country east of the Mississippi. It has been estimated that there are about 8,800 mineral springs in the United States in about 2,700 separate areas of which over 400 are used commercially. Wyoming, California, Virginia, Texas, Missouri, Colorado, and New York have the greatest number of springs. New York leads in the commercial exploitation of mineral waters. In the South, Kentucky, Tennessee, and Arkansas are the chief producers of mineral waters. In 1921, Arkansas Hot Springs, believed by some to have been the "Fountain of Youth" which Ponce de Leon was seeking, was made a national park.

In the United States the production of imitation mineral waters, made by the addition of salts or carbon dioxide gas to plain water, is, like the bottling of natural waters for drinking and medicinal purposes, a thriving industry.

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MINERAL WELLS, city, Texas, is located in Palo Pinto County, north central Texas, about 45 miles west of Fort Worth, at an altitude of 925 feet. Served by the Weatherford, Mineral Wells and Northwestern Railroad, Pioneer Air Lines, and federal highways, it is essentially a health and pleasure resort. The popular mineral springs in the vicinity attract thousands of visitors annually, and each year more than 1,000,000 gallons of water are shipped. In the midst of a grain and livestock area, the chief industries of Mineral Wells are dairying and the manufacture of brick, ceramics, and silk products. Hexagon House, erected in 1897, is an architectural curiosity. The city was founded in 1880 and incorporated in 1891. Pop. (1950) 7,801.

MINERAL WOOL, also known as slag wool, rock wool, silicate cotton, or cotton fiber, is a product of molten slag or rock which has been subjected to a steam or air blast. The result of this process is a light, fluffy, vitreous fiber, useful as a non-conductor. It was first manufactured on a sizable scale in Germany in the early 1870's. In 1875 some mineral wool was made at the Greenwood iron furnace in Orange County, N. Y.; the industry

was firmly established by 1885, but its product, made from slag and called slag wool, was soon in competition with rock wool, a similar fiber made from rocks and lacking the small percentage of sulphur that sometimes formed injurious sulphuric acid in the slag product when it came in contact with water. In 1951 over 10,000 people were engaged in the production of mineral wool from slag, rock, and glass. The total value of the product in that year was estimated at $134,128,000, of which about 1½ million dollars' worth was exported. It remains one of the best practical non-inflammable coatings and is a non-conductor of heat. As a lining for floors it has the additional advantage of being soundproof. Rock, glass, or desulphurized slag wool are often used to encase steam pipes.

MINERALOGY, mĭn-ĕr-ăl'ô-jĭ, is the science which deals with minerals. It is especially concerned with their chemical composition and their physical characteristics, including the crystal form and structure. Mineralogy considers the origin and occurrence of minerals in the earth's crust, their geographical distribution and their utilization.

The science is closely related to several others, such as geology, chemistry, physics, and mathematics. The rocks studied by the geologist are made up of minerals. Their identification and classification depend upon their mineral composition. The study of the crystal forms and atomic patterns of minerals is a branch of solid geometry. Chemical methods must be used to establish the composition of minerals, and many chemical tests are used in their identification. The processes of mineral formation and alteration are chemical reactions. Important discoveries in physics, especially in optics, have been made through the study and use of mineral crystals. The recovery of minerals from the earth involves mining engineering, while the extraction of useful metals and compounds involves metallurgical and chemical engineering.

A mineral is a homogeneous substance with a composition which may be expressed by a chemical formula, and which occurs in nature and is not the direct product of life. Most minerals are crystalline. Many minerals may be duplicated by man, but are then termed synthetic or artificial, as synthetic ruby and sapphire, and artificial ice. The term mineral is not restricted to terrestrial objects, but is also applied to the components of meteorites, which in general are similar to minerals found on earth.

Among the members of the mineral kingdom which do not fully qualify as minerals are asphalt and petroleum, because they are complex mixtures, and volcanic glass, formed when lava cools too quickly to allow individual mineral constituents to crystallize. A pearl is the direct product of an organism and does not change after formation, hence is not called a mineral. Shells, which definitely belong in the animal kingdom, may lose their organic material, and be broken, compacted, and cemented to form limestone, which is composed of calcite, a mineral. Likewise, vegetation may form peat, and then soft coal, hard coal, and sometimes graphite. The last is definitely a mineral. The coals and certain other natural hydrocarbons clearly belong to the mineral kingdom, but because of variable compositions do not fully qualify as minerals.

Mineralogy as a science is comparatively modern. While the ancients utilized a very considerable number of minerals, some for the metals they contained, others as pigments, ornaments, charms and talismans, and still others in medicine and the arts, they knew little as to their composition. They classified them, but in an unscientific way. There is still extant part of a work *On Stones,* written by Theophrastus before 287 B.C., while Pliny in his great work on natural history, in the year 77 A.D., devoted five books to "earths, metals, stones, and gems."

As chemical knowledge increased, the compositions of minerals were gradually determined and became the basis of classification. The recognition of the importance of the crystal form in mineral determination followed the invention of the reflecting goniometer by William Hyde Wollaston in 1812. This made possible a study of the relation of crystal form to chemical composition in groups of isomorphous minerals. With the development of modern optics and the recognition of the unique optical properties of crystals, there developed techniques for mineral identification by the determination of their optical properties. X-ray methods make possible the determination of the atomic positions in minerals.

Thus the modern classification and description of a mineral includes not only the chemical composition and ordinary physical properties, but also the crystallographic and optical constants, and the data concerning the size of the unit cell and the location of the individual atoms.

Mineralogy may be conveniently considered under the following headings:

Crystallography	Crystal Structure
Physical Mineralogy	Formation and Occurrence
Chemical Mineralogy	Uses
Optical Mineralogy	Descriptive Mineralogy
Determinative Mineralogy	

Crystallography.—This is a limited phase of solid geometry, being restricted to those geometric forms which result from crystal growth. Since the crystal form is of great value in identifying minerals, the subject has been developed largely by mineralogists, and has its own nomenclature, its own type of projections and drawing, and its own methods of calculation. See CRYSTALLOGRAPHY; and CHEMICAL CRYSTALLOGRAPHY.

Physical Mineralogy.—Physical mineralogy considers the physical properties of minerals. Some of these are directly related to the crystal structure, and are discussed separately in the articles on CRYSTALLOGRAPHY, and CLEAVAGE. Other physical properties, which are either not dependent on or not so closely related to crystal structure, are here discussed.

Luster, as used in the mineralogical sense, is difficult to define precisely. It includes the *degree* of brilliancy, as indicated by the use of such terms as dull, shining and splendent, but is more concerned with the *kind* of brilliancy. For mineral descriptions, luster is divided into metallic and nonmetallic. The former is further described as iron black, steel gray, tin white, golden yellow, etc. The nonmetallic lusters include vitreous, adamantine, pearly, resinous, silky, waxy, greasy, pitchy, etc.

Color depends upon the ability of a mineral to absorb in different proportions the various wave lengths which make up the incident light. A white or colorless substance transmits or reflects all colors equally.

Some minerals have a constant color, such as gold, malachite and sulphur, and are said to be

Ektachromes by Willard R. Culver

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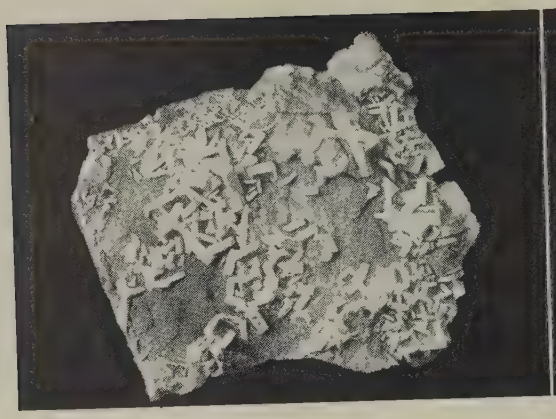
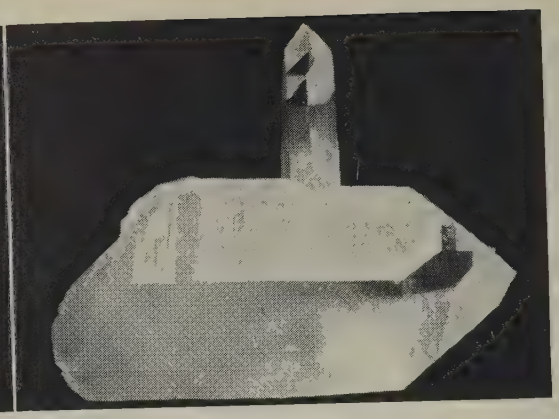
MINERALOGY

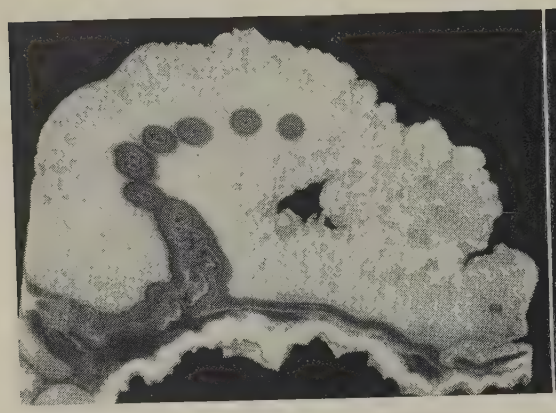
Age of these specimens varies from a few centuries to nearly a billion years. *Upper left and clockwise:* Sulphur crystals; wulfenite crystals; malachite; rhodonite, a manganese silicate, created some 800 million years ago.



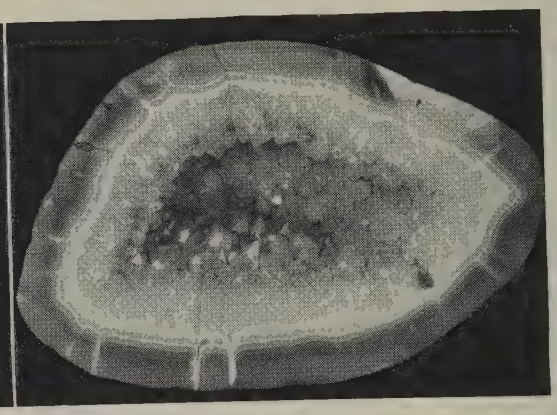
Barite.



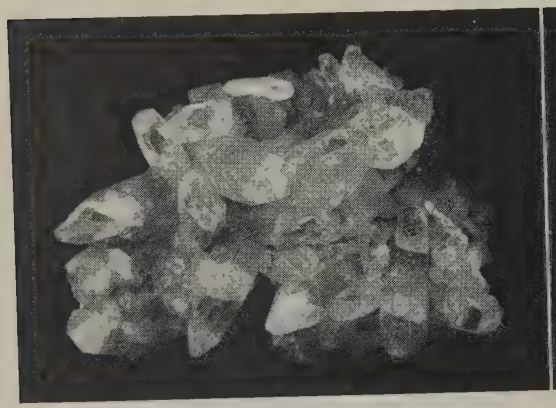
Quartz crystal.



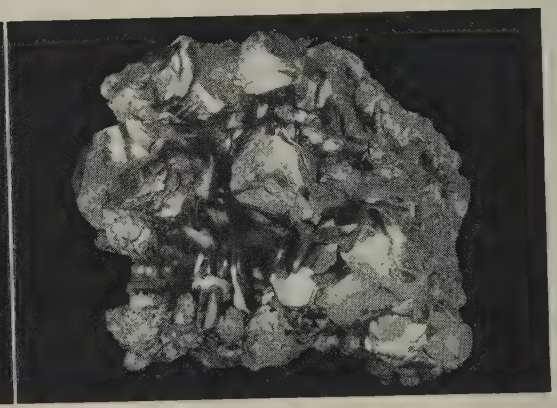
Agate-quartz radiating from agate nuclei.



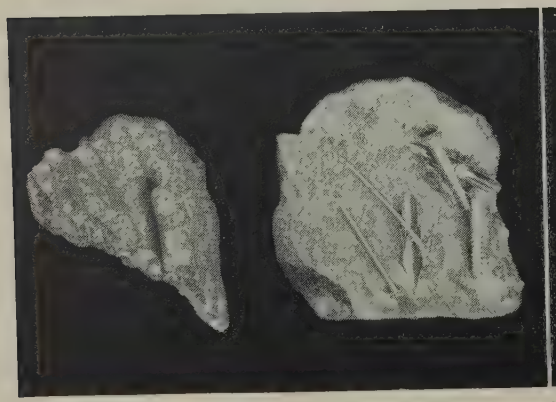
Quartz agate geode.



Calcite group.

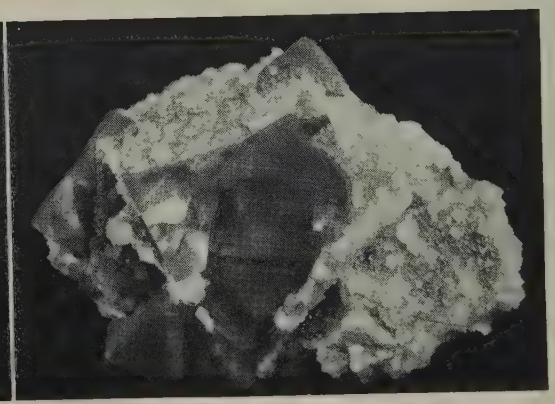


Hematite.



Courtesy of The American Museum of Natural History

Pyrolusite and magnetite.



Fluorite.

idiochromatic. The color in this case is inherent in the substance itself, and is always evident unless the mineral is so admixed with impurities that the color is diluted or masked. Other minerals may be colorless or white when pure, but show colors when impurities are present. These are said to be allochromatic. The color may be due to dissolved impurities, as in the case of ruby and sapphire, or to colored inclusions. For example, quartz may be red or yellow, due to disseminated particles of iron oxide, or green, due to scales of chlorite.

Other color or optical effects are known as play of colors, opalescence, tarnish, dichroism, asterism, etc.

Streak is the color of the fine powder of the mineral. It is usually obtained by rubbing the mineral on a piece of unglazed porcelain. If the mineral is softer than the porcelain, it leaves a streak whose color is readily apparent. In some cases the streak is markedly different from the color of the original specimen. Thus hematite and goethite, both occurring in black fibrous masses, give red-brown and yellow-brown streaks, respectively, and may be easily distinguished. Minerals too hard to rub off on the streak plate are said to have colorless streaks.

Hardness is defined by the mineralogist as resistance to scratching or abrasion. A harder mineral will scratch a softer one. An arbitrary scale of minerals was devised by the mineralogist Friedrich Mohs, and is used to designate degrees of hardness. It consists of ten minerals, beginning with (1) talc (softest); (2) gypsum; (3) calcite; (4) fluorite; (5) apatite; (6) feldspar; (7) quartz; (8) topaz; (9) corundum; (10) diamond (hardest). Each mineral in the scale will scratch all of the preceding ones, hence there is a progressive increase in hardness. However, this increase is not uniform. There is an especially large gap between (9) and (10). Moreover, no mathematical ratio is implied. A mineral with a hardness of four is not twice as hard as one with a hardness of two. The hardness is not expressed in specific units, but merely by comparison with the hardness of certain minerals selected as standards.

If two minerals both scratch each other, or if neither scratches the other, they have the same hardness. A mineral may be intermediate between two adjacent minerals in the scale. For example, if a mineral will scratch calcite (3), but is scratched by fluorite (4), it is said to have a hardness of 3½. No fractional values other than ½ are used. The approximate hardness can be determined by reference to other standards if the minerals of the scale are not available. For example, the fingernail is 2½; a copper coin is 3; window glass, 5½; hard steel file, 6½. The hardness of a crystal varies with different directions. Although the diamond is said to have a hardness of 10, some directions are harder than others. It is only because of this variation that it is possible to use diamond powder to grind and polish diamonds. Harder directions in the powder will act on softer directions of the stone being shaped. Usually these variations in hardness for a given mineral are small in comparison with the divisions of the scale. Thus both the hardest and softest directions of calcite are considered as hardness 3. The mineral kyanite is an exception. It occurs in long bladed crystals, and across the blades the hardness is 7; parallel to them it is 4.

Specific gravity is defined as the weight of a substance compared with the weight of an equal volume of distilled water at 4°C. It is numerically equal to density, if the latter is expressed in grams per cubic centimeter. The specific gravity of a pure crystallized substance is practically constant, but as indicated in the later section on Chemical Mineralogy, most minerals contain at least traces of other substances and hence may have variable specific gravities.

Various methods are used to measure specific gravity. Many are based on the fact that when an object is immersed in water it weighs less than when weighed in air. The loss in weight is equal to the weight of the water it displaces. Obviously it displaces its own volume of water, hence by definition specific gravity =

$$\frac{\text{wt. in air}}{\text{wt. of equal volume of water}} = \frac{\text{wt. in air}}{\text{loss of wt. in water}}$$

There are various other properties which may be of value in mineral identification. The fracture surface is described by such terms as even, uneven, conchoidal, splintery and hackly. Substances may be described as elastic or as flexible. Tenacity is expressed as brittle, sectile, malleable, ductile or tough. The feel is described as smooth, rough, slippery or soapy. A few minerals have a characteristic taste or odor. Although many minerals will respond to a powerful electromagnetic field, only a few will be attracted by a simple horseshoe magnet.

When minerals do not occur in crystals they are said to be massive. Even without the crystal form there are many characteristic appearances which may be helpful in identification. Minerals may occur in fine or coarse granular aggregates. They may be in needles or fibers, which may be interlaced, parallel, or in radiating or divergent groups. They may be in small rounded particles or in larger rounded masses, termed in order of increasing size, oolitic, pisolitic, botryoidal, mammillary and reniform. Numerous other descriptive terms are used for various structural features, including columnar, tabular, foliated, platy, spongy, cellular, arborescent and dendritic.

Variations in physical properties without any basic change in composition or structure give rise to what are known as varieties of a mineral. The mineral quartz has several varieties based on color, as rose quartz, citrine, amethyst, and carnelian. Ruby and sapphire are colored varieties of the mineral corundum. Gypsum, when occurring in white, fine-grained form, is called alabaster, while a fibrous form is satin spar. Calcite occurring in sharp scalenohedral crystals is known as dog-tooth spar. Brilliant black hematite is specular iron ore, while the red earthy type is called red ocher.

Chemical Mineralogy.—A few minerals occur as elements, such as sulphur, copper, silver and gold, but the great majority are chemical compounds. The chemical composition of a mineral is its most important feature as far as classification is concerned, and is of prime importance in identification. Standard chemical procedures are used in mineral analysis. The results of such an analysis for the mineral beryl show how the formula is calculated.

	Percentage composition		Molecular weights			Ratio
BeO	14.01	÷	25.02	=	0.560	3
Al_2O_3	19.26	÷	101.94	=	0.189	1
SiO_2	66.37	÷	60.06	=	1.105	6

The formula may thus be written $3BeO.Al_2O_3.6SiO_2$, or $Be_3Al_2Si_6O_{18}$.

In addition to the regular chemical methods for making a complete analysis, many qualitative tests for particular elements are useful in mineral identification. The so-called "blowpipe methods" include colored sublimates on charcoal and plaster tablets, colored beads made by dissolving minute amounts of the mineral in molten drops of borax and other salts, and colored flames produced by the volatilization of certain compounds or elements.

The chemical classification of minerals is described in section (*8*) *Descriptive Mineralogy.* Within the major divisions, whenever possible, minerals are placed in isomorphous groups, which are based on analogous chemical composition and similar crystal forms. An example of isomorphism is the well known calcite group, which consists of the minerals calcite, magnesite, siderite, rhodochrosite and smithsonite. They all crystallize in the same symmetry class, all have high double refraction, and all have rhombohedral cleavage. In a series of this kind, if the atomic dimensions are close, it is possible for one element to proxy for another in the structure. This is known as isomorphous replacement. Thus in siderite, $FeCO_3$, any proportion of the iron (Fe) atoms may be replaced by manganese (Mn) atoms, giving a continuous solid solution series from pure $FeCO_3$ to $MnCO_3$. For intermediate members the formulas may be written as $(Fe,Mn)CO_3$ or $(Mn,Fe)CO_3$, depending upon which element predominates.

Optical Mineralogy.—Crystallized substances have unique optical properties. With the exception of those in the cubic system, all are double refracting, that is, in passing through them ordinary light is broken up into two plane polarized rays which travel with different velocities and are refracted at different angles. Cubic substances have only one index of refraction, but hexagonal and tetragonal substances have two indices, and those in the remaining systems, orthorhombic, monoclinic and triclinic, have three indices of refraction. The determination of these indices alone may be sufficient for identification. Such determination can be made even on microscopic grains, by use of the petrographic microscope, which differs from the ordinary microscope by its use of plane polarized light. Because of the different velocities with which the rays travel, various interference colors and figures may also be obtained, and make possible a complete method of identification.

Opaque ore minerals may be studied by the use of reflected light with the microscope. Variations in color, reflectivity and response to various etching agents provide a means of identification of opaque minerals. This field is known as mineralography.

Crystal Structure.—The determination of the actual atomic arrangement in a mineral by X-ray methods may be of importance in several ways. (a) In minerals with complex compositions the exact formula may be impossible to deduce without a knowledge of the structure. (b) The structure offers a more precise way of establishing isomorphism. Thus a long used classification of the barite group included $CaSO_4$, $SrSO_4$, $BaSO_4$ and $PbSO_4$. However, the arrangement of the Ca and the SO_4 group in $CaSO_4$ is quite different from that in the others, and it is not isomorphous with them. (c) A knowledge of the structure may make possible a correlation between the atomic positions and certain physical properties. (d) An X-ray powder diffraction photograph, even when not utilized in deducing the atomic arrangement, is a precise and indisputable method of mineral identification. It can be used on an extremely small amount of material, and has the advantage of not consuming the sample, as does a chemical analysis.

Formation and Occurrence.—The processes by which minerals are formed follow the same laws which govern reactions in the laboratory. However, there are important differences in degree with respect to pressure, temperature, and time. Man so far has not produced simultaneously the temperatures and pressures which are required for certain types of mineral formation, nor does he have available the almost unlimited time which nature has used to produce some minerals.

The origin of some minerals is very obvious, as in the simple deposition of rock salt and gypsum from evaporating sea water, as has occurred in past geological periods. In other cases the origin is complex and not entirely understood. The possible methods of formation may be summarized as follows:

Formation from Gases: Sublimation.—The most common example of this process is the formation of snowflakes from water vapor. Direct deposition from hot gases may occur in connection with volcanic activity. A related process, known as pneumatolysis, refers to the interaction of two gases, or that of a gas with the country rock adjacent to igneous intrusions.

Formation from Liquids.—These liquids may be either molten rock, magmatic water, or ground water. Molten rock reaching the earth's surface is called lava, while beneath the surface it is known as magma. A magma is formed by the melting of previously existing rocks at moderate depths. The resulting liquid tends to migrate toward the earth's surface. If it reaches the surface as a lava flow or volcanic eruption, the resulting "extrusive" rocks are fine grained or glassy, because of the rapid cooling. If the magma does not reach the surface, cooling may be very slow, resulting in coarser grained "intrusive" rocks. Certain characteristic minerals, including feldspars, quartz, pyroxenes, amphiboles and micas make up the great bulk of these igneous rocks, while a number of so-called accessory minerals may be present in minor amounts. The composition of the magma corresponds to that of the rocks which produced it. It contains, even at a high temperature, certain volatile constituents such as water, chlorine, fluorine, sulphur and boron compounds called mineralizers. These are retained in the magma because of the high pressure, and materially affect the fluidity and the chemical activity of the magma. They do not enter appreciably into the major crystallization products of the magma, and eventually form a residue, which is a hot concentrated aqueous solution called magmatic water, in contrast to the cool and dilute water solutions at or near the earth's surface known as ground water. The magmatic water produces important mineral deposits known as pegmatite dikes and plays an important part in the production of many ore deposits. The dissolved gases in the magma and in the magmatic water are involved in the pneumatolytic reactions mentioned under sublimation.

Ground water is the surface water in oceans, lakes and streams, as well as that in the porous

strata near the surface of the earth. Many characteristic reactions are brought about by the action of ground water. Minerals are dissolved, transported, altered and redeposited, and new minerals may be formed. Some common methods of this type of formation are (1) evaporation of ocean water to form salt; (2) decrease in temperature and pressure of water from geysers and hot springs, allowing their mineral content to be deposited; (3) bacterial action, and the action of organisms which extract mineral matter from the water and then secrete it to form shells and skeletons which may ultimately give rise to deposits of limestone, chalk, or tripolite; (4) the action of ground water containing CO_2 in dissolving limestone to form channels and caverns, and the reverse of this process, in which the dissolved material may again be deposited to form stalactites, stalagmites and other cave and stream deposits. Many other chemical reactions occur in ground water, including oxidation, reduction, hydration and carbonation.

Formation by Metamorphism.—This includes the production of new minerals or new varieties of old ones, chiefly through the action of heat and pressure, but the presence of water and other mineralizers may be important. In the movements of the earth's crust resulting in warping and folding of rock strata, various changes occur in which pressure is the predominating factor. These include the change from soft to hard coal, and the recrystallization of limestone to form marble. This process is known as regional or dynamic metamorphism, and may occur over large areas. When a large body of molten rock, magma, is working its way upward through the earth's crust, marked changes may occur in the country rock adjacent to the intrusion. This is known as local or contact metamorphism. Heat and pressure are both important, as well as the chemical action of mineralizers in the magma.

Occurrence of Minerals.—Minerals may occur in large rock formations, such as beds of salt, gypsum and limestone. One mineral may be disseminated in another. Minerals may be deposited in cracks and fissures to form veins and in a similar way cavities may be filled to form geodes. The occurrences of calcite in various types of cave deposits is well known. When mineral fragments are transported by water, sorting may occur, giving rise to placer deposits of the heavier, more durable constituents and stream and beach deposits of sand, which may be composed almost entirely of quartz, or may contain concentrations of other minerals as well.

Uses.—The ore minerals which furnish our metals are of enormous importance, but many non-metallic minerals are likewise essential to our civilization.

A great number of the raw materials of chemistry and industry are directly of mineral origin. And of course, all vegetable and animal products are derived indirectly from soil and water, both of the mineral kingdom. Some minerals are used in their original state, as building materials like limestone, marble, granite, sand and gravel. Others go directly into ceramic products, such as pottery, porcelain and glass. Others are processed into cements, plasters, plastics, artificial abrasives, fertilizers, pigments, etc. Chemistry finds important uses for sulphur, for sodium and chlorine derived from salt, for phosphates, borax, and many others. Numerous organic compounds are derived from coal and petroleum. Sources are not limited to mineral deposits. Salt has always been obtained in warm climates by evaporation of sea water, and the modern production of bromine and the light metal magnesium is from this same source. One important element, nitrogen, is obtained only in small amounts from mineral sources—the greater proportion is obtained from the atmosphere. See also MINERAL PRODUCTION OF THE UNITED STATES.

Descriptive Mineralogy.—This branch of mineralogy sums up the results of the study of minerals, as already outlined, into orderly form for each mineral species, and classifies the different species so that related minerals will be grouped together. The classification for inorganic compounds is as follows:

1. Elements
2. Sulphides and sulpho minerals
3. Oxides and hydrated oxides
4. Haloids
5. Nitrates, carbonates and borates
6. Sulphates, chromates, molybdates and tungstates
7. Phosphates, arsenates, and vanadates
8. Silicates

Within these major divisions, the chemical composition and crystal form are used to group those minerals which are isomorphous, or which are most similar.

Determinative Mineralogy.—Determinative mineralogy deals with the identification of minerals. When a new mineral is found, a chemical analysis must be made to establish its formula, the crystallographic and optical data must be determined, and the various physical properties noted. These data constitute the description of the mineral. Previously described minerals, however, are usually identified by much simpler methods. Sight recognition may be possible if there is some obvious feature, such as a unique color, definite crystal form, recognizable cleavage or characteristic structure. With experience in handling and testing minerals, it becomes possible to identify many minerals in this way. The more general methods of determinative mineralogy make use of tables in which the minerals are arranged in some systematic order. Two or more major divisions are used, based on some easily determined property. These are divided into smaller groups by using a second property, and these in turn are subdivided, and so on. By noting these same properties on an unknown mineral, it is placed first in the proper major division, and then successively in the smaller and smaller groups. Finally the possibilities are restricted to such a small number of minerals that the individual differences between the members are readily recognized, and the final decision can be made. Obviously, the mineral in question must be among those listed in the table.

Tables of this kind may be based solely on (1) physical properties; or (2) a combination of chemical tests and physical properties. In addition to these, there are special tables based on (3) optical properties; (4) mineralographic tests; and (5) X-ray data.

Physical Property Tables.—Most of the tables used are modifications of the original tables prepared by Albin Weisbach in 1866. One set in common use has two major divisions based on (1) metallic luster; and (2) nonmetallic luster. Each of these is divided into five color groups, and each color group subdivided according to streak.

In each of these smallest groups the minerals are arranged in order of increasing hardness. Another set of tables likewise makes the initial division into metallic and nonmetallic lusters, with the latter subdivided into (a) streak colored; and (b) streak colorless. Further subdivision is according to hardness, combined with the presence or absence of a prominent cleavage. Some tables begin with divisions based on streak, followed by subdivision into color groups.

Chemical and Physical Tables.—The chemical tests are chiefly those called "blowpipe tests" as described in the section on *Chemical Mineralogy.* Most tables of this kind are modifications of Franz von Kobell's tables, first published in 1833. The initial division is into minerals with metallic and nonmetallic lusters. The former are divided into (a) fusible, with specific tests for As, Sb and S; and (b) infusible, with tests for Fe and Mn. The nonmetallics are divided into (a) volatile or combustible; (b) fusible, with subdivisions: (1) Metal globules when fused on charcoal with soda; (2) Magnetic after heating in reducing flame; (3) Those not included in (1) and (2), separated according to behavior in HCl, alkaline reaction after intense ignition, solubility in water, etc. (c) Infusible, with subdivisions similar to (b-3). Final identification in many cases is made by specific tests for elements or radicals. As an example, a specimen of olivine would be placed successively in the following divisions and subdivisions:

Nonmetallic luster.
Infusible.
Dissolves in HCl, leaving gelatinous residue of silica on evaporation.
Gives test for Mg.
Contains no water.
Gives test for Fe. Therefore olivine.

This identification is confirmed by the green glassy granular appearance of the specimen, which is typical of olivine.

Optical Properties.—The determination of the optical properties is very important in the identification of very small crystals and fine-grained material. Substances are classified either as (1) isotropic (with one index of refraction); or (2) anisotropic, including (a) uniaxial (two refractive indices); and (b) biaxial (three refractive indices). The uniaxial and biaxial groups are further divided according to their positive or negative character. Tables are available with divisions, corresponding to these groups, in which the minerals are arranged in order of increasing refractive indices. Additional optical observations can be made, such as color, pleochroism, optic angle, extinction angle, dispersion, and the orientation of the optical directions with respect to crystallographic directions.

Mineralographic Tests.—For opaque minerals, the microscopic examination of polished surfaces with reflected light is very useful in identification. Minerals may have a distinctive color or varying shades of gray which can be compared with standards. Various reagents applied as tiny drops may produce effervescence, staining, a precipitate, or reveal a structure or texture. There are determinative tables for opaque minerals based on such tests.

X-Ray Identification.—X-rays can be reflected from the internal atomic planes of crystallized substances, and various X-ray methods have been developed for determining the arrangement of the atoms. The so-called "powder method" not only furnishes data from which the crystal structure may be deduced, but also provides an extremely useful method of identification. An X-ray powder photograph consists of a pattern of lines whose positions and intensities are dependent upon the atomic arrangement. To the extent that no two different substances may have identical atomic arrangements, no two substances may have identical X-ray powder patterns. Positive identification of a mineral may be made by measuring the positions and intensities of the lines of its powder photograph, and checking the results against published data for known materials.

See also section on Minerals in articles on countries, states of the United States, and provinces of Canada.

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MINERALS. See MINERAL PRODUCTION OF THE UNITED STATES; MINERALOGY.

MINER'S INCH. See HYDROLOGY; WEIGHTS AND MEASURES—*Unit Standards.*

MINERSVILLE, borough, Pennsylvania, in Schuylkill County; altitude 697 feet; on the west branch of the Schuylkill River; 4 miles west of Pottsville; on the Pennsylvania and Reading railroads. Thomas Reed, the first settler, built a tavern, sawmill and distillery here in 1793. Situated in the hard coal region, its chief industries are connected with mining and shipping coal. There are also machine shops and garment factories. Pop. (1950) 7,783.

MINERVA, mĭ-nêr'vȧ, village, Ohio, on the line between Stark and Carroll counties, 15 miles east-southeast of Canton. It is served by the New York Central, Pennsylvania, and New York, Chicago and St. Louis railroads. Manufactures include dinner ware, electric switches and signalling devices. The village was founded in 1835. Pop. (1950) 3,280.

MINERVA, one of the chief Roman divinities, identified with and having similar attributes to the Greek Athena. Her name, probably derived from the same root as *mens* (mind), suggests her characteristic as the personification of the power of the intellect. With her father Jupiter and Juno she was worshiped as the third of the Capitoline divinities. A virgin goddess, her sacrifices were calves which had not yet borne the yoke. She was reputed the inventor of numbers and musical instruments, especially wind instruments, and was patroness of all the arts and trades. At her five-day festival (March 19-23), called *Quinquatrus* because it began five days after the ides of March, she was invoked by all who would excel in any art or craft, as painting, poetry, teaching, spinning, and weaving. She was also patroness of warriors, teaching them cunning, prudence, courage, and perseverance. Hence she is portrayed panoplied with helmet, shield and armor.

MINERVINO MURGE, mē-nȧr-vē'nō mōōr'jȧ, commune, Italy, in Bari Province, Apulia, 40 miles west of Bari. Fruits, vegetables, and olive oil are produced here. Pop. (1936) 18,604.

MINES AND MINING, Military. In all periods of the history of warfare, particularly in siege operations and the somewhat similar operations in trench warfare, recourse has been had to the use and construction of subterranean passages, either as a means of penetrating the lines of the enemy, or to avoid a dangerous advance under fire at the surface, or for the destruction of a hostile position by the use of explosives, or to prevent on the part of the enemy undertakings such as those already described. These operations constitute military mining, and the charge of explosives set off under a position of the enemy is known as a mine. While any of the devices and methods employed in commercial mining may be used in appropriate military situations, military mining is dominated by the consideration of simplicity—for complicated tools cannot be brought up to the battle line—speed, and inconspicuousness. In addition, by far the greater part of the work is done in soil which is sufficiently soft to present relatively little difficulty to excavation, but which manifests a constant tendency to cave in. This tendency is accentuated by the continual disturbance of the soil by artillery fire and the countermines of the enemy. Accordingly the reinforcement of the walls of his excavation is generally among the chief problems of the military miner. The methods used are much the same, whether the excavation is a vertical shaft or an approximately horizontal gallery. They fall into two general classes. In one, casings are inserted as the work progresses. These consist of four lengths of stout planking surrounding the excavation. Two opposite lengths are provided with mortises, and the other two with tenons. In the other type of mining, longitudinal planks known as sheathing are held in place by frames of strong timber.

Galleries are divided into great or grand galleries (6 feet high by 3½ feet); half galleries (4½ feet by 3 feet); branches (3½ feet by 2½ feet); and small branches (2½ feet by 2 feet). The smaller galleries are often excavated by earth augers; the larger ones by ordinary excavating tools reduced in size so as to be adapted to use in a confined space. An especial boring tool known as a "wombat" was devised by the Australians during World War I (1914–1918), and used with great success. It was worked by hand. The direction of galleries is determined by the ordinary surveying instruments used on the surface, due allowance being made for the unreliability of the compass under ground. The targets are of course slits through which an artificial light shines. The azimuth is transferred from the top to the bottom of a shaft by means of a pair of plumb lines, which are oriented by compass and map above ground. Ventilation is essential, and is secured by various mechanical means, or in a system of galleries with two or more outlets, by a fire near the upper end of a shaft. In difficult places, air may be pumped in by a hose. Respirators may be worn in case of emergency. Drainage is secured by sloping the floors of the galleries and supplying them with gutters. If it is not possible to make all the galleries slope toward the entrance, a sump is dug from which the water is pumped or carried in buckets. The lighting of galleries is often a difficult problem, on account of the nearness of explosives and the difficulties of ventilation. Electric lights are often used. Where it is possible, daylight is reflected into the gallery by mirrors or white surfaces, and the walls are whitewashed. The disposal of the excavated earth is often a difficult problem. It is usually taken away in sacks or relays of wheelbarrows. Sometimes, small narrow-gauge railways have been used.

The mine chamber is nearly cubical, or of the shape of a cylinder with an altitude twice its radius. It is often simply the end of a gallery or shaft. The charge is usually some high explosive such as dynamite or trinitrotoluol. It is set off by a detonator and primer, usually fired by electricity, though a powder fuse may be used. The charge is tamped by obliterating from 6 to 10 feet of the passage leading up to the chamber.

The explosion of a mine produces a compression of the surrounding soil which will blow in any gallery within a certain radius. It also causes a pit or crater to be excavated in the surrounding soil, provided the chamber is sufficiently near the surface. A mine which does not break the surface is known as a camouflet. In a normal mine, the depth of the charge beneath the surface is equal to the radius of the crater at the surface of the ground.

Mines dug from the surface are known as land mines, or if the crater is filled with stones, etc., so as to form a crude mortar, as fougasses. Land mines are only permissible in ground obviously prepared for defense. They may be set off by devices under the control of some operator, or automatically by triggers or other such means.

The tactics of mining depend on the opposition of mines by countermines. It is always necessary to supplement one's own effort to attain his objective by an effort to frustrate the plans of the enemy. The only way by which reliable information of the progress of the enemy can be attained is by listening either directly, or with the aid of geophones. Men are trained for this purpose, and stationed in galleries called listeners, placed sufficiently near to one another to prevent a hostile gallery from being pushed between them without being heard.

It is generally better in mining operations to come into actual contact with the countermines than to fire too soon. The best place to attack a hostile gallery is from the side, as then a greater length of gallery is destroyed.

Mines are sometimes used to form craters to take the place of trenches in an advance. A row of such craters serves not only as a parallel on the surface, but as a starting point for new mines.

Galleries are usually started as near the hostile lines as possible, i.e., from advanced saps. In fortresses, concrete-lined permanent galleries often serve as a beginning for countermine galleries in case of siege.

The first historic example of an *offensive* mine in warfare dates back to 430 B.C., when Servilius, besieging the Etruscans in Fidenae, dug an underground gallery through which his troops entered the heart of the city and captured it. Philip II of Macedonia, in the 4th century A.D., introduced the use of the *defensive* mine. In early times, it frequently happened that the besieged, aware of the mining operations against them, would sink shafts to meet the mined galleries. Through these shafts they then poured water, boiling pitch, red-hot sand or whatever refuse was at hand. Another favorite counterdevice was to fill a ditch with a smoldering wood fire whose smoke could be forced back into the attacker's underground tunnel. Under these ancient conditions, mine attacks had but one fixed objective, the destruction of a fortification or town which was the keystone of a given military position. In trench warfare of modern days, the object is to force the enemy back along a considerable front.

In the Crimean War, mining was extensively employed. At the siege of Sebastopol, over five miles of galleries were driven by the opposing armies in 10 months of underground warfare. In the American Civil War, the "crater" at Petersburg, Va., was an example of the effect of mining warfare, even though it proved to be without military value in this particular instance. In the Russo-Japanese War, at the siege of Port Arthur, underground operations played a prominent part, and it was here that modern high explosives were used for the first time in mine warfare.

From the close of the Russo-Japanese War until the outbreak of World War I in 1914, little attention was paid to instruction in mine warfare. This attitude reflected European opinion of the times that, should the great powers go to war, everything would be settled by one short, decisive campaign. However, it did not work out that way since both sides began entrenching after the first Battle of the Marne. Eventually two great opposing trench systems swept from the English Channel to the Swiss border. The first intimation the Allies had that mining operations were to be reckoned with came in December 1914, when German mines were exploded in a planned attack in a number of sectors extending from Lorraine to Flanders. Soon both sides were using special mining troops, recruited from the ranks of civilian coal miners. Schools were established for officers and men. During 1916, the most active year in mining operations, 750 mines were exploded by the British and 696 by the Germans. By 1917, the British had gained control of the underground situation, and on June 7, 1917, they put on the greatest military mining operation in the history of warfare, when, at Messines Ridge, 500,000 pounds of explosives were discharged along 4,500 yards of front. This climaxed World War I mining operations which declined almost to zero after this event.

During the Spanish civil war mining and countermining were employed by the opposing forces in the siege of Madrid (1936–1938). However, in the immediately succeeding World War II (1939–1945) mining of the type developed during World War I was rarely used in either the European or Asiatic theaters. In France the previously built Maginot Line system and the Metz fortifications with their underground mines and galleries were utilized; but traditional mining operations were invalidated by the brief periods of siege warfare. Skillful use of natural caves by the Japanese was countered by air and artillery bombardment of the entrances and spraying by liquid fire. See also EXPLOSIVES; FORTIFICATIONS; MILITARY ENGINEERING; MILITARY SCIENCE; TRENCHES.

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MINGHETTI, mĕng-gāt'tē, **Marco,** Italian statesman and writer: b. Bologna, Italy, Nov. 8, 1818; d. Rome, Dec. 10, 1886. Minghetti began his public career in 1846 by establishing a liberal journal, *Il Felsineo,* in Bologna. In 1847 he was called to Rome by Pius IX to become a member of the Consulta delle Finanze and in 1848 he became minister of public works. In 1859 he became Cavour's secretary of state for foreign affairs. On Cavour's death in 1861 he was regarded as the ablest representative in the Italian Chamber. In 1863 he became prime minister. He left office in 1864. In 1868 he was ambassador to London. He was ambassador to Vienna in 1870–1873; and from 1873 to 1876 again head of the cabinet. Minghetti's writings include *Della economia Pubblica* (1859); *La Chiesa e lo Stato* (1878); *Opuscoli letterari ed economici* (1872); and *Discorsi parlamentari* (1888–1890).

Minghetti was also a student of the fine arts, lectured on Dante and Raphael and wrote a book, *Le donne italiane nelle belle arte al secolo XV e XVI* (1877) and a biography of Raphael (1885).

MINGO JUNCTION, mĭng'gō, town, Ohio, in Jefferson County; altitude 662 feet; on the Ohio River; 17 miles north of Wheeling, W. Va.,

on the Pennsylvania; the Pittsburgh and West Virginia; the New York Central and St. Louis railroads. It has steamboat connections. It is included in Steubenville township. Huge steel works are situated here. Farming, dairying, and fruit growing are leading industries. Coal is found in the vicinity. A Mingo Indian village formerly stood on the site. Pop. (1950) 4,464.

MINGRELIA, mĭn-grē'lĭ-à; mĭng-grē'yā, region, Georgian Soviet Socialist Republic, bordering on the Black Sea. In ancient times the district was known as Colchis, famous in Greek mythology as the home of Medea and the Golden Fleece, the goal of the Argonauts. To the Greeks, the province was famous as the seat of Dioscurias, (modern Sukhumi) a colony of Miletus, noted for its wines and fruits.

MINIATURE PAINTING (from the Latin *minium,* "red lead"), a painting on a very small scale. The word has its origin in the practice of embellishing books, in which the principal pigment used was red lead. Hence the Low Latin verb "miniare," to color with red lead, was applied to the art, and those who practiced it came to be known as "miniatori" (See MANUSCRIPTS, ILLUMINATED). Eventually the word was applied to all works of art of "miniature" size. Its principal meaning today is that of a very small portrait painting.

The early artists painted on vellum, and used body colors, for example, colors mixed with white or other opaque pigments and this was continued until the 17th century when thin leaves of ivory were substituted. Ivory was adapted to richer and more varied coloring; transparent colors were employed on faces and hands, while opaque ones were used for other textures. Another technique was that in oil on thin copper. From the use of miniature on boxes, watches, jewelry, etc., enamel came into favor too.

Illuminated manuscripts often contained portraits of authors or owners; suitable persons were represented on manuscript diplomas and other such documents. Late illuminators like Hans Müelich (1516–1573) and Giulio Clovio (1498–1578) have painted portrait miniatures. But most of the early work of this kind was done by great portraitists like Hans Holbein the Younger (1497?–1543), Lucas Cranach (1472–1553), Agnolo Bronzino (1502–1572); and great portraitists ever since occasionally have worked in miniature scale.

In *England* the tradition started by Holbein was continued by Nicholas Hilliard (1537–1619) who wrote a treatise on the *Art of Limning,* (ed., P. Norman, *Walpole Society,* 1911–1912) and Isaac Oliver (1556–1617). The transition to a new style, influenced by Sir Anthony van Dyck is made by John Hoskins the Elder (1620–1664); the style is fully developed by the brothers Cooper, Alexander (1605?–1660) and Samuel (1609–1672) by whom we have the likeness of Oliver Cromwell. Then follow Lawrence Crosse (1650?–1724) and Bernard Lens (1682–1740). A new impetus came with the prince of English miniature painting, Richard Cosway (1724?–1821) who combined English sentiment with French refinement. Followers of his were: Andrew Plimer (1763–1837) and John Smart (1741?–1811); a rival, who preferred a more sober style, was the court painter George Engleheart (1752–1829). Into early Victorian times reach the Scot, Andrew Robertson (1777–1845) and the court miniaturist of Queen Victoria, Sir William Charles Ross (1794–1860).

The *United States* is best represented by the portrait painters, John Singleton Copley, Gilbert Stuart, and James Peale. Edward Greene Malbone (1777–1807), however, was the first great American miniaturist. Charles Fraser (1782–1860) and Jonathan Trumbull, his contemporaries, and later George Freeman (died 1906) deserve mention.

In *France,* one of the earliest examples is the selfportrait by Jean Fouquet (1416?–1480), in enamel, and this technique remained in favor there and elsewhere: Léonard Limosin the Elder, at Limoges (1505?–1575/77); Jean Petitot of Geneva (1607–1691) and his son, Jean Louis Petitot (1653–1699) who both also worked in England, and many others in the 17th and 18th centuries. Small portraiture, almost miniature-like was practiced in the 16th century in the workshops of the Clouet family and Corneille de Lyon. Typical of the 17th century miniaturist is Louis Du Guernier the Elder (1614–1659). Among the many miniaturists of the 18th century must be mentioned: Jean Baptiste Massé (1687–1767), Ignace Jean Victor Campana (died 1786), Hubert Drouais (1699–1767) and, the greatest of them, the Swede Pierre Adolphe Hall (1739–1793). The finest flowering of the art came in the period from Louis XVI to the Restoration, with Jean Baptiste Isabey (1767–1855), one of the most famous miniaturists of all ages, and his contemporaries J. B. J. Augustin (1759–1832), Jean Urbain Guérin (1760–1836), Ferdinando Quaglia (1780–1853), Jean Baptiste Singry (1782–1824), Louis Sicard (Sicardy, 1746–1825), and François Dumont (1751–1831).

In *Germany* and *Austria* the art was practiced by Ismael Israel Mengs (1688–1764), Martimus II Mytens (1695–1770), J. H. Hurter (1734–1799), active also in England, and above all the Viennese Heinrich Friedrich Füger (1751–1818) who followed English taste. Popular was Moritz Michael Daffinger (1790–1849).

In *Italy* only Rosalba Carriera (1675–1757) gained international fame.

The *Netherlands,* just as Italy, produced too many great portraitists to leave much room for this minor art, which was practiced by lesser men, for example P. Fruytiers (1607?–1660), and J. B. van Deynum (1620–1668).

Sweden, besides Pierre Adolphe Hall, had many good miniaturists—Arvid Karlsten (1647–1718), who also was a medalist; Erik Utterhjelm (1662–1717); the learned Elias Brenner (1647–1717), who wrote a Latin treatise on the technique (Stockholm 1680); Nils Lafrensen, father and son (1698–1756; 1737–1807) who were famous in Paris; and J. A. Gillberg (1769–1845).

In *Russia* many foreigners were active: the two Swiss H. F. G. Viollier (1750–1829) and N. Soret (1759–1830), the Italian D. Bossi (1765–1853) and others.

Except for miniatures in oil which mostly look like regular portraits reduced in size, miniature painting has a distinct style, which is characterized by a brilliant coloring in a light key, suggested by the technique, and by a minute execution of highest precision, required by the scale. The taste of the late 17th, 18th, and the early 19th centuries were susceptible to such qualities; and this accounts for the flowering of the art at this time. Such periods of refinement could

savor to the fullest the elegance, preciousness, and intimacy of this art; miniatures, often in precious settings on boxes, etc., then played a more vital part in every day life.

The invention of photography meant the end of miniature portraiture as a well defined art. It still was practiced, but either became a slave to photographic likeness, losing all style, or went to the other extreme by indulging in stylistic experiments not suited to the medium and purpose.

Miniature portraits in low relief, in wax (often elaborately colored), terracotta, Wedgwood ware, on coins and medals are akin to the painted ones, as are countless small portrait drawings, in black on parchment (for example, Vischer the Younger, Haarlem, (1618/29–1658/62) or in red and black on paper (Louis Carroges Carmontel, 1717–1806), and similar engravings (Charles Nicholas Cochin, 1715–1790).

In miniature scale, in the same techniques, many other subjects were painted: devotional subjects and mythologies (Joseph Werner II, 1637–1710; K. G. Klingstet of Riga, 1657–1734; Pierre Antoine Baudouin, 1723–1769); landscapes (Hans Bol, 1534–1593); animals and flowers, often as scientific illustrations (Maria Sybilla Merian, 1647–1717; Catherine Perrot, c.1680, from whom there is also a treatise on the technique); battle scene (Louis Nicholas van Blarenberghe, 1716?–1794); copies after famous pictures (S. F. Dinglinger, 1739–1791).

A special branch of miniature painting, technically related to enamel, is that on porcelain which developed during the 18th century in such factories as Meissen, Sèvres, Chelsea, and Capodimonte. Tableware was decorated with miniature landscapes, pastoral and other scenes, flowers, birds, etc.; a great deal of imagination was spent on porcelain snuff boxes. Towards the end of the century and in the beginning of the 19th these decorations became increasingly like real miniature pictures, and on cups, for example, even portraits became the fashion. In the *Near East*, particularly in Persia and in India, portrait miniatures are found beginning with the 16th century. They have their origin in the rich secular book illustration of these countries and they were actually painted by the great miniaturists themselves. It is not always quite easy, however, to tell the borderline between illustration and portraiture, especially in Persia. Among the known painters there Ali Rizā Abbāsi (first half 17th century) should be remembered, to him are ascribed some of the finest examples known. In greater numbers portrait miniatures existed at the court of the Mogul emperors in India (16th-18th centuries), particularly those of the emperors themselves. They are true portraits and differ little in general character from their Western contemporaries.

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U. Middeldorf.

MINIMUM THERMOMETER. See Thermometer.

MINIMUM WAGE, the lowest wage paid to workers by their employers permitted by legislative authority. In the modern concept of the term, the minimum wage is intended to be not merely commensurate with the bare cost of living but sufficient to ensure a fair measure of comfort and well-being in terms of the general standard of living. It is always difficult to decide what should be a fair minimum wage, because the cost of food, housing, fuel, and clothing differs widely in various countries and often in sections of a particular country. In general, living costs are lower in rural than in urban districts; also in the less industrialized nations than in those where industrialization is further advanced.

The growth of modern capitalism in the 18th and early 19th centuries, with its economic ruling concept of *laissez faire* and opposition to traditional governmental controls over commerce and industry, witnessed a like rejection of legislative authority to determine wage scales. Such authority had been a governmental prerogative at least since medieval times. France enacted a minimum wage law as early as 1270, while England enacted maximum wage laws in 1357 and 1536. The English laws, after being long inoperative, were finally repealed in 1813.

From early in the 19th century trade union policy has favored minimum wage standards, and trade agreements made between unions and employers have contained stipulations as to the minimum wage to be paid the workers.

The modern statutory minimum wage movement had its origin in Belgium in 1855 when the Belgian government in making contracts with private concerns for public works constructions inserted the so-called "fair wages clause," requiring that the contractor's workmen should receive at least the rate of wages usual in private trade agreements or paid by reputable employers. During succeeding decades the Belgian example was followed by other governments; but not until the last decade of the 19th century did any government extend the protection of minimum wage laws to the great mass of labor in private employment.

In 1894 New Zealand enacted a law requiring compulsory governmental conciliation or arbitration for settlement of industrial disputes, in effect giving the government authority to determine the minimum wage rate. Two years later the Australian state of Victoria passed the first legislative minimum wage act of modern times applicable to private employment. Similar acts were soon passed by other Australian states and New Zealand. In 1910 England adopted a minimum wage program. France, in 1915 and 1928, enacted minimum wage bills applying to home workers in the clothing industry. The discussion of minimum wage standards at the annual conferences of the International Labor Office in 1927 and 1928 focused world attention on the problem of underpaid workers in every industrialized country.

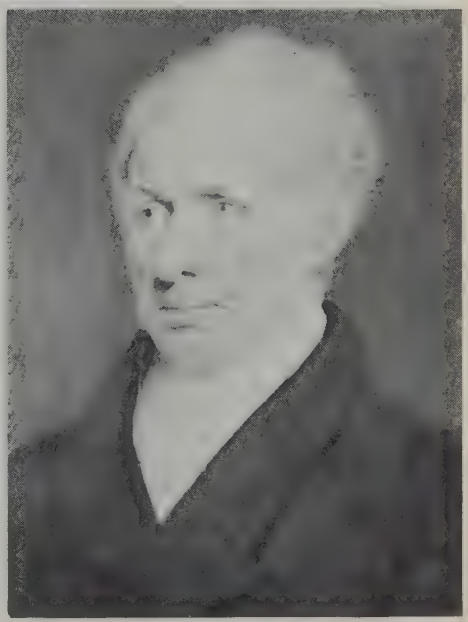
The United States.—The enactment of minimum wage legislation by states of the United States, like most other American labor legislation, followed an English precedent; minimum wage legislation by the states also long preceded federal legislation. Massachusetts, so often a pioneer in humanitarian causes, was the first state to enact legislation applicable to women and children, in 1912. Within the next twenty

MINIATURE PAINTING

Above: "Man in a Red Cap," by Hans Holbein the Younger—painted in oils on a wooden panel.

Left: Portrait of Lady Sophia Boyle by Richard Cosway, most famous of the English miniature painters of the 18th century.

Right: Portrait of Gilbert Stuart, famous portrait painter, by Sarah Goodridge, an American.



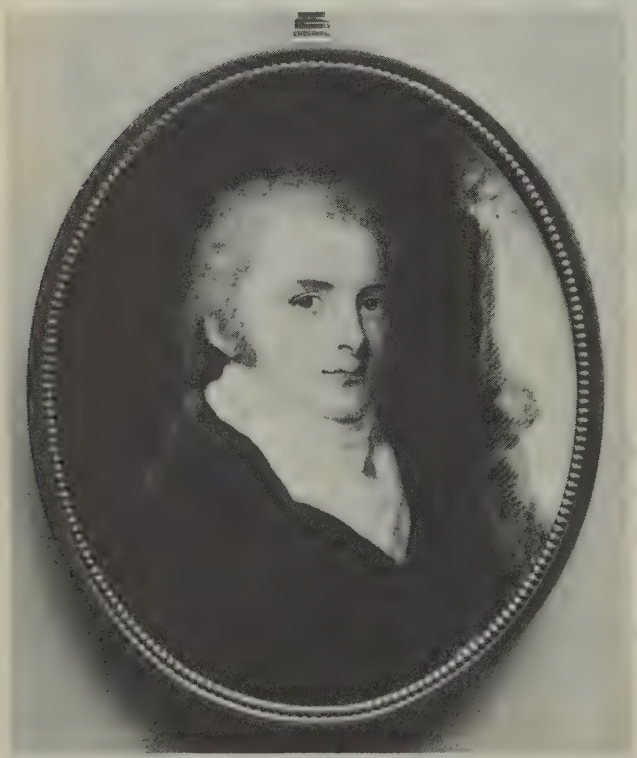
Courtesy of The Metropolitan Museum of Art

MINIATURE PAINTING

Portrait of Augusta Temple Prime, painted on ivory by Jean Baptiste Isabey, a popular French miniature painter of the early 19th century.

Portrait of Prince Klemens Wenzel Nepomuk Lothar von Metternich by Friedrich Johann Gottlieb Lieder—painted in water color on cardboard.

Courtesy The Metropolitan Museum of Art



Self-portrait of Edward Greene Malbone as a young man. A self-taught American, Malbone won distinction as a painter of miniature portraits.

Portrait of Anne Goldthwaite by Sarah Eakins Cowan.

years 14 other states, the District of Columbia, and Puerto Rico enacted similar laws. However, further extension of such legislation was checked when the constitutionality of the enactments was successfully challenged. Thus, the act passed by Congress in 1918 to govern wages paid to women and children in the District of Columbia was declared unconstitutional by the Supreme Court in 1923 New York's minimum wage law was likewise held unconstitutional by a Supreme Court decision of 1936 But a year later the Supreme Court reversed itself and declared a Washington State minimum wage law to be constitutional. The change of attitude of the court reflected the change from a conservative to a liberal majority of justices which occurred through new appointments in the first Roosevelt administration.

Although Congress in 1892 had established wage and hour standards applicable to employees engaged in work for the United States, it was not until 1931, with the passage of the Bacon-Davis Act, that it exercised any authority to establish *wage* standards for employees engaged in contract work for the government. The first attempt to regulate wage and hour standards for private employment was made by the National Industrial Recovery Act (NIRA) of 1933; but its far-reaching delegation of legislative power was clearly in violation of the Constitution, and its main provisions were nullified by a Supreme Court decision of 1935. The Walsh-Healey Act of 1936, providing terms for public contracts, in addition to limiting the work day to eight hours and the work week to 40 hours, stipulated that all persons employed by the contractor should be paid not less than the minimum wage prevailing in similar work.

The Wage-Hour Act of 1938, sponsored by President Roosevelt, established a 25-cents-an-hour minimum wage for the first year, with increase to 30 cents for the following six years and, after Oct. 24, 1945, 40 cents an hour (unless the Wage and Hour Administrator prescribed a lower minimum, but not less than 30 cents). The Fair Labor Standards Act of 1938 limited its application to businesses engaged in interstate commerce.

Amendments to the Fair Labor Standards Act in 1949 raised the minimum hourly wage to 75 cents. In 1955, Democrats and Republicans compromised on a further increase to $1.00, effective March 1, 1956.

MINING, the removal of valuable mineral products from the earth. While in its narrower sense mining includes only the actual operations of releasing the mineral from its surroundings and raising it to the surface, the broad field of mining encompasses all procedures from the search for the deposit through the delineation and exploitation to the treatment of the product, on the surface of the earth, until it is in such physical condition or degree of purity that it may command a suitable market price. If such treatment extends to the point that the mineral loses its identity as a chemical compound, as in smelting or leaching, it has passed from the realm of mining into that of metallurgy. Mining operations are treated here in the following order: prospecting, exploration, development, mine plant, exploitation, mineral dressing, administration. The geology of ore deposits is discussed with prospecting and exploration.

PROSPECTING

Prospecting is the search for a new mineral deposit, and may include preliminary exploration. Intelligent prospecting is based on a knowledge of the geologic modes of occurrence of minerals. These modes are: (1) by weathering and erosion, either in place or transported; (2) by concentration in bodies of water on the earth's surface, by either organic growth in place, chemical precipitation, evaporation, or sedimentation; (3) by deposition from circulating ground waters, either from rock masses containing minor percentages of valuable mineral, or from those rich enough to be worth mining; (4) by deposition from heated waters rising from the interior of the earth; (5) by alteration of the original rock (country rock) due to the great heat of intruded molten materials and chemical reaction with those materials; (6) by segregation of the valuable materials in the molten rock (magma) of an intrusive, either in the main body of the intruded mass, or in fissures in the country rock into which the more fluid constituents of the magma (and thus the last to solidify) may be forced. Valuable deposits have been formed by each of these methods. Examples of those produced by weathering may be found in the rich iron ores of the Lake Superior district and the gold placers of California; most salt beds and all coal fields were concentrations in water on the surface; the lead and zinc ores of the Mississippi Valley are usually considered to have been formed by circulating ground water, as were the enriched ores of copper mines in Arizona at Ray, Miami, and Bisbee, among others; rising heated waters formed the mercury deposits of Spain and the gold-bearing veins in the Black Hills of South Dakota; contact metamorphism resulted in the primary copper ores at Bisbee, Arizona, and the iron deposits at Cornwall, Pennsylvania; the titanium-bearing iron ores at Lake Sanford in New York and the nickel deposits at Sudbury, Ontario, may have been formed by magmatic segregation.

Prospecting was formerly carried out by individuals or very small groups, usually men of no training and often little experience in mining, called sourdoughs, searching for valuable minerals in the sands and gravels of stream beds or for outcrops, or surface exposures, of the solid mineral. Much prospecting is still done in this way, not infrequently by men with little formal training in geology, but the trend in surface prospecting is for large mining companies to send parties headed by geologists into promising areas. One method of prospecting is by studying the coarse and fine stream gravels, concentrating the heavier materials in the fine sands by "panning," or washing in a shallow iron pan. By careful manipulation, even very fine particles of gold and platinum can be retained in the pan while much larger grains of sand are washed over the edge. Materials less dense than gold, such as silver, copper, and most metal-bearing ore minerals, can be retained in the pan if the particles are not too much smaller than the sand grains. If valuable mineral is found, the party works upstream, testing each branch on the upper side of each junction to determine from whence the material came. When the desired mineral is no longer found the party works downstream, testing at close intervals until the valuable mineral again appears. From this point the ore particles, or

float, are traced up the slope of the valley wall by sinking pits in the soil at intervals from the stream, the soil from each pit being tested intermittently until float is obtained, then a new pit is dug higher up the slope. The series of pits is continued until one is dug to bedrock without finding float. If the soil is not too deep, a trench is now dug to bedrock between the last two pits to find the deposit; where the cover is too deep, intermediate pits may be dug, or a tunnel driven between the pits. While this procedure is simple and appears to lead directly to the source of the float, the infinite variety of relationships possible between topography and underground structure often impedes the search. The source of the California placers made famous in 1849 was sought for years before it was found.

Another surface method is to examine outcrops instead of or in addition to tracing float. In Northern Rhodesia an area to be prospected was laid out in parallel strips. The European geologist walked the baseline of each strip, paralleled by natives carrying hammers. Every exposed rock was sampled, and each sample was brought immediately to the geologist. Promising outcrops were studied in detail, and a major copper deposit was discovered. Intelligent evaluation of outcrops can indicate the wisdom of further exploration when valuable minerals are not actually found in the exposed rock or are in quantities too small to appear worthy of consideration.

Geophysical prospecting methods can indicate the presence of an ore-body or of a sub-surface structure favorable for the formation of an oil or gas deposit when there is no surface indication. Probably the first such method was the use of a magnetic needle similar to a compass needle but mounted on a horizontal axis. This dip-needle gives practically uniform readings in most areas, but dips more or less steeply over the various parts of a deposit of magnetic iron ore. Compass needles, too, are deflected from their normal position by such deposits, and sensitive instruments called magnetometers now indicate even slight variations of the horizontal and vertical components of the earth's magnetic field. As all substances are susceptible to magnetism to a varying degree, any variation of composition and structure underground may have a magnetic effect at the surface.

Another surface manifestation of lack of uniformity underground results from a body of greater or less density than the surrounding rocks. A large body of ore of specific gravity 4.6 in rocks averaging about 2.9 would increase the pull of the earth on any body located above it, at the surface, or would exert a sidewise pull on a plumb line located off to one side, in accordance with the formula $F = g\frac{m_1 m_2}{r^2}$, where F is the force of attraction, g the constant of gravitation, m_1 and m_2 the masses of the two bodies being considered, and r the distance between their centers of gravity. Because the mass of the earth is tremendous compared to that of even a very large body of dense material, the effect on gravity of mineral deposits is on the order of magnitude of one part in a million. Gravitational surveys can be conducted with a torsion balance, a pendulum apparatus, or a gravimeter, of which there are several types. The torsion balance has been little used in the United States since the middle 1930's.

Minerals differ in their electrical conductivity and in their dielectric constant, or ability to store electrical charge. Some, under favorable circumstances, will actually generate a current of electricity due to chemical reaction with ground water, in a manner similar to the operation of a battery. Measurements of resistance or of current flow (natural or impressed) may indicate underground deposits. Coal beds, for instance, easily carry currents, while quartz veins offer high resistance to their passage. The dielectric constant of a deposit influences the passage of radio-frequency waves; this principle was applied in detectors for non-magnetic land mines during World War II.

The speed of elastic waves in rocks is a function of their elastic properties, which differ with different kinds of rocks and are affected by discontinuities such as bedding planes. If a charge of dynamite is exploded on the surface, a wave will proceed outward from the point through the surface soil just as waves spread from a pebble dropped in a pool. This wave will be detected and recorded by a seismograph some distance away. However, if there is a stratum of rock a short distance below the surface, it will transmit a wave to the instrument more rapidly than the surface wave is carried. Use of waves in this manner is known as refraction, and it has been much used in the past to locate salt domes, on the flanks of which oil deposits are sometimes found. Currently, reflection shooting is more commonly used. This method is based on the principle that as a wave moves downward through sedimentary rocks a portion of the energy is reflected from each succeeding stratum in much the same way as a window-pane reflects part of the rays of the sun while transmitting the remainder. Inclination of the beds from the point of the explosion upward or downward toward the location of a series of seismographs will cause a differing relationship between the times of arrival of the various reflected waves. This difference recorded by the seismographs indicates the underground structure which caused it. Structure favorable to the accumulation of oil indicates the possibility of sinking a producing well.

There are other geophysical methods of prospecting, which do not enjoy the wide application of those just described. None of these methods provides a positive indication of the presence of oil, gas or metallic ore, but merely the possibility of finding a deposit after careful surface or underground prospecting.

EXPLORATION

The determination of the extent and quality of a deposit is termed exploration. A property at this stage is referred to as a prospect because of the prospective future income. If a bed, seam, or vein extends to the surface, its extent, where the soil is reasonably shallow, is determined by digging a series of trenches across it at suitable intervals. Pits or shallow shafts are used where the cover is deeper, with short tunnels or cross cuts driven out on the surface of the bedrock to determine the limits. The actual extent of the deposit within the country rock is best determined by a combination of vertical, inclined, and horizontal workings, most driven along the boundary between ore and rock, but some entirely in ore, to determine its width and to connect various galleries for convenient access. Workings are also driven in barren rock to make

contact with other bodies of ore known or suspected to be nearby, or to find a continuation of the body being explored where it has pinched out or else been cut off by displacement along a fault.

A less exact method of delineation, but much cheaper, is by using drills. Bedded deposits lying near the surface may be explored cheaply by use of a well drill, which can drill vertically downward only. Of more universal application is the core drill with a diamond-set bit, which drills at any angle, can be set up in a restricted space, and is obtainable with a gasoline motor for surface work, or a compressed-air motor for surface or underground use. The cores obtained give an excellent picture of the composition of the rocks drilled. Because the holes are not straight, but wander considerably from the original direction line, the picture of the structure obtained by careful plotting of the drill core composition on vertical and horizontal projections is not strictly accurate, and proper interpretation requires experience and a sound knowledge of geology. With very thin and irregular deposits, such as thin veins of the precious metals, this method of exploration is especially unreliable, as it may indicate too high a quantity of metal by following the softer material of a rich veinlet, or it can completely miss the valuable parts of the ore body, giving no indication of their presence.

To enable more exact plotting, instruments have been devised for surveying boreholes with a high degree of accuracy. A recent development is a camera which takes a series of 360 degree photographs of the interior of a three inch diameter borehole, thus making a record of the entire interior.

DEVELOPMENT

Development is the driving of those workings necessary to remove the ore from the deposit (Fig. 1). Most exploratory galleries are later used in the exploitation; thus, a mine is referred to as being in the "exploration and development stage" because the exploration workings being driven are part of the development plan. These openings must provide means for the miners with their tools and supplies to enter the working places where the mineral will be mined, they must make possible the easy removal of the mineral to the surface, and they must be so planned that fresh air can be brought into the workings while foul air and water are separately removed from the mine. While filling these conditions, the development workings must also be planned with a view to economy, as they usually represent the majority of the capital investment in the mine. When practicable, they may be driven in the ore body to provide some return on the investment; but, since they must not weaken the rock structure to such a degree that the lives of the workers are endangered or the maximum recovery of ore may not be realized due to early collapse, this practice is not so wide-spread as might be expected. Where adequate capital is available, it is often more economical to do practically all of the development in the country rock, particularly if the deposit is weak structurally. On the other hand, in flat bedded deposits, such as coal, the practice is to do all development in the valuable seam if it is thick enough. In such cases the development work often shows a profit.

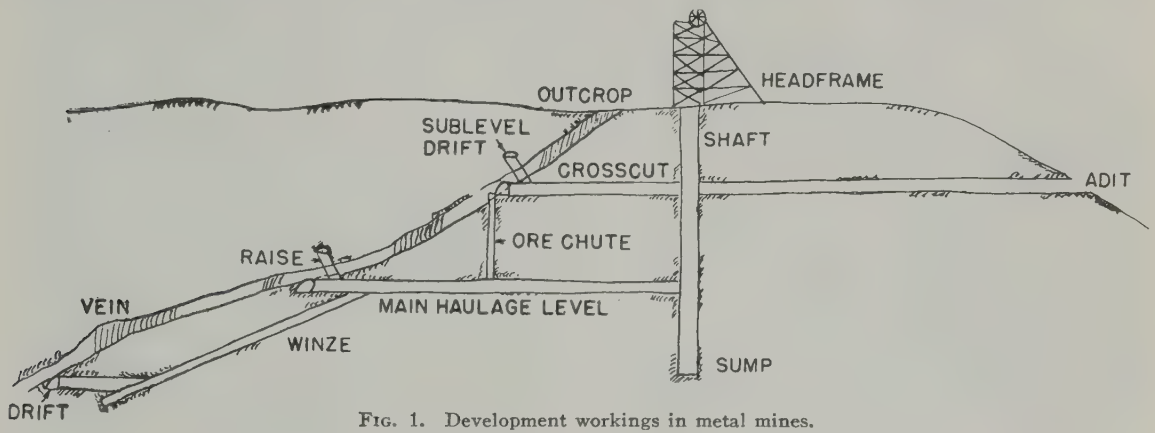


Fig. 1. Development workings in metal mines.

Principal access to a deposit may be through a horizontal opening, such as a drift in coal mining or an adit in metal mining, where the deposit is above the valley bottom. If the mineral is found below drainage, a vertical or inclined shaft may be sunk to the desired depth before horizontal workings are driven. Shafts must be planned to provide compartments for hoisting ore; for hoisting and lowering men, equipment, and supplies; for compressed-air, fresh-water, and mine-water pipes, power cables, and telephone and hoisting-signal wires; for ladderway for inspection, repair, and emergency escapeway; and for fresh or used air when the shaft is used for ventilation. Vertical shafts are easier to sink and maintain; hoisting in them is much safer and more rapid than in inclined shafts. Their chief disadvantage is that when the dip angle between the ore body and the horizontal is much less than ninety degrees, it is necessary to drive long horizontal openings from the shaft to the ore body. Under such circumstances it is often more economical to sink the main shaft part of the distance, drive a main haulage level toward the ore body, and sink a blind shaft, called a winze, from there to the lower levels.

Shafts are sunk in rock by drilling a round of holes, usually with compressed-air hammer drills, loading with a high explosive which is blasted after the working crew is withdrawn from the shaft, and removing the broken rock by hand- or power-shoveling into buckets and hoisting to the surface. The sides are supported by a framework (called timbering) of wood, steel, or reinforced concrete, or by a full lining of one of these materials, of brick or stone masonry, or of cast iron sections. The degree of support required is dependent on the rock; firm, solid rock requires little support, and in shallow shafts the

main purpose of the timbering is to guide the cages or skips used for hoisting and to support the ladder, pipes, and cables; in weak or fractured rock more support is required; and in sand, loose earth, quicksand, or rock carrying large quantities of water, full linings are needed. The difficulties of sinking the shaft are proportional to the amount of support required. Badly fractured rock or dry sand may have to be solidified by pumping in a thin cement-and-sand slurry ahead of the actual excavation process; this grouted rock must then be drilled and blasted. Quicksand can be frozen and removed like rock, or a drop-shaft of steel or concrete may be constructed on the surface and allowed to sink to bedrock as a bucket excavator removes the sand inside the casing. If large boulders are encountered it may be necessary to convert the drop-shaft into a caisson to permit men working under air pressure to drill and blast the boulders.

The shaft cross-section may be rectangular, circular, elliptical, or rectangular with rounded ends. Rectangular shafts are most easily divided into compartments, while circular shafts offer the most resistance to crushing, require the least lining material for a given size opening, and, in the case of a ventilating shaft, give the highest air-flow capacity for the amount of material excavated. Elliptical and rounded-end rectangle shafts are compromises.

Horizontal development openings in coal mines are called entries; in metal mines those parallel to the main trend of the ore body are known as drifts (or drives in parts of the British Commonwealth), and those not parallel are crosscuts. A series of drifts and crosscuts at one elevation used as the means of access to the ore body from the shaft is a level; a series not connected directly to the shaft, used to facilitate the removal of the ore, is a sublevel; a level at which ore is collected from several levels and hauled to the shaft is a main haulage level.

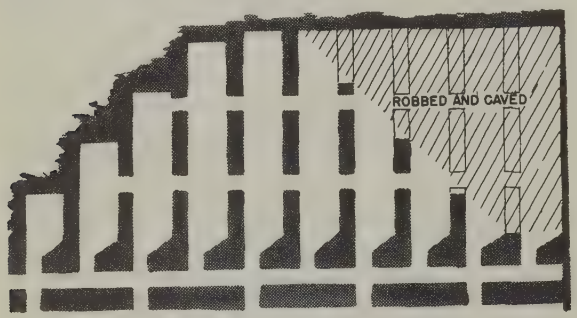


Fig. 2. Room-and-pillar mining.

Drifts and crosscuts, like shafts, are driven by drilling and blasting. The muck is then loaded into cars by hand or mechanical shovels. The workings are inclined toward the shaft so any water will drain to the sump; the slope is usually planned so it is as easy to haul a loaded car down grade as it is to haul an empty one up. Where these workings are driven in the country rock they are made as small as is suitable for the use planned for them, to reduce the cost and simplify the problem of roof support. In coal mines the entries are usually as wide as they can be made and still remain open over long periods, because by so doing greater ventilating capacity is obtained and more coal is mined in the operation for each dollar of cost.

In development for open-pit mining the deposit must be cleared of vegetation and top-soil, and access roads prepared. If the deposit is on a hillside the sloping rock surface must be excavated into a series of benches wide enough for drills, power shovels, and trucks or ore cars to work and not interfere with each other.

MINE PLANT

The mine plant includes all of the structures and machines used around the mine. See also Mining Machinery and Milling Machinery.

Electric power for a mine is obtained from commercial producers when available, otherwise it is generated on the site by steam, gasoline, or diesel driven generators. The power is frequently transmitted underground at high voltage by cables in the shaft or lowered through boreholes, with underground transformer stations for reduction to operating voltages. Direct current is especially popular in coal mines because variable-speed motors are used on locomotives, coal drills, undercutters, and loading machines. Rectification is performed underground or on the surface by vacuum-tube rectifiers, motor-generator sets, or rotary convertors; the rectifiers are becoming increasingly popular, and have the advantage for coal mines that there is less danger of igniting explosive mixtures of mine gases.

Compressed air is not commonly used in coal mining, but in metal mines it is the customary source of power for rock drills, loading machines, and scraper hoists, and sometimes for locomotives and for the hoist engines at underground hoisting stations. Compressor stations may be located at the surface, but underground compressors, driven by high-voltage motors, have the advantage of shorter piping systems and consequently reduced distribution losses.

Ventilation is provided by either centrifugal or axial-flow (propellor) fans. The latter type, brought to a high degree of efficiency about 1936, has become increasingly popular for that reason. All fan installations should be designed to permit reversing the air current in case of fire or explosion on the intake airway.

Coal mine fans are required by most state laws to be outside the mine because of the danger of gas or coal-dust explosions. At drift mines they usually operate exhausting, and fresh air enters along the haulage entries. At shaft mines good practice makes the hoisting shaft an intake, and the fan operates exhausting at a separate ventilation shaft; at large mines, however, economical ventilation requires additional inlets, and thus blowing fans also are used.

Most metal mines require less air than coal mines because explosive gases are quite rare; this condition also permits underground fan installations and the use of the main shaft as a return airway, which contributes to the comfort of the men working at the shaft bottom in cold climates. Large quantities of conditioned air are required for cooling in hot, deep mines such as those of the Rand in South Africa. Air is distributed in metal mines by making levels alternately intake and return, or by providing special galleries to carry the used air to the upcast shaft.

Transportation includes horizontal movement, or haulage, and vertical movement, or hoisting.

In small and medium-size open-pit mines truck haulage is the rule, diesel trucks holding from 15 to 30 tons being preferred. In the largest pits, rail transportation is used for ore and rock haulage and trucks are used for service.

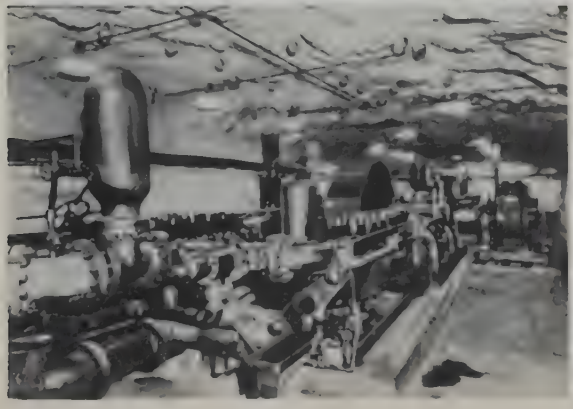
MINING

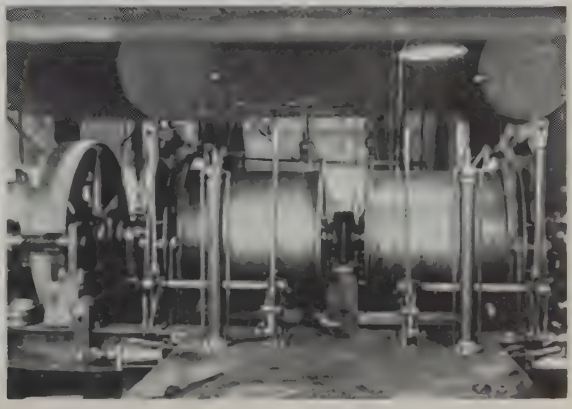
Above: Power shovel used for stripping operations in coal mining. *Below:* Jumbo drills in an underground mine. *Bottom left:* Pumping station 2,000 feet underground keeps mine from flooding by pumping mine water to surface.

(Above) Marion Power Shovel Co.; (below and bottom left) "Engineering and Mining Journal"

Left: Diamond drill in operation. *Below:* Mucking, or loading, machine at work in an Idaho lead-zinc mine. *Bottom right:* Hoisting mechanism for operating skips, or cages, in a vertical shaft mine, for ore, men, or materials.

Photos courtesy "Engineering and Mining Journal"

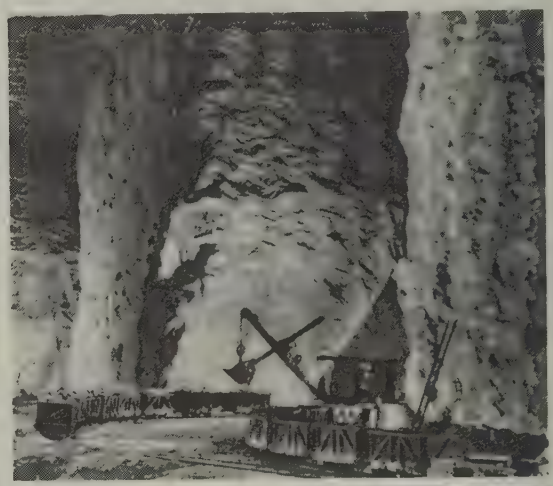




MINING

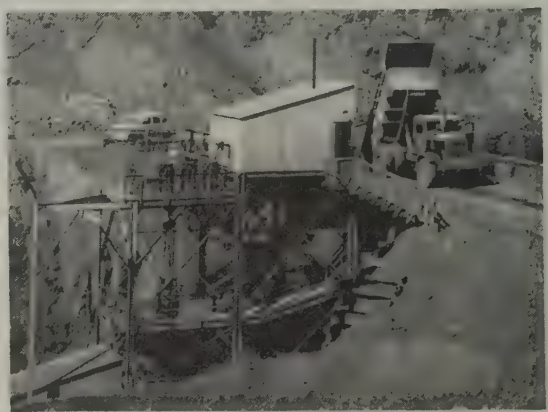
Upper left: Helicopter carrying magnetometer for aerial exploration. *Above:* A mine headframe.

(Upper left) Bell Aircraft Corporation; (above) "Engineering and Mining Journal"



Center right: Room-and-pillar mining of salt. *Above:* Bucket dredge for gold mining.

Photos from "Engineering and Mining Journal"



Center left: Dragline excavator used in stripping operations. *Lower left:* Open pit copper mine with rail haulage. *Lower right:* Truck dumping 22 tons of iron ore into drive-over hopper at mine screening plant.

(Center left) Bucyrus-Erie Co.; (lower left) "Engineering and Mining Journal"; (lower right) Euclid Road Machinery Co.

Rail haulage in coal mines, formerly universal, is being replaced at the working face by shuttle cars, self-propelled cars with conveyor bottoms for unloading, and by room and gathering conveyors, which may be of the belt, flight, or shaking type. For main haulage, rail transport with cars up to 30 tons capacity is still of major importance, but in many cases it is losing ground to belt conveyors where short hauls are involved, and in coal seams that are inclined at angles too steep for rail haulage, or where the coal lies near enough to the surface to make the use of an incline with a belt conveyor more economical than hoisting cars in a vertical shaft.

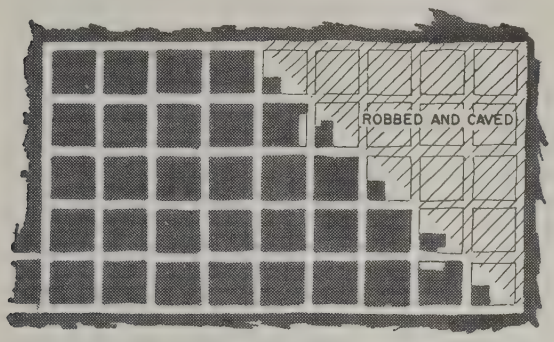


FIG. 3. Bord-and-pillar mining.

In most other underground mines rail haulage is used. Cars vary in size usually from 1½ to 7½ tons or larger. In thick horizontal deposits, such as limestone and salt, diesel or electric trucks are often used.

Mine cars can be hauled up inclined shafts singly or in groups, or their contents dumped into bins and loaded into special cars permanently fastened to the hoisting rope. With vertical shafts the cars are raised in cages of one to four decks, or else the ore is hoisted in skips, which are large buckets equipped with shoes to ride on guide timbers in the shaft and designed to dump automatically at the surface. Because of the reduced dead weight, skips are widely used, especially for hoisting from deep mines, but they are not often used at coal mines because the extra handling breaks up the large coal, which usually brings a higher price. Skips are sometimes suspended below a cage of conventional design, permitting the same unit to serve for ore, men, and materials; this practice increases the dead load and is avoided where possible. Cages may be constructed to tilt, dumping the car at the surface with minimum delay.

Hoisting engines are usually driven by steam or electric power, although gasoline hoists are commonly used during exploration, and air hoists at underground stations. The hoisting rope, made of the finest grade of steel, is wound, in most cases in a single layer, on a smooth or grooved drum which may be cylindrical, conical, or a combination to share the low first cost of the cylinder with the operating economy which is attained with the cone. The cone also requires a smaller motor for the same hoisting capacity. Two drums are mounted on one shaft, and the weight of the empty skip or cage descending in one shaft compartment helps to raise the load in the other. If only one cage is used a counterbalance is desirable. Tapered ropes reduce dead load at deep shafts, but are not used in the United States. Hoisting load may be equalized in other ways. The simplest method, which provides perfect equalization, is to use a tail rope connected to the bottoms of the two cages working in balance and riding under a large sheave in sliding bearings at the shaft bottom. Another method is to use a flat rope winding on a reel, which in effect is similar to a conical drum; the rope may be tapered. These practices have never found wide acceptance.

Some electric hoists have been made semiautomatic in operation. The motor is started by the man who fills the skips underground, and is stopped automatically when the skip is dumped after controlled periods of acceleration, high speed deceleration, and low dumping speed.

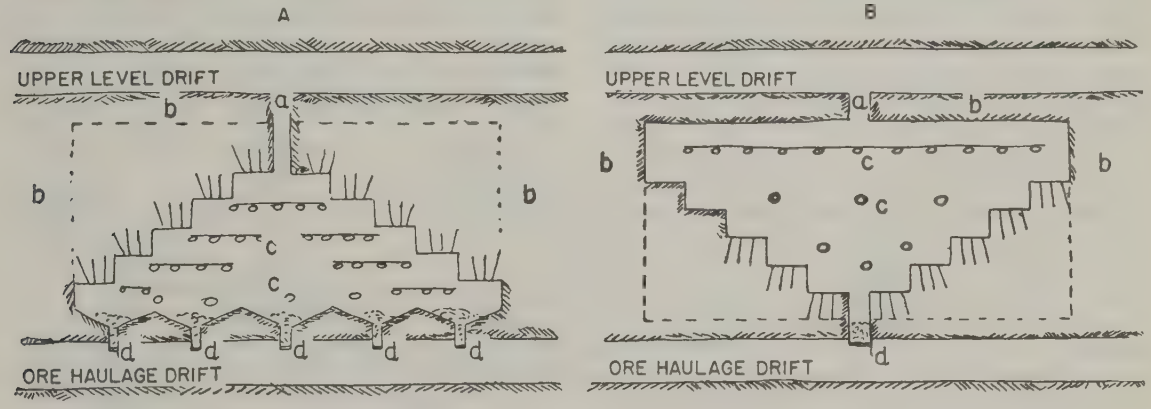


FIG. 4. Open stopes: A, overhand stope; B, underhand stope (*a*, manway and timber chute; *b*, pillar; *c*, stull; *d*, ore loading gate).

Headframes are constructed over hoisting shafts to support the sheaves over which the hoisting ropes travel, the vertical and dumping guides for cages and skips, and the ore receiving bin, and to provide a cover to prevent people and objects from falling down the shaft. They may be made of wood, but are usually of steel because of greater strength, longer life, and elimination of fire hazard. Reinforced concrete has been used also.

Other structures found at the surface of most mines include: office building, change house, maintenance shops, warehouse, assay laboratory, crushing plant, concentrator, and explosives magazine.

Pumping stations are located near the shaft at the bottom level, and at intermediate levels when it is possible to gather sufficient water there

for economical pump operation, or when excessive depths or other considerations made pumping in several stages advisable.

Mine pumps have varied widely in design, but most new installations use electrically driven centrifugal pumps unless the quantities involved are small and the vertical lift is high. Multistage pumps are used for high lifts. Water is collected in sumps, either below the level of the pump room, or behind dams and at the same or higher elevation. Pumps are usually controlled automatically.

EXPLOITATION

Exploitation is the removal of valuable mineral from the earth. The methods used vary widely with the nature and value of the deposit, and are so varied that only a few representative types can be described here.

Placers.—Deposits of sand or gravel containing valuable mineral particles are known as placers. Gold bearing placers, if rich enough, can be mined by hand shoveling, using pans, rockers, or sluices for concentrating. For larger-scale work the gravel is washed into sluices by heavy streams of water from hydraulic giants, or is mined by power shovels loading into cars or trucks. Deposits are mined by dredges when they are flooded or a lake can be made by damming a stream; the dredge contains the concentrating equipment, and deposits the barren gravel behind it as it progresses through the deposit.

Open-pit Methods.—These are used where deposits are of reasonable lateral extent and are not covered too deeply with overburden, or where they lie on a hillside. When benches have been developed blastholes are drilled, usually by churn drills vertically downward, from 15 to 50 feet in from the edge of the bench; in other cases compressed air drills are used, and both vertical and either horizontal or inclined holes are made. The broken ore is loaded into cars or trucks by electric or diesel shovels. Loose rock is scaled down from the face by the shovel bucket if the benches are not too far apart; 40 feet is a common spacing which permits this type of scaling, although 225 foot benches have been used, requiring hand scaling by men working on safety ropes. Common dipper sizes are ¾ to 5 cubic yards. Bulldozers pile the scattered ore for the shovels, and clear roads for the trucks to prevent tire damage which can become prohibitively costly.

As the pits become deeper haulage becomes more difficult, and sometimes it is necessary to blast the ore into funnel-topped raises leading to an underground haulage system. These raises are called mill holes, or, because of the danger involved, glory holes. This method cannot be used if the ore tends to pack.

Stripping, or course stacking, is a special type of open-cut mining applied to extensive thin horizontal beds such as coal. In this process a wide strip of the coal or other mineral is exposed by removing the overburden, after blasting if necessary, with either dipper shovels or drag-line excavators. These machines have long booms, and bucket capacities of as much as 45 cubic yards. Part of the exposed coal is mined out by blasting, then loading with smaller shovels, and the stripping shovels, moving on the portion of the bed still exposed, uncover to the original width, stacking the removed waste in the space left as the coal was mined. Thus, no waste need be hauled away. This type of mining has been highly developed in Europe, where a wide variety of specialized excavators have appeared.

Room-and-Pillar.—This type of mining and its many variations are used in relatively thin beds which lie horizontal or at slight to moderate dips, such as coal, salt, and limestone beds. Rooms are driven parallel with pillars between; when the rooms are completed the pillars may be robbed and the overlying rock allowed to cave, if the work can be done with safety (Fig. 2). In strong formations such as limestone the pillars take a more-or-less circular cross-section and are relatively far apart; if the rock is mineral-bearing the pillars are left in barren rock where possible, and the pillar pattern is less regular. In coal and other weak materials the pillars are larger and closer together. Bord-and-pillar systems (Fig. 3) are used where the coal is very weak; after the narrow bords are driven, the pillars are mined so the roof caves along a straight line, relieving the pressure on them.

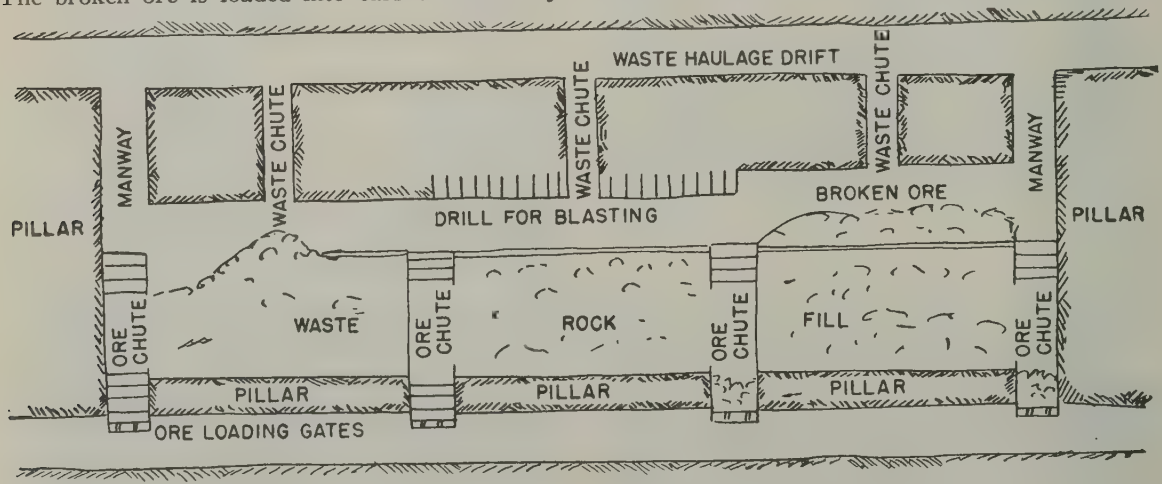


Fig. 5. Flat-backed stope.

In mining coal and other soft materials the seam is usually undercut by machine, and the mineral is then drilled and blasted. Attempts to mine coal by machines which break it free of the seam without using any type of explosive were attracting widespread attention in the United States in the late 1940's. In Europe such machines had been developed earlier and had gained

considerable success, largely because they are better suited to the longwall methods used there in preference to the room-and-pillar systems which are almost universal in the United States. See also Coal.

Longwall Mining.—Coal is mined by this method which is characterized by a continuous face without pillars extending around the entry shaft. In advancing work the mining goes outward from the shaft, and the roof is allowed to settle slowly onto a pack built up of waste rock from the mining operation. In retreating operations the roof is allowed to subside onto the floor or such waste rock as may be produced. A flexible roof is almost a prerequisite for this type of mining, but it has been carried out under brittle roofs by causing the rock to cave at some distance from the face while supporting it over the working area.

Where hand methods of mining are used the face is undercut and roof pressure is allowed to break the coal, making drilling and blasting unnecessary and giving a large quantity of lump coal. Where machine methods are used a plan of the workings resembles a more-or-less regular polygon, the sides of which, sometimes 1,000 feet or more in length, are ideal for continuous mining machines, which break down the coal and deliver it onto a conveyor laid along the face.

Stoping.—The removal of mineral by driving, by drilling and blasting a series of horizontal workings steplike in ascending (overhand) or descending (underhand) sequence is called stoping. This method of exploitation is used in ore bodies of relatively steep dip or of considerable thickness. The deposit is divided into stopes by pillars, and each stope is worked by one of the various stoping procedures.

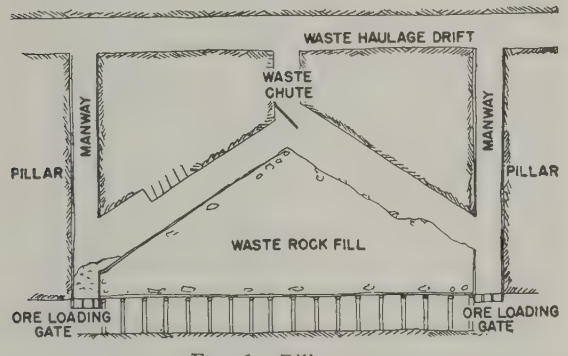


Fig. 6. Rill stope.

Open stopes (Fig. 4) are more frequently used in thin veins. Their name comes from the lack of complete timber support or rock fill to maintain the workings, which rely on the pillars only or on a few timbers, called stulls, across the stope to prevent collapse. In relatively horizontal beds the work resembles room-and-pillar mining, but because of the thickness of the bed it is not mined in one cut from top to bottom, but is taken in several layers. In steep veins the miners lay planks on the stulls to provide a platform in overhand stoping.

Timbered stopes are those in which large quantities of timber are used to prevent caving. Open stopes with many stulls grade into stulled stopes, a type of timbered stope. In thicker ore bodies timber support is given by the use of square sets which are assembled to fill the opening with a cubic lattice, the vertical posts resting on a square grid of girts and caps. The system may be modified to give triangular frames for greater strength. Both stulled stopes and square-set stopes may be left open if the ground will hold, or may be filled as the work progresses, or on completion of the stope, with crushed rock or with fine waste from the concentration plant.

Filled stopes include both filled timbered stopes and stopes which are filled as they are mined without appreciable timbering. The latter are always mined overhand, with the miners standing on the fill, onto which the ore is blasted. In flat-backed stopes (Fig. 5) the broken ore is then mucked into wooden chutes leading to car-loading points, by shoveling or by use of drag scrapers, the chutes are then extended, and more fill is brought in. In rill stopes (Fig. 6) the ore slides on the waste to the loading chute. If the ore is rich, boards may be placed over the fill before blasting to prevent loss; in other cases, where waste and ore are cheaply separated at the concentrator, a layer of waste is scraped into the chutes with the ore. After a stope is completely mined and filled all pillars are sometimes mined out and filled in turn.

Rock fill may be quarried at the surface, sorted out of the ore underground, or mined out of the barren rock underground.

Shrinkage stopes are overhand stopes in strong ground in which the broken ore is allowed to accumulate, enough being drawn off after each blast to give the miners room to work as they stand on the ore. When the stope has been completely mined the ore is drawn off; the stope may then be filled or left open.

Top slicing is a stoping method used in ore bodies relatively large in all directions, so named because slices are taken from the top of the ore body.

The principle of this method is shown in Fig. 7. First a raise is driven containing a manway, timber chute, and ore chute from the haulage level to the top of the ore body. From this point drifts are advanced to the ends of the stope, which frequently are the ends of the ore body, and crosscuts are run from the drift ends to the contact between ore and country rock. If the stope is very long, ore chutes may be raised to the drift at intervals. As the work advances, heavy plank is laid on the floor, posts are set up on the planks, and cap timbers are laid on the posts to support the top. As a crosscut is completed, a new one is driven beside it, and is timbered as it is advanced. The ore is shovelled or scraped to the ore chutes, and the posts on the far side of the first crosscut are pulled or blasted down, allowing the top to cave in on a mat of timbers. Crosscuts are driven successively toward the center of the stope, and as the slice nears completion a new slice is started by driving drifts immediately below; several slices may be worked at one time, the workings of each one being nearer the central raise than those of the next lower slice. The workings are covered with an ever-increasing layer of tangled timbers.

Sub-level caving is a modification of top-slicing in which the drifts and crosscuts of successive slices are driven under a few feet of ore, which is made to cave by pulling out the vertical posts and caps supporting it. This method requires less drilling and blasting and less timber than top-slicing.

Block-caving is a stoping system in which the ore is divided into blocks, 100-250 feet wide, 100-

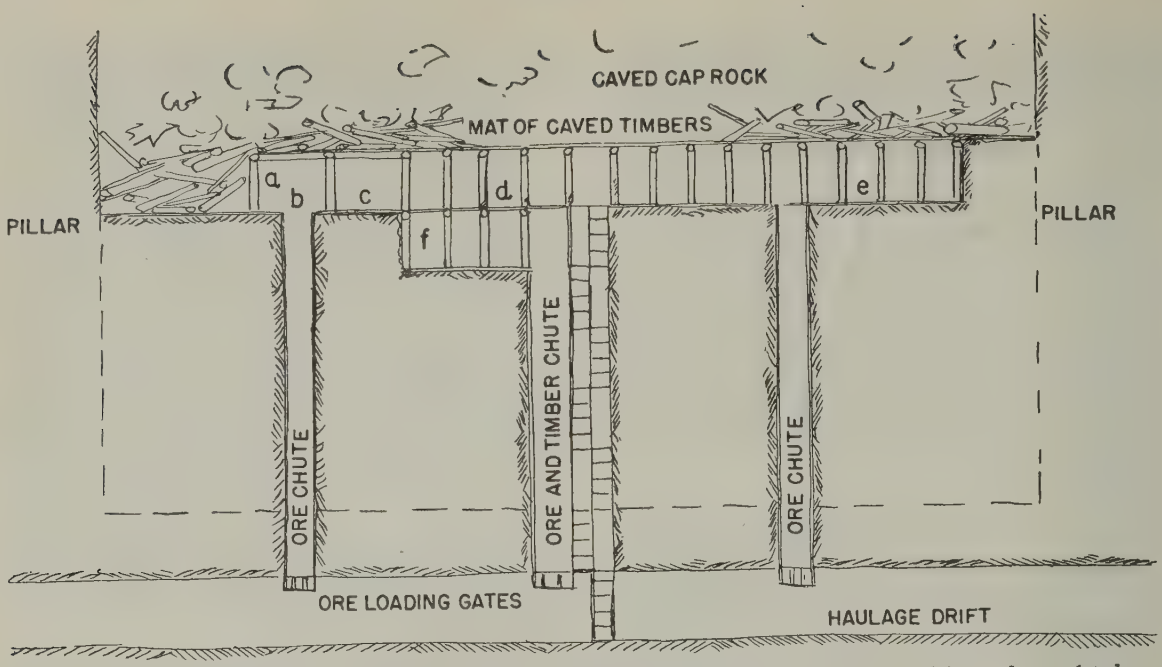


FIG. 7. Top slicing: *a*, posts ready for blasting; *b*, completed crosscut; *c*, crosscut being driven; *d*, completed drift; *e*, drift being driven; *f*, newdrift.

400 feet long, and 30-600 feet high. An example is shown in Fig. 8. These blocks may be loosened from the surrounding pillars or country rock by driving shrinkage stopes at intervals up the sides and ends. The ore must be of such a soft nature that it will cave of its own weight into a network of hoppers prepared under the block, and will break into small pieces as it passes from the hoppers downward through finger raises into merging chutes (transfer raises) leading to the loading pockets as much as 130 feet below the bottom of the block. Caving may be started by driving drifts or cross-cuts directly over the centers of the hoppers, then drilling the pillars between the drifts and blasting them out. Caving proceeds until the caved ore, which occupies more space than the solid ore, fills the opening and supports the hanging block. As ore is drawn into cars many feet below, more ore caves into the space provided. This is a very economical method of mining, but, like most other types, requires a special combination of natural conditions in the deposit.

Blocks may be filled with cap rock which caves as the ore supporting it is withdrawn, or rock fill may be introduced. Pillars between blocks are mined after the fill has had several months to become stabilized.

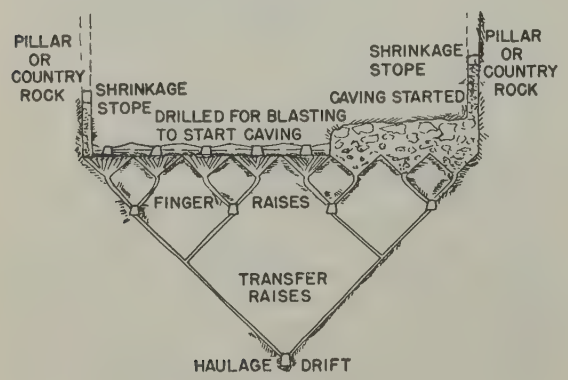


FIG. 8. Block caving system.

All of these methods of exploitation are modified to suit the conditions of the individual deposit, and combinations of methods are used wherever greater safety or economy can be obtained by so doing.

MINERAL DRESSING

The product of a mine may, and usually does, require treatment to put it into proper condition for use by the immediate consumer. Coal must have slate and bone removed to prevent formation of ash and clinker, and it must be sized so it will burn properly in the furnace of the consumer. Rock must be crushed and sized for various uses. Metalliferous ores as mined are in most cases of too low grade to be treated economically at the smelting plant; discarding of waste at a mineral dressing plant, or mill, in the vicinity of the mine saves not only the extra smelting cost, but also the freight charges which would have to be paid on the discarded material if it were not removed.

Mineral dressing operations consist primarily of comminution, or severance, to release the particles of valuable mineral from the waste material, and concentration, or separation, to divide the broken material into valuable and worthless fractions. The first of these operations is carried out in crushing and grinding machines, frequently aided by sizing machines to prevent excessive breakage of the material. Concentration is carried out by hand sorting and by a variety of machines which separate the different minerals because of their varying physical properties. Color, luster, specific gravity, and magnetism were the properties of importance in concentration until the beginning of the 20th century, but in the succeeding fifty years such properties as electrical conductivity, elasticity, friction, friability, and surface characteristics that cause substances to be wetted by a fluid or to remain dry have been made the basis of machines and processes for concentration. See also MINING MACHINERY AND MILLING MACHINERY.

Besides the comminuting, concentrating, and

sizing machinery mentioned, there must be other equipment in the mill for transporting and storing the ore in process, for removing excess water, or even drying it, and for taking samples at critical points in the process. The coarse and fine waste products must be removed from the plant and stored, usually permanently; fine waste frequently is a source of stream pollution and may thus cause expensive litigation. Where possible this material is used for mine fill, but often the milling processes do not remove all of the valuable mineral from the ore, and the waste, or tailing, is placed in temporary storage for a few years or several decades until discovery of a more efficient concentration process makes it possible to extract more of the valuable mineral at a profit.

MINING ADMINISTRATION

Organization.—A mine may be owned or operated, or both owned and operated, by an individual, a partnership, or a corporation. Many manufacturing companies own and operate the mines which supply their raw materials; these are called captive mines. A mining industry faces a peculiar set of financial problems due to the fact that its assets, in the form of mineral deposits, are constantly diminishing, even though the known deposits, or reserves, may be enlarged by new discoveries on the property. Furthermore, many deposits of large extent and apparent value cannot be mined economically because of unfavorable geologic conditions, or because no system of mineral preparation has been developed to separate the constituents of the ore without excessive cost.

A mining company usually operates one property under a manager who directs the operations of the mine and preparation plant. A maintenance department keeps the equipment in operating condition, the elaborateness of the shop facilities increasing with the size of the operation and the remoteness from sources of supply. Headed by an electrical and a mechanical engineer, this department should include a timber and carpenter shop, a blacksmith shop, machine shop, electrical shop, vehicle maintenance shop, and steam, water, and power plants. The accountant often has charge of purchasing and the warehouse. Usually the company has its own doctors, nurses, and hospital. A town and stores may be constructed and owned by the company, but the trend is to dispose of all such holdings. An engineering department including mining engineers, geologists, surveyors, samplers, assayers, and mineral preparation engineers provides technical guidance for the manager and the operating departments. This department may design all structures and many machines for the special conditions prevailing at the property. See also MINING ENGINEERING.

Because mining depletes the natural resources of the country, special laws are enacted to control it. See also MINING LAWS. The special hazards of mining have caused the passage of laws in most states to provide for minimum safety standards, and mines are subject in addition to laws governing industry in general. The accounting system, besides offering ready information to be used in cost analysis to improve operating efficiency, must supply all data required for compliance with these laws.

Mine Safety.—This important factor in mining has received increasing attention since early in the 20th century, and substantial progress has been made in reducing fatal and lost-time accidents. While the public eye is quickly focused on spectacular mine disasters such as coal mine explosions and mine fires in which occasionally one hundred or more men are killed at one time, the total number killed in small accidents in any year is far greater and warrants proportionally more attention to the means of reducing the frequency, both in number of accidents or fatalities per man-day worked, and in the number per unit of production.

Progress in mine safety is attained by continuous attention to accident preventatives, such as the proper selection, training, and discipline of workers; the provision of a plant with proper arrangement, safety devices and warning signs; the wise use of incentives to work safely, such as competitions and bonuses; and, above all, a true "safety-mindedness" on the part of management, reflected in ardent support of the program. A safety engineer of mature judgment, respected by his colleagues, and with authority to enforce his decisions can do much to plan and execute an effective safety program.

Closely allied to safety is the health of the miner. Hazards peculiar to the industry or of greater-than-average severity when encountered in mining are numerous. Because of the dark and sometimes damp working places and the abrupt changes of temperature when entering or leaving the mine, pneumonia, rheumatism, and tuberculosis are more common than in many other industries. The extended workings foster laxness in sanitary precautions, and thus hookworm disease and typhoid fever may be spread.

Where free silica is encountered in the rock, silicosis, a laceration of the lung tissue, is caused by inhaling very fine particles of quartz. The illness can be fatal unless detected in time and its advancement checked by change of occupation; at one time it caused more fatalities than all types of mining accidents. The hazard is reduced by use of wet drilling methods and by wearing respirators, and medical research is developing improved methods of treatment. In lead mines where the carbonate occurs, lead poisoning may result from inhalation or swallowing. Mercury poisoning is a great hazard where cinnabar is mined, and ores containing arsenic are also dangerous.

Gases occurring in mines present a dual hazard of poisoning and explosions. Carbon monoxide, dangerous in concentrations of 3/100 of 1 per cent or more, depending on the period of exposure, is formed by blasting, mine fires, and explosions. It is difficult to detect, and canaries or mice were long carried into mines for this purpose, since, being more easily affected than humans by the gas, their distress or collapse gave warning of danger. Nitrogen trioxide and tetraoxide, which are formed when dynamite burns instead of detonating, are poisonous gases which have caused a number of deaths. Hydrogen sulphide, more deadly than carbon monoxide, is fortunately seldom encountered in mines.

In coal mines and some metal mines methane (firedamp) is encountered; this gas forms explosive mixtures in air when it makes up from 5.0 per cent to 13.9 per cent of the mixture. Explosion of a small pocket of methane can stir up fine coal dust and ignite it, causing the explosion to extend through a large part or all of the mine with loss of many lives and much

property. Coal dust suspended in the air may ignite when gas is not present, but it is believed that most explosions were started by ignition of gas, and that almost all severe ones developed into dust explosions. The most severe mine explosion on record occurred in France on March 10, 1906, when 1,110 persons were killed at Courrières. In each of five other disasters 300 or more persons were killed.

During the years 1902 through 1918 there were 25 major explosions (100 or more fatalities) in coal mines throughout the world, killing 5,717 persons. Their frequency caused widespread agitation for corrective legislation, which caused a great improvement in mining safety statistics, both in the number of explosions and the number and severity of other accidents. In the United States, for instance, the fatality rate has been reduced from 1.93 per million man hours in 1911 to 0.90 in 1950, and from 5.00 per million short tons of coal mined to 1.15, in the same period. In 1951 there were 791 fatalities in the coal mines of the United States, of which 367 were due to falls of coal or rock from the roof or face, 158 were caused by major explosions (5 or more men killed) 5 by minor explosions, 119 in haulage accidents, 67 by miscellaneous underground accidents, and 75 on the surface or in strip mines. It should be noted that the chief cause of fatalities is falls of coal or rock; prevention of this type of accident is largely a question of care on the part of the individual miner and, to a lesser degree, of his immediate supervisor.

General Aspects.—Successful operation of a mining enterprise requires a careful blending of many skills under experienced technical supervision and wise fiscal management; a large measure of good fortune is also necessary, as only a small percentage of mining ventures pay off the money invested in them and show a profit. A study of precious metal mining companies organized in Ontario between 1907 and 1941 indicated that less than 1 per cent were likely to pay a fair return on the investment. The proportion of successful ventures is much higher in coal mining, where the extent and value of the bed can be accurately determined at relatively low cost, a deposit can usually be purchased close to markets or to established transportation systems, and the costs of mining can be predicted with reasonable accuracy, with less chance of unexpected natural conditions causing excessive expenses.

The choice of methods offered in mining is wide in most cases. Where natural conditions are favorable the right selection may lead to outstanding success, but the wrong one can cause financial ruin or loss of life. Many fortunes have been made in mining, and the development of the industry has resulted from the willingness of men to risk everything in the hope of great financial success.

Any industrial economy must rely on a firm mining industry to supply its raw materials. Coal and iron in abundance are the primary essentials, followed closely by oil, copper, and the more common non-ferrous metals. Even a mineral for which the demand is only slight, however, is essential to modern industry, and a supply of almost every known commercial mineral must be available, within the country or by importing, to maintain the world of today. See also MINING ENGINEERING.

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MINING ENGINEERING, that branch of engineering which pertains to the operations of extracting useful minerals from the deposits in which they occur. While no distinct line can be drawn between the fields occupied by mining and mining engineering, the former may be termed an industrial art and the latter an applied science. The present article will be confined to a consideration of the qualifications, professional duties, and training of the mining engineer; the subjects relating to mining as an art, namely, the modes of searching or prospecting for mineral deposits, the various systems or methods of working mines, and the details of the operations connected therewith, are dealt with under the head of MINING.

The province of the mining engineer comprises the testing and valuing of mineral deposits, the planning and execution of the various mining works required to reach the deposit—such as tunneling, shaft-sinking, etc.—the choice and application of a suitable method of opening the mine and bringing the ore to the surface, the selection of means of preparing the mineral product for sale, and, lastly, the installation of the necessary surface and underground plant. In addition, therefore, to a knowledge of the theory and practice of the various kinds and methods of mining, the successful pursuit of the profession demands not only a training in mathematics, mechanics, physics, and other fundamental subjects which underlie all engineering education, but also an intimate acquaintance with certain of the natural sciences, particularly geology, mineralogy, and chemistry, and many of the principles of civil, mechanical, and electrical engineering. In a well-planned course of professional instruction the scientific studies would preferably come first, but the engineer lacks a comprehensive understanding of his profession until to these he adds a knowledge of the actual practice of mining, ore dressing, and extractive metallurgy. The functions of the mining engineer cannot be defined in precise terms, largely because of the infinite variety of local conditions which may be encountered, and the differing physical, mineralogical, and chemical characteristics of the ore deposits themselves. (See also ORE DEPOSITS.)

There has been a great tendency toward specialization in mining. As the professional field has broadened, no one man can hope successfully to cover it all. Quite a sharp distinction exists, for example, between metal mining and coal mining. The modes of deposition of coal and of the metalliferous ores, the geological and physical conditions, and the accepted systems of mining are so different that the engineering

of collieries has become largely a specialty. So again among the metals themselves. Engineers may be led to specialize in the direction of iron, or lead and zinc, or copper, or gold and silver mining. This latter differentiation is not the result of any fundamental diversity in the methods of developing and working the mines, but is due rather to differences in the scale of operation, the physical characteristics of the deposits themselves, the treatment of the ores of the various metals, and their final disposition. It frequently happens that the dressing, or concentration, and even the smelting or other process for the reduction of the ore are carried on at or near the mine itself and under the same general management. The mining engineer, therefore, must be something of a metallurgist also, and, though not necessarily highly skilled in this direction, he should at least be able to decide upon and select the plant and process appropriate to the character of the ore, and to supervise its erection and operation. But this applies to the mining and treatment of the non-ferrous metals. The metallurgy of iron and steel forms far too large a field to be included in the range of work of the mining engineer. It requires a special training.

Several more or less conventional distinctions are made as to the particular branch of work in which a mining engineer may specialize. He may devote himself to examining, valuing, and reporting on mines, being engaged for such work by intending sellers or buyers; he may serve in the capacity of consulting engineer for one or more mining companies; or in doing a general business he may be retained by his clients in an advisory capacity similar to that occupied by a counsellor-at-law, leaving to others the actual execution of the work or the carrying out of the policy determined upon. On the other hand, a mining engineer who becomes identified with the management of the affairs of a particular company must be a successful organizer and businessman; he must possess the ability to make favorable contracts for work, the purchase of material, and disposal of product, to control men, and not only to plan work, but to know how it should be executed to attain the best economic results. He often combines with his purely professional functions the duties of superintendent or manager, and the smaller the property, the greater usually is the variety of responsibility devolving upon the engineer. When in charge of a small or temporarily non-paying mine, especially one situated in a remote region, the engineer may be compelled to serve simultaneously in the capacities of superintendent, foreman, assayer, and bookkeeper. He must know enough of chemistry and of civil, mechanical, and electrical engineering to exercise intelligent control in matters relating to these branches, and he should have at least a general knowledge of mining law.

Formerly, the profession of mining engineering was less complex and exacting in its requirements than more recently. An inspection of the course of study prescribed in mining schools of good standing will show how largely the education of a student in mining engineering lies in the direction of subjects not relating specifically to the art of mining itself. The great advances made since 1870 in scientific and technical lines have brought with them constantly increasing responsibilities. Since that date, manual labor has been largely replaced by mechanical appliances, and the engineer must be alert in availing himself of the innovations which have been introduced in endless variety; the use of compressed air for rock drills, hoists, and other machinery, the ever-widening applications of electricity in the automatic control of machinery and for power, the various machines for loading ore and coal which have appeared, numerous continuous-type mining machines designed for coal, but with possible application to other soft minerals, the drilling of blast holes by shaped explosive charges and by jet-piercing with blow torches, the use of internal combustion engines, the numerous improvements in machines and processes for the concentration and reduction of ores, the increase in knowledge of the relations of geology to the deposition of ores; all these constitute new tools in the hands of the mining engineer, but they unite also in demanding a broader and more severe training.

Mining and hoisting large quantities of ore from great depths, that is, vertical depths of, say, more than 5,000 feet, are among the most serious problems confronting the mining engineer. Depths of as much as 7,000 feet have been already attained in several mining districts, notably in the state of Mysore in India and the Witwatersrand in South Africa, where mining is conducted more than 9,000 feet below the surface. The prosecution of work at such depths involves the solution of rather intricate problems. One of these is the support of the workings to prevent rock bursts, which are failures of the rock with explosive violence due to the tremendous pressure. A second is the providing of large quantities of conditioned air to the hot and frequently humid workings. Another is the proper design of hoisting equipment and controlling apparatus for the safe, economical, and rapid transportation of hundreds of men, large tonnages of ore, and a variety of equipment and supplies at speeds as high as 5,000 feet per minute in some cases; the difficulties involved include the varying weight of the rope itself as it winds upon its drum, a weight which often greatly exceeds that of the ore raised at each hoisting operation. A high degree of mechanical skill and knowledge is demanded for the effective solution of these and other problems. Consult discussions on hoisting from great depths which appeared during 1902 and 1903 in *Engineering and Mining Journal,* New York, and in the transactions of the Institution of Mining and Metallurgy, London, and of the South African Association of Engineers.

In all branches of his work the mining engineer of the present day finds himself compelled to introduce every new method and appliance that promises some saving in the cost of production. This is the result of many factors: wages have increased greatly, in the United States, for instance, from up to $2 per day in 1873 to approximately $14 in 1951; the prices of some metals have dropped greatly in that period—for example, the New York price of silver went from $1.30 to $.90 per ounce; the rich ores of many other metals have been exhausted to such a degree and current demands are so great that it is necessary to mine low-grade ores which, in spite of higher prices, in some cases are profitably mined only because of government subsidies. Furthermore, as the more easily accessible mineral deposits are exhausted the mining engineer is called on to practice his profession farther afield, often in regions

remote from centers of population. Here he may be confronted with new problems arising from the lack of transport facilities, distance from source of supplies and materials, labor insufficient in quantity and poor in quality, and adverse and unhealthful climatic conditions.

Engineering has progressed from dealing merely with design of machines and processes to include the development of their most efficient utilization by careful management. This is attained, firstly, by the successful application of management-labor practices to insure productive attitudes on the part of the workers and, as a result, obviate low production rates and strikes; and, secondly, by careful time-and-motion study of the relationships between men, machines, and working places to prevent loss of operating time while one group of workers or a machine and its operator are waiting for another group or machine to complete one stage of an operating cycle. Much emphasis is being placed on labor relations, and engineers, as management representatives, must take the forefront in careful handling of delicate situations and in daily maintenance of good relations. The mining engineer must frequently plan and execute his own time-and-motion studies, usually to attain lower costs, but often to assemble data justifying proposed changes in equipment, mine layout, or operating methods. This is especially true in the modern coal mine, where expensive machines for undercutting, drilling, and loading and hauling away the broken coal after blasting must move from one working place to another with a minimum of mutual interference.

Mining is an essentially hazardous occupation. The mining engineer is charged with elimination or mitigation of the hazards by the judicious use of safety policies covering worker selection and education, safety devices, rules, competition, awards and punishments, accident investigations, and inspection for and correction of hazardous conditions. It has been observed that the safety record of a mining operation is a direct reflection of the attitude of the management toward safety, and an engineer without a forthright and positive interest in the elimination of accidents can expect to have a poor record.

That function of the mining engineer which relates to examining and reporting on mining properties is both delicate and difficult, and calls for the highest degree of professional efficiency and integrity. In brief, the examination of a mine includes a study of the local conditions, topographical, geological, and economic, and of the mineral deposit itself; the mineralogical character, quality, quantity, and grade of the ore, and its value per ton; an estimate of the cost per ton of mining the ore and the net profit which reasonably may be expected; and, lastly, the probable life of the mine. Upon these factors depends the market value of the property. In determining the quantity and grade of the ore, the deposit, as revealed by the development work already done, must be carefully and systematically tested. This is done by taking a series of samples in a manner which will enable the engineer to obtain a true average of such ore as can be examined and measured with sufficient accuracy and definiteness to warrant confidence in the results obtained. Besides the ore which can be actually measured and sampled, the engineer may often be warranted in taking into consideration the quantity of ore which in the future will probably be rendered available by further development of the mine. In balancing such probabilities or possibilities, he must be guided mainly by geological and mineralogical analogies deduced from his previously acquired knowledge and experience. It may be added that the circumstances under which mine examinations are made are often rendered difficult and embarrassing where the perpetration of fraudulent practices by interested persons may be attempted for the purpose of misrepresenting or concealing the true condition of the mine; records of cost and of the value and amount of previous production may be falsified, or the samples taken by the engineer tampered with. Constant vigilance is required to guard against such contingencies.

With the development of the mining industry and the wider adoption of mechanical appliances and engineering methods in connection with mining operations, the demand for trained engineers has steadily increased to such a degree that probably no field of engineering affords better opportunities for a young man. Formerly, the so-called "practical" man monopolized most of the positions of responsibility and emolument, but the educated engineer has made his way to a degree that has produced an active demand for his services. Mining companies have found that the greater breadth of view resulting from a sound technical education has a direct money value. The trained engineer is acquainted with what is being done in his profession in other regions or countries. He keeps himself informed as to the experiments and discoveries made by others, is quick to utilize improved and more economical methods, and knows not only what to do, but also what to avoid. His competitor who lacks this knowledge, having at his command only what has come within his own personal experience, is in danger of failure if circumstances bring him face to face with new conditions and with problems the prompt and efficient solution of which must be based on a familiarity with the principles of engineering practice. It must be remembered that the young graduate of a mining school is not yet an engineer; he has been grounded in the fundamentals of his profession, has absorbed a multitude of facts relating to its practice, and his powers of observation have been cultivated; but before he is fitted to deal successfully with the diverse problems which sooner or later will confront him, he must in most cases patiently continue his education in the field for some years after graduation. His first employment is likely to be that of miner's helper, chemist, assayer, draftsman, surveyor, or assistant to one of the heads of department in the mine or works. How fast he advances will depend on his native energy and ability and the efficiency of his preparatory training. Not all young men are fitted by nature to become successful mining engineers. If the student has no aptitude for such a pursuit, the sooner he finds it out, the better both for himself and his instructors. The curriculum of the school, therefore, should be so planned as to eliminate inefficient students as early in the course as possible.

In the making of an engineer, circumstances and opportunity are important. A well-known engineer and instructor has said: "A man without school education may make a remarkable engineer; but it may have taken him years to get his training and at the end of the time there may be whole regions of knowledge utterly unknown

to him; in other words, he is liable to be a one-sided man without a broad outlook upon other fields than his own. The school cannot teach him everything, but it can give him the keys to the storehouses which he may need to draw from in after life." A graduate of a good mining school has this advantage over his uneducated competitor: that he is better able to avail himself of the opportunities presented to him.

MINING SCHOOLS: UNITED STATES AND CANADA

The need of technical schools especially equipped for preparing young men for the profession of mining engineering was long ago recognized in Europe, and some of the institutions there established have exerted through their graduates a marked and beneficial influence upon the mining industry of the world. Previous to 1865, mining practice in the United States was based chiefly upon European methods, and the earliest work prosecuted on a large scale in this country—for example, at the Comstock mines, Nevada—was in great measure planned and managed by American engineers who had received their education in Europe. The influence of the Continental institutions also made itself felt in the organization of the older American mining schools. The first School of Mines in the United States was founded in 1863 under the auspices of Columbia College, New York. Since then, mining schools have been established in many parts of the country, the total number being now (1952) about 33. The majority of them, however, are small, with limited equipments and teaching forces. The leading mining schools of the United States are the School of Mines of Columbia University, the College of Mining of the University of California, the State School of Mines of Colorado, the Michigan College of Mines, the School of Mines of the University of Minnesota, and the schools at Rolla, Missouri, Lehigh University, and Lafayette College. The courses of study leading to the degree of mining engineer generally occupy four years but exhibit quite wide variations in plan and scope. Some of the best of the schools have rigidly prescribed courses; others offer a range of elective subjects, comprised in more or less interdependent groups. Specialization has also appeared in subdividing the mining curricula of the various schools. Metallurgical engineering curricula have taken over the field of extractive metallurgy, and mineral preparation engineering is beginning to be heard of as a field of specialization which may eventually remove this type of work from the normal scope of operations of both mining and metallurgical engineers, as petroleum engineering has taken the production of oil and gas from the mining engineer. Prospecting and exploration are fast becoming the province of mining geologists and geophysicists, to the gradual exclusion of the mining engineer. The basic field of mining engineering is sometimes subdivided into coal mining and metal mining options, and in some schools the instruction is given in only one or the other of these fields. The trend to specialization is currently being ardently opposed by many prominent men of broad experience in the field of mining engineering and engineering education, who contend that to specialize in a four-year course gives the student too narrow a basis in fundamental science and reduces the quality of his education from college or university level to that of a trade school. They contend that specialization should be reserved for the fifth year, in work for the master's degree.

Without attempting a comparison of the curricula of these schools, a condensed statement of the ground that should be covered by a well organized School of Mines may here be given, with the total semester-credit-hours of work to be taken in each department indicated:

Mathematics (15): college algebra, solid trigonometry, analytical geometry, calculus
Chemistry (16): general inorganic, qualitative and quantitative analysis, fuels analysis, wet and fire assaying
Physics (12): general engineering physics, thermodynamics
Geology (16): engineering and economic geology; descriptive, determinative, and optical mineralogy, petrology
Engineering fundamentals (12): engineering drawing, descriptive geometry, applied mechanics
Mining engineering (32): mine surveying, fundamental mining operations, mining systems, mining equipment, mine plant design, ventilation, drainage, mining administration, mineral valuations, mine safety, mineral beneficiation
Inspection trips (3 weeks minimum): mines, preparation plants, smelters
Surveying field work (6 weeks minimum): precise control, topographical, and underground surveys
Metallurgical engineering (6): characteristics and applications of metals, principles of extractive metallurgy
Civil engineering (10): general and railroad surveying, hydraulics, structural design
Electrical engineering (6): electrical machinery, mine power control and distribution
Mechanical engineering (3): machine design
Military science (8): basic training
English (9): grammar, composition, public speaking, report writing
Economics (6): principles, business management
Other humanities (9): a coordinated program in one field, such as history, government, economic geography, or industrial relations.

The above program provides for eight semesters in residence and two summer courses. An additional three weeks or more could well be spent on geological work in the field. The training in humanities should be directed toward a better understanding of the political, social, and economic problems of foreign nations which supply the United States with substantial amounts of strategic materials, as increasing numbers of technically trained men are going into the government services for foreign work in mineral economics.

Requirements for admission to the best American mining schools include two years of algebra, plane and solid geometry, plane trigonometry, elementary chemistry and physics, up to four years each of high school English and history or government, and two years of a modern foreign language in some cases.

The extensive mining industry of Canada has led to the establishment of mining engineering curricula in a number of colleges and universities, including Nova Scotia Technical College, Laval University, McGill University, the University of Toronto, and the University of Alberta. While Canadian schools usually confer the degree after a four year course as do American schools, their curricula generally differ from their American counterparts in relying more on the pre-college training in mathematics and physics, and in placing more stress on philosophical considerations and on the benefits of practical experience with critical observation and reporting while at work.

Another distinguishing feature of Canadian mining schools is the planned transfer of students who have diplomas in engineering from certain colleges into a shortened curriculum at the university granting the bachelor's degree. These differences are indicative of British and Continental influences on Canadian educational philosophy as compared with American theories.

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Consult the publications of the following societies: American Institute of Mining and Metallurgical Engineers, New York; American Mining Congress, Washington, D.C.; Canadian Institute of Mining and Metallurgy, Montreal; Institution of Mining and Metallurgy, London; Institution of Mining Engineers, London, Eng.

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MINING LAWS OF THE UNITED STATES. These laws safeguard the rights of prospectors while searching for mines and, after minerals have been discovered, assure them of title, provided that all legal requirements have been complied with. No more than a brief summary of salient aspects of these laws can be given for general information. Mining statutes change from time to time as exigencies demand; therefore specific mining problems call for special consideration by qualified authorities familiar with local conditions. Failure to follow prescribed procedures incurs the danger of loss or forfeiture of rights to the property.

Sources of Mining Laws.—The influence of French and Spanish laws upon American mining jurisprudence is marked because most of the domain in the states and territories subject to federal mining laws was originally acquired by treaty or purchase from France and Mexico both of which countries had had their own codes of mining law in operation. In the old ante-revolution British grants of property are found traces of the principles of the common law whereby, in general, minerals were the landlord's property and went with the surface. The principles of common law in the United States establish for the owner of the surface *prima facie* title to minerals beneath it, until evidence to the contrary has been adduced. Separate and distinct title to minerals may, however, arise through acts of Congress or of any state, or through transfer by the individual who once owned both surface and minerals.

In regard to colonial grants, there was generally reserved to the sovereign a certain fixed proportion of the gold and silver discovered. Interesting evidence of the antiquity of these rights is found in the charter granted to Sir Walter Raleigh (1584) by Elizabeth, queen of England, which embodied this proviso: "Reserving always to us, our heirs and successors, for all services, duties, and demands, the fifth part of all the ore of gold and silver that may be from time to time and at all times after such discovery, subduing, and possessing, be there gotten and obtained." With few exceptions reservations of this nature occur in all subsequent grants. These precedents were followed by the United States in its first dealing with public lands. Prior to 1845 the general policy of the United States was to reserve mineral lands from sale absolutely. As far as was known, these lands in the then-called Northwest or Indian territory contained lead, iron, copper, and zinc. This area is now embraced by Michigan, Wisconsin, Illinois, Iowa, Missouri, and Minnesota.

Federal Leasing System.—The legislative policy for the leasing of mineral lands in the United States originated with the law passed by Congress March 3, 1807, which provided "that the several lead mines in the Indiana territory . . . shall be reserved for the future disposal of the United States; and any grant which may hereafter be made for a tract of land containing a lead mine which had been discovered previous to the purchase of such tract from the United States shall be considered fraudulent and null, and the President of the United States shall be and is hereby authorized to lease any lead mine which has been or may hereafter be discovered in the Indiana territory for a term not exceeding five years." Under the supervision of the War Department leases, first of three miles, and later of one mile square, were given which bound the lessees to diligently work the mines and return to the United States six per cent of all ores raised. This system worked well for a time, but after 1834, for good reason, miners and smelters refused to make further payments, and the government was unable to collect them. So much trouble was involved that in 1847 it was decided to end that system and sell mineral land outright without reserves of lead or other metal. The act of 1847 laid the foundation of a more substantial prosperity.

Mexican Grants.—The peace treaty with Mexico, proclaimed July 4, 1848, added to the national domain more than 500,000 square miles including California, Nevada, Utah, Arizona (except Gadsden Purchase of 1853) New Mexico, west of the Rio Grande, and north of Gadsden Purchase, Colorado, west of the Rocky Mountains, and southwest part of Wyoming. The Gadsden Purchase (q.v.) added 45,532 square miles to the public domain forming part of the present states of Arizona, and New Mexico. Under the treaty, all property theretofore belonging to Mexico within defined limits, passed to the United States which government undertook to protect valid rights acquired under Mexican rule.

In California, a board of land commissioners was appointed to whom all persons claiming lands by virtue of any right granted by the Spanish or Mexican government were required to present their claims. Such claimants had the right to appeal to federal courts. By the acts of July 22, 1854; Feb. 28, 1861; and Feb. 24, 1863, the surveyors-general of New Mexico, Colorado, and Arizona, were required to report to the Department of the Interior upon all private land claims within their jurisdictions. All rights and claims to lands arising out of Mexican grants presumably have been finally settled by judiciary decree.

Source of the Public Domain.—The national government acquired no property rights within the present boundaries of the 13 original states, nor in the States of Vermont, Kentucky, Maine, and West Virginia, hence no question of apex rights or other questions of federal procedure or titles arise therein. The first acquisition of national domain which became subject to disposal of Congress was by cessions of territory claimed

by seven of the original states. These cessions, over a period of 20 years (1781 to 1802) brought all that territory now comprising Tennessee, Illinois, Indiana, Ohio, Michigan, Wisconsin, and parts of Alabama, Mississippi, and Minnesota within the jurisdiction of the federal government.

In 1803 was added to the national domain the territory known as the Louisiana Purchase, and in 1867, the territory of Alaska. In 1898 all lands in the Hawaiian Islands, covered by the treaty of cession, which belonged to the republic as distinguished from private lands, also became subject to the disposal of Congress the same as the other public lands although the land laws of the Hawaiian republic existing at the time of the treaty continued in force. These laws do not provide for sale, or other disposition of lands classified as mineral. In Puerto Rico, ceded to the United States by Spain, its lands are subject to disposal under territorial laws of that island. Thus it is indicated that federal statutes regarding public domain do not apply to all territory controlled by the United States.

Principles of Construction of Mining Laws.—Two fundamental principles form the basis of all mining laws: (1) the right of mine operators to secure an indefeasible title to their property provided that specified conditions are complied with; (2) the right of the state or other landlord to certain rents, royalties, or taxes on the profits of mining property, and to reasonable performance of effective work so that invested capital shall not be idle. These principles are essentially common to the laws of all countries although in individual cases subject to modification to suit local conditions.

Classes of Mining Laws.—There are two classes of mining laws: (1) the "concession" system whereby the state or private owner of mining property may grant leases or concessions to others under stipulated restrictions; (2) the "claim" system. This originated when adventurers rushed in and staked out claims in newly discovered gold producing areas. At the beginning of this wild rush there was locally no law to restrain, and no court to punish an offender for trespass, misdemeanor, larceny, or murder. The miner whose rights were invaded or whose property was taken, had neither court nor authority to which he could resort for the protection of his rights, or redress his wrongs. The tide of immigration carried on its crest men of learning and integrity; but it also swept before it the derelicts of society—criminals fleeing from punishment past or prospective. For self-protection the law-abiding prospectors organized themselves into local communities acting with the direction and authority of constituted bodies exercising power to preserve and to punish offenders. The communities were known as Mining Districts. The "claim" system was, therefore, necessary to determine at once the conditions under which the miner was permitted to work and hold the property. And it is necessary by law to ensure proper working of the claims. These two classes of mining laws are basic.

Theory of United States Mining Laws.—Mining in the United States is not a "public utility"; it is a private industry such as other economic industries. The government does not concern itself with mining lands, nor with mining, after it parts with title. No royalties are reserved, and no governmental supervision is attempted. Upon issuance of the deed of the government, mining land becomes private property subject to the same laws as other real property. The government of the United States has never engaged in mining operations although to do so is within its sovereign power. Nor is there any provision in United States laws for the location of mining claims in privately owned lands; public mineral lands only may be located and entered under the mining laws.

By act of Congress March 3, 1849, the Department of the Interior was given authority to administer public lands. Prior to 1866, it was the policy of the United States government to reserve the minerals in all lands sold or granted to individuals, states, or railways and other corporations. Except in special cases, it was the uniform policy of the government to reserve mineral lands from sale or grant in all cases. With regard to railroad grants non-mineral lands only were to be granted; but discovery of mineral character after title has legally passed does not invalidate title, because issuance of patent to the land implies that it has been examined by the land department and found to be non-mineral in character, and establishes vested rights which can not be attacked. See also article PUBLIC LANDS.

First General Mining Act.—The first general statute by which title could be acquired to any public mineral lands within what are known as the mining states and territories was the law of July 26, 1866. Although this act has since been largely superseded or repealed by subsequent legislation it is said to have established three beneficient principles: "(1) that all mineral lands of the public domain should be free and open to exploration and occupation; (2) that rights acquired in these lands under local rules, with the apparent acquiescence of the government, should be recognized and confirmed; (3) that titles to at least certain classes of mineral deposits or lands containing them might be ultimately obtained."

Mining Act of 1872.—The famous "Apex Law," which is "an act to promote the development of the mining resources of the United States." It was passed by Congress May 10, 1872. In accordance with its provisions the vast majority of mining claims in the territory to which it applies have been located. With a few additions and amendments, it is the law under which federal mining rights are now acquired. This law is now incorporated in the *United States Code Annotated,* Title XXX, chapter 2, generally available in any public law library. Following is a brief digest:

Reservation of Mineral Lands from Sale.—Unless otherwise expressly directed by law all lands valuable for minerals shall be reserved from sale.

Valuable Mineral Deposits Open to Location.—All valuable mineral deposits in surveyed and unsurveyed United States lands shall be open to exploration and purchase under stipulated conditions.

Length and Width of Lode Claim.—Discovery is essential to location. The act provides explicit detailed directions whereby mining claims shall be governed as to length by the customs, regulations, and laws in force at the date of their location; and limitations of footage along the vein or lode and extent on each side, etc. No location may be made until the discovery of the vein or lode within the limits of the claim is lo-

cated; end lines of each claim must be paralled to each other.

Proof of Citizenship, or an affidavit in regard thereto, is required of all claimants.

Extralateral and Intralimital Rights.—Regulations governing exclusive right of possession of all the surface included within the end lines of locations and of all veins, lodes and ledges, throughout their depth, the apex of which lies inside surface lines extended downward vertically, although they may depart from the perpendicular so as to extend outside the vertical side lines of surface locations, subject to definite restrictions and regulations.

Tunnel Rights—Length of Tunnels.—Rights of possession of all veins or lodes within prescribed limits from the face of tunnels and stipulations in regard thereto, and conditions governing validity of claims by others.

Mining-district Regulations by Miners.—The right of miners to make regulations subject to restrictive conditions regarding annual labor on claims pending issue of patents, and requirements of minimum labor expenditures, etc., and expenditures on tunnels.

Patent Proceedings.—The procedure for obtaining a patent for any land claimed and located for valuable deposits entails observance of many detailed requirements such as the filing of a plat and field notes clearly indicating all boundaries of the claims, and the filing of affidavits; the publicizing of the same for a stated period; evidence of the expenditure of a minimum sum for labor, etc. If no adverse claim is filed and all requirements have been complied with it may be assumed that the applicant is entitled to a patent upon payment of five dollars an acre, and that no adverse claim exists.

Adverse Claims, Filing of, and Suit upon.—Adverse claimants are required to file under oath full details of the nature of claims; and all proceedings regarding the issuance of patents related thereto are stayed until the controversy has been settled by a court of competent jurisdiction. Adverse claimants must commence proceedings within a given period; failure to do so constitutes a waiver of claim. After the rendering of the judgment formal procedures under the act must be observed.

Claims on Surveyed and Unsurveyed Lands.—Vein or lode claims upon surveyed lands must designate location with reference to the lines of the public survey; but claims upon unsurveyed lands require adjustments according to statutory regulations by the United States supervisor of surveys.

Placer Locations, Claims, and Patents in Regard Thereto.—Requirements covering all details as to forms of deposit, subdivisions of claims, group entries, patents for lodes within placers, adverse claims and possession, which call for detailed consideration, are fully stipulated in the Code.

Further statutory requirements regarding mineral surveyors, expenses and fees, affidavits, crossloads and uniting veins, patents for millsites, homesteads upon mineral lands, exceptions in various states, water rights, etc., are fully provided in chapter 2, Title XXX, of the *United States Code Annotated.*

NOTE.—The foregoing curtailed digest is merely indicative of the extent and nature of the *Code Annotated* which should be studied in detail before effective application to any mining problem or question.

Mining Laws Extended to Non-Mineral Lands.—Reference to the following chapters and sections of the *United States Code,* Title XXX, having no bearing on the Apex Law, but applying to federal mineral lands, may be of interest. Chapter 3 of Title XXX refers to "Land Containing Coal, Phosphates, Petroleum, Oil, Oil Shale, Gas, Sodium, Potassium, etc., and Building Stone." Sub-titles of chapter 3 are given hereunder:

Entry on coal lands in general, sections 71-77.
Entry under Non-mineral Land Laws of coal lands, with reservation of coal to United States, sections 81-90.
Entry under Mining Laws of lands containing petroleum, or other mineral oils or gas, sections 101-104.
Homestead entry of lands in Utah withdrawn or classified as oil lands, sections 111-113.
Agricultural entry of lands withdrawn or classified as containing phosphate, nitrate, potash, oil, gas or asphaltic minerals, sections 121-123.
Locations under Placer Mining Laws of lands containing phosphate rock, section 131.
Permits to prospect for chlorides, sulphates, carbonates, borates, silicates or nitrates of potassium, sections 141-152.
Entry of building stone or saline lands under Placer Mining Laws, sections 161-162.
Disposal of lands in Alabama as agricultural lands, sections 171-172.
Leases and prospecting permits, subdivision 1, general provisions; sections 181-194, subdivision 2, coal; sections 201-208, subdivision 3, phosphates; sections 211-214, subdivision 4, oil and gas; sections 221-236, subdivision 5, oil shale; section 241, subdivision 6, Alaska oil proviso; section 251, subdivision 7, sodium.

NOTE.—All references in chapter 3 apply only to United States lands and the entry upon the same.

The Bureau of Mines.—In chapter 1, of Title XXX of the *United States Code Annotated,* subtitle "The Bureau of Mines," sections 1-11, are governmental rules and regulations concerning the Bureau of Mines, establishment, director, experts and other employees.

Withdrawals of Public Lands.—The president may, at any time in his discretion, temporarily withdraw from settlement, location, sale or entry, any of the public lands of the United States, including Alaska, and reserve the same for water-power sites, irrigation, classification of lands, or other public purposes to be specified . . . all lands withdrawn under provision of the act shall at all times be open to exploration, discovery, occupation and purchase under the mining laws "so far as the same apply to metalliferous minerals."

Regulations of the Land Department.—Supervision of mineral lands was transferred to the General Land Office of the Department of the Interior when it was established March 3, 1849. This department has judicial powers to hear and determine claims to public lands. There are two classes of claims: lode claims and placer claims.

Lode Claims—Dimensions.—Lode claims may have a maximum length of 1,500 feet, a maximum width of 600 feet, not exceeding 300 feet on each side of the vein at the surface. The law of 1872 governs exterior boundaries of claims and other conditions regarding lode claims such as initiation of title, location notice, perpetuation of possessory title, method of procuring patent, etc.

Placer Claims.—Discovery of valuable mineral in place is necessary before location of a placer claim. The price fixed by law for placer claims is $2.50 per acre. Proceedings to obtain patents for placer claims are similar to those for obtaining patents for vein or lode claims except where a placer claim is upon surveyed lands, and conforms to legal subdivisions when

no further survey or plat will be necessary. The law provides explicit directions regarding the making and filing of placer applications.

Mining Laws of Western Mining States and Alaska.—The states of Arizona, Colorado, California, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, and Alaska have all adopted laws for the working of mines under authority of Section 43 of the *United States Code Annotated.* There are constant changes in these statutes; specific data on the mining laws governing these states call for special research. For a general survey of the nature of the special mining laws of the states mentioned a comprehensive view may be obtained through study of the California acts, as now contained in the *California Civil Code* of 1937, and amended through the 52d Session of the California legislature of 1937. Inasmuch as California is a typical mining state, a brief capitulation of the California Mining Act follows. Subsequent reference to the mining laws of other states is by title only.

Lode Claims, How Located.—Any qualified discoverer of a vein, or lode of quartz, or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposit, may locate a claim upon such vein or lode by defining the boundaries of the claim; and by posting a notice at the point of discovery containing the names of the lode or claim and the locator; the number of linear feet claimed in length and width, the date of location; and a description by reference to some natural object as will identify the claim located.

Boundaries and Extent of Lode Claims.—In no case may the claim extend more than 1,500 feet along the course of the vein or lode, nor more than 300 feet on either side. Within 60 days after the location of the claim the locator must erect post markers as prescribed.

Record of Location.—A true copy of the notice of location must be given the recorder of the county in which the claim is situated.

Placer Claim, Location of.—The procedure is similar to that stipulated in regard to lode claims *provided,* that where the United States survey has been extended over the land embraced in the location, the claim may be taken by legal subdivisions, and no other reference than those of the survey is required, and the boundaries need not be staked or monumented.

Discovery Shaft.—Within 90 days after date of the location the locator shall sink a discovery shaft to a minimum depth of 10 feet exposing the deposit upon which the discovery and location is based, or drive a tunnel, adit, or open cut at the discovery point to at least 10 feet below the surface, exposing the deposit.

Placer Locations, Work on.—On all locations containing more than 20 acres, the locator shall within 90 days after date of location perform at least one dollar's worth of work for each acre in the claim.

Relocation of Lodes or Placers.—The same procedure as with an original location is required, except that the relocator may either sink a new shaft as required by law to expose the deposit upon which the location is based, or drive a new tunnel, adit, or open cut to at least 10 feet below the surface, or the relocator may sink the original shaft 10 feet deeper, or drive the original tunnel, adit, or open cut 10 feet farther.

Tunnel Right, Location of.—Locator of a tunnel right or location is required to post a notice at the face or point of commencement of the tunnel, which must contain the name of the locator; date of location; proposed direction of tunnel; description with reference to some natural object as will identify the claim or tunnel right.

Boundaries of Tunnel Location.—Boundary lines of the tunnel by stakes or monuments are required from the point of commencement of the tunnel to the terminus.

Record of Tunnel Location.—A true copy of the notice of location must be given the recorder of the county in which the claim is situated within 30 days after posting notice.

Amended Notice of Location.—Subject to stipulated conditions the locator may file an additional notice should his original location have been defective, erroneous, or in non-compliance with the law.

Prima Facie Evidence of Record of Survey.—Under stipulated conditions a certificate of the surveyor setting forth that the survey was made by him; the name of the claim and the location thereof; and that the description incorporated in the declaratory statement is sufficient to identify; such survey and certificate become a part of the record, and are *prima facie* evidence of the facts therein contained.

Millsite, Location Thereof.—Persons qualified by law may locate not more than five acres of non-mineral land as a millsite.

Record of Location of Millsite.—The locator of a millsite, claim, or location is required within 30 days to record a true copy of his location notice with the county recorder.

Annual Labor Required.—To hold possession of a mining claim the amount of work done or improvements made must be of a value not less than $100 annually.

Record of Proof of Annual Labor.—An affidavit setting forth the value of labor or improvements made, and other formal requirements, must be recorded and duly certified by the county recorder. Such affidavit shall be *prima facie* evidence of the performance of such labor.

Forfeiture to Co-owners; Contribution by Delinquent Co-owners.—Complete details of the requirements of law in regard thereto are given in Section 1 426o of the *California Civil Code,* together with penalties for noncompliance therewith.

Records to Be Received in Evidence.—The record of any location of a mining claim, millsite, or tunnel right, in the office of the county recorder shall be received in evidence, and have the same force and effect in the courts of the state as the original notice.

Copies of Record as Evidence.—Copies of the records of all instruments recorded and certified by the recorder may be read in evidence under circumstances and rules as provided by law.

Effect of Act on Mining Districts.—The provisions of the act shall not be construed as affecting or abolishing any mining district or the rules thereof within the State of California.

Failure to comply with the requirements of Sections 1 426, 1 426a, 1 426da, 1 426db, or 1 426dc of the *Code* shall render locations null and void, and no portion of the area within such location shall be subject to relocation by the same locator for a period of three years from the date of such voidance.

Failure to perform development work of the character required by law disqualifies locators

from relocating the ground in the original location or claim for a period of three years.

The foregoing curtailed capitulation of the leading features of the *California Civil Code,* 1937, derives from one of the more recent expressions of state legislation on the subject of the location of mine claims, upon the public domain, within the particular states. Further details regarding California mining laws are contained in the laws of that state of 1927, 1929, 1931, 1933, and 1935. Other laws have been and will be passed from time to time but the foregoing covers the most important of the California mining acts. Special provisions for the location and sale or lease of state mineral lands have also been passed by California, Michigan, Minnesota, Nevada, Texas, New York, Wisconsin, and some other states.

Exceptions to statutory requirements of federal mining laws are stipulated in the statutes and codes of Arizona (1928); Colorado (1933); Idaho (1932); Montana (1935); Nevada (1929); New Mexico (1929); North Dakota (1913); Oregon (1930); South Dakota (1929); Utah (1933); Washington (1932); Wyoming (1931); Alaska (1933).

CURTAILED SUMMARY OF UNITED STATES LAWS

How Mining Rights May be Acquired.—The conditions of the right of possession are: (1) *discovery,* (2) *development.* In all of the mining states, except California and Utah, a certain amount of development work is essential to the completion of the location. In addition to this preliminary work, $100-worth annually of labor and improvement is required by national law as a condition to perpetuation of possessory title. The nature of the work required to be done varies in different states. Further essential requirements as to "posting of notice," "marketing of location," and "recording of notice" of location, in each case are governed by local or state regulations.

How Mining Rights May be Lost.—Forfeiture of a mining claim may be caused by failure to fulfill any of the acts required by the laws for maintenance of possession. Abandonment also results in loss of mining rights although under certain conditions resumption of work in good faith before initiation of possessory rights by others operates to prevent forfeiture.

Patent Proceedings.—Patent is the deed or grant of the United States conveying the title authorized to be given by the mining or other land laws. It establishes the character of the land which it conveys, and is conclusive evidence of performance of all necessary steps leading to its issuance. Exclusive jurisdiction over the disposition of lands of the public domain under the law lies with the Land Department under the supervision of the Department of the Interior. To obtain a patent for mining land from the United States it is first necessary to make application to the district surveyor general for a survey. Stipulated requirements must be complied with regarding names of claimants, locations; names of the mining district, state and county in which claims are located; and the name of the surveyor to whom the order is to be issued.

Where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat is required. If a known lode exists within the placer it must be described in the survey and surveyed as though it were situated elsewhere.

Adverse Claim.—Adverse claims are permissible where one mineral claimant contests the right of another mineral claimant. Controversies over the character of the land, that is, whether mineral or agricultural, etc., are not proper subjects for adverse claims; but may be heard by the land department under the head of protests.

Nature of Title Conveyed by Mineral Lode Patents.—Patent to a lode claim conveys: (1) exclusive right of possession of all the surface included within the limits of the location, subject only to pre-existing easements; (2) all veins, lodes, and ledges throughout their entire depth, the tops, or apices, of which lie within the boundaries, the right to pursue the vein in depth outside such boundaries being limited however . . . ; (3) *prima facie,* such a patent confers the right to everything found within vertical planes drawn through the surface boundaries; but these boundaries may be invaded by an outside lode locator under statutory restrictions.

Placer patent conveys to the patentee everything within vertical planes with exceptions as prescribed by law. This term in current legal phraseology implies the right to follow the vein beneath the surface of land owned by another. There is considerable differentiation in the interpretation of this which has given rise to interminable litigation. (Refer to Chapter 2, Title, *United States Code.*)

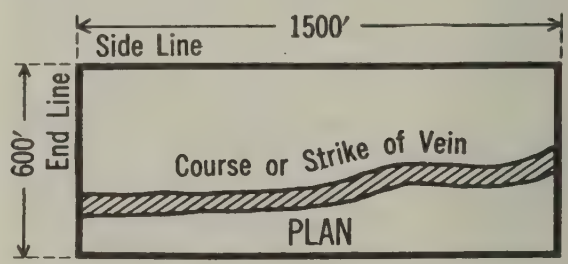


Fig. 1. Ideal location.

Ideal Claim Defined.—An ideal quartz mining claim is a portion of mineral land, 1,500 feet or less in length, along the vein, and 600 feet or less in width. Fig. 1 illustrates the surface of such a claim, showing the apex and course of the vein, and the side and end lines of the claim. Fig. 2 illustrates a cross-section of such claim, showing the vertical side lines thereof, and the dip of the vein. The statute seems to refer only to an ideal location, with the vein on its course or strike passing through its two parallel end lines. The planes of the end lines, dropped downward perpendicularly, and extended in their own direction until they intersect the exterior portions of the vein, bound the extralateral rights on such vein. In actual mining, however, an ideal location is the exception rather than the rule because of the inability of the locator to determine the actual course or strike of the vein at the time of completing his location. It is almost impossible to determine correctly the true course or strike of a vein from such a small exposure. Veins may be found running through the earth in almost every direction.

Principles of Extralateral Rights.—In applying this statute, certain well-established principles must be borne in mind.

1. The basis of extralateral rights is the existence of the apex of vein within surface

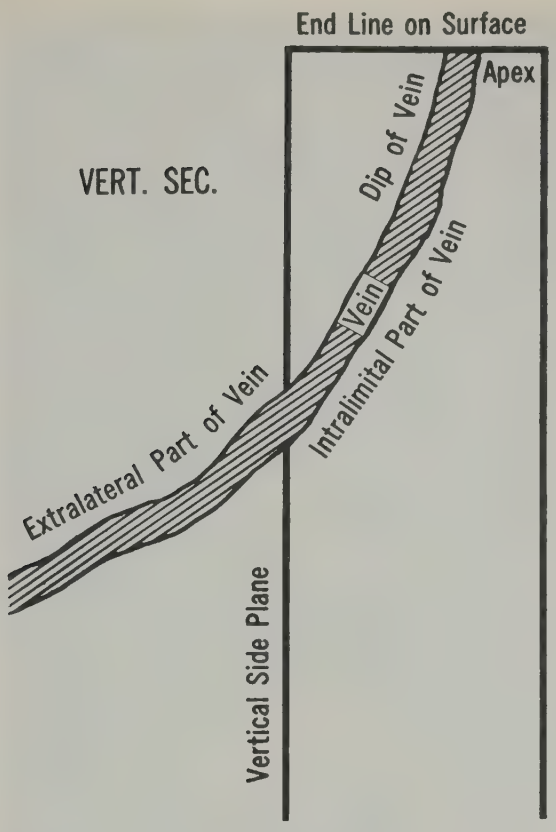


FIG. 2. Cross-section, ideal claim, showing dip.

boundaries of the location, dropped downward perpendicularly, and therefore their extent along the vein should always be limited by the extent of the apex within the claim.

2. In order that extralateral rights exist in any location, its end lines must be parallel. It is not held that the end lines must be parallel in order that such location be valid, but only that they must be parallel in order to give extralateral rights to any vein the apex of which may lie within the surface boundaries of such location. A prospector has the general right to make his location in such shape as he desires, and it will be held valid if he has otherwise complied with the law. End line parallelism need not be mathematically accurate; substantial parallelism is all that is necessary.

Extralateral Rights on Incidental or Secondary Veins.—Statute gives extralateral rights to *all* veins whose tops or apices lie within the surface lines of the location. The vein on which the location is based is called the "discovery," or "original" vein; others are called "secondary" or "incidental" veins. While all veins have equal and similar rights under the law, yet the location or discovery vein, in its relation to the surface boundaries, is the vein which determines the direction of the planes limiting the extralateral rights for all other veins apexing within the claim. Consult decisions of federal and state courts.

Conflicting Extralateral Rights.—If two claims may be so located on the same vein that the planes of their extralateral rights will intersect, the senior valid location is entitled to those portions of the vein which are in conflict. The junior rights again attach beyond the area of the conflict.

Veins Dipping Into and Beneath Agricultural Patents.—Whether veins properly located under the mining laws can be followed down beneath the surface of patented agricultural lands seems not to have been decided by the United States Supreme Court. Refer to decision of Ninth District Circuit Court (36 Fed. 668).

Conclusion.—The statute of 1872 is generally considered to be ambiguous and perplexing. Questions arise which have to be carried to the Supreme Court of the United States for final decision. For further details refer to "Why the Mining Laws of the United States Should be Revised," by H. V. Winchell, in *Transactions*, American Institute of Mining Engineering, vol. 48, p. 361.

NOTE.—*The foregoing general outline of the mining laws of the United States is taken, by courtesy of the publishers, from "Mining Engineers' Handbook," 2 volumes, 3d edition, edited by Robert Peele; publishers, John Wiley and Sons, Inc., New York.*

MINING MACHINERY AND MILLING MACHINERY. Mining is the process of extracting valuable minerals from the crust of the earth and placing them on the surface where they may be used. The deposits in which the minerals are contained are known as ore bodies if they can be extracted from the ground at a profit. For the purpose of mining, ore bodies fall into two major classifications: surface and underground.

Surface Mining.—Surface deposits may lie exposed on the surface or be buried under several hundred feet of overburden. The overburden is worthless material and must be removed before mining can begin. A big factor in determining whether an ore body shall be mined by open-pit methods or underground is the depth of overburden. The process of uncovering the ore body is called stripping. If the ore body is a thick one, the mining and stripping are carried on simultaneously once the first ore has been disclosed, and the excavation is made in successive lifts of from 20 to 50 feet so that the walls of the pit rise in terraces. The same machines are used for excavating in both the stripping and mining operations.

Shovels are used for digging the overburden without drilling and blasting when the material to be excavated is unconsolidated. Conventional types of steam or electric shovels with 4- to 12-cubic yard buckets are used. These machines are all crawler mounted and therefore highly maneuverable. When large volumes of material must be handled in stripping operations, equipment with greater capacity is needed. The dragline is often used for this work. It is a long-boom shovel, self-propelled and fully revolving. The bucket is like a scoop and is manipulated by wire cable which permits it to be dropped from the end of the boom and pulled back toward the cab, scooping up earth as it comes. When the bucket is full, the machine turns to dump the waste out of the way or into trucks or a loading tipple. It is essential that the stripping operation be performed as cheaply as possible, because the lower the cost of stripping the deeper the overburden can be and still permit economical mining of the ore body by surface methods.

Trucks are used to a great extent for hauling ore and waste out of the pit. These trucks are all of extra-heavy construction and normally have capacities up to 30 tons. They are powered by gasoline and Diesel engines.

Locomotives are used for transporting rock

in large open-pit mines. The truck is particularly adapted to medium and small pits where steeper haulage grades are used. However, in very large open-pit mines, some type of rail haulage is more economical. Steam, Diesel, or electric locomotives are used. The ore or waste is loaded by shovels directly into the railroad ore cars for transportation out of the pit.

Belt conveyors have a limited use in open-pit mining or stripping, but there are a few such installations and they are ubiquitous to material handling operations. They consist of an endless belt made of rubber with a cord or steel wire core. At the extremities of the belt are drums or drive pulleys which transmit the motion of the propulsion motor to the belt. Spaced a few feet apart along the entire travel of the belt are rollers which are called idlers to carry the weight of the burdened belt.

Rock drills are used to drill holes in the rock in which dynamite is placed for blasting when the rock is too hard to be excavated by a shovel without first being broken up. The *churn drill* is the most common type of drill used for this work. It drills holes from 6 to 12 inches in diameter to depths of 50 feet if necessary. The drill bit is made of steel with chisel faces on its cutting end. The machine operates by dropping the bit to the bottom of the hole being drilled, and the impact pulverizes the rock. This operation is repeated over and over again until the hole is drilled. The bit is weighted by cylinders of steel, and the bit and weights, known as the "string of tools," may weigh between 2,000 and 3,000 pounds. The tools are attached to a wire cable which passes over a head sheave on the top of a vertical tower and comes down to wrap around a hoisting drum. The drum winds up the cable, pulling up the string of tools to the top of the tower and, as the clutch is released on the drum, the tools drop to the bottom of the hole. Water is used in the drilling operation to make a sludge of the pulverized rock in the bottom of the hole. Every so often the hole must be bailed out or the drill bit will be striking pulverized rock instead of the solid rock to be drilled.

The *pneumatic hammer* is adapted to many different types of drilling machines. A valve admits compressed air to a cylinder which pushes a piston. The piston exposes exhaust ports at the extreme end of its travel and compressed air admitted on the other side of the piston returns it to the other end of the cylinder. The piston reciprocates at high speed hitting hammer blows on the shank of the drill steel. Some pneumatic hammers have a ratchet arrangement which causes a positive rotation of the drill steel. The drill steel is a solid piece of steel with a water hole down the center. Water is used for cooling the bit and removing the cuttings. Successively longer pieces of steel must be used to deepen the hole. Drill bits are made in different designs of alloy steel; they must be hard but not brittle. They are usually threaded to screw on to the drill steel. When the bits become dull they are heated, and resharpened in a forging machine, and then they are tempered and returned to the mine for reuse. The bits may be resharpened until the wings have been ground flush with the diameter of the body of the bit. Tungsten-carbide inserts are used on the cutting faces of some bits and this material increases the drilling speed and the life of the bit.

Wagon drills are another type of drill frequently used for stripping or mining operations. The machine is a pneumatic hammer mounted on a tripod. Wheels are placed on two of the legs of the tripod for ease in moving the drill. The pneumatic hammer is moved up and down automatically by a threaded shaft which meshes with corresponding threads on the bottom of the drill. Holes of from 1½ to 3 inches in diameter may be drilled in this way to depths of 20 feet.

Another method of surface mining, known as *placer mining,* is peculiar to those near-surface deposits which have been formed by the action of wind and water carrying valuable minerals away from the mother lode and depositing them in concentration among the gravels at the bottom of streams. Gold and tin minerals are found in this type of deposit. These gravel ore bodies may be mined by using hoses known as giants with high water pressure. The jets of water are directed against the gravel beds and the impact washes the gravel down where it is channeled into sluice boxes, in the case of gold, or into conduits for transportation to the concentrator, in the case of phosphate or tin minerals. The sluice box is an open trough with riffles in the bottom, usually made in 12-foot sections. Mercury is placed in the riffles and the gold is amalgamated when it comes in contact with it.

Placer deposits are also mined with dredges which are in fact self-contained mining and concentrating plants. A gold or tin dredge is a barge on which the concentrating plant is housed. The mineral bearing material is usually scooped from beneath the surface of the water by a chain of buckets which move over a boom positioned so that the buckets scoop the bottom. The barge is moved about the pond by its own winches. The dredge digs a channel and may fill in behind itself by discharging the waste from the concentrator plant over a stern boom. Deposits having as little as .01 ounce per square yard of gold can be mined economically in this way because a large volume of material can be handled cheaply.

Underground Mining.—This is a highly mechanized operation everywhere except where labor is cheap. Shafts or tunnels are driven to gain access to the ore body. Other tunnels are driven to follow the vein or outline the block of ore. A tunnel following the vein or paralleling the plane of the ore body is known as a drift and one at right angles to the plane of the ore body as a crosscut. Connections between tunnels at different elevations in the mine are usually driven from the lower elevation to the higher and are therefore called *raises.* The advantage of raising is that the rock is moved from the excavation by gravity after it has been drilled and blasted and, therefore, no shoveling is required. Wherever possible in a mining operation, gravity is used to advantage. It is almost a rule that the ore is extracted from the bottom to the top or in successive lifts a few hundred feet apart, each being worked from the bottom up.

Mining machinery consists of drilling, shoveling, hauling, hoisting, and pumping equipment. Pneumatic hammers of various designs are used almost exclusively in hard rock for drilling the blastholes. Jackhammers are used for down holes, stopers are used for up holes or at rising angles from the vertical. The stoper is a pneumatic hammer with an elongated body. Below the hammer mechanism is an open end cylinder in which is a piston about 3 to 4 feet long. Compressed air is admitted on top of the piston and

An automatic Joy loader and a Diesel shuttle car at work in a lead mine.

Courtesy Joy Manufacturing Company

Scraping iron ore out of a Cornwall, Pennsylvania, mine by means of a slusher.

Courtesy Bethlehem Steel Corporation

Stoper drill operators drilling holes in a magnesite mine at Gabbs, Nevada.

An Eimco loader is dumping ore into a side dump car which has a capacity of 32 cubic feet and is hauled by a battery locomotive.

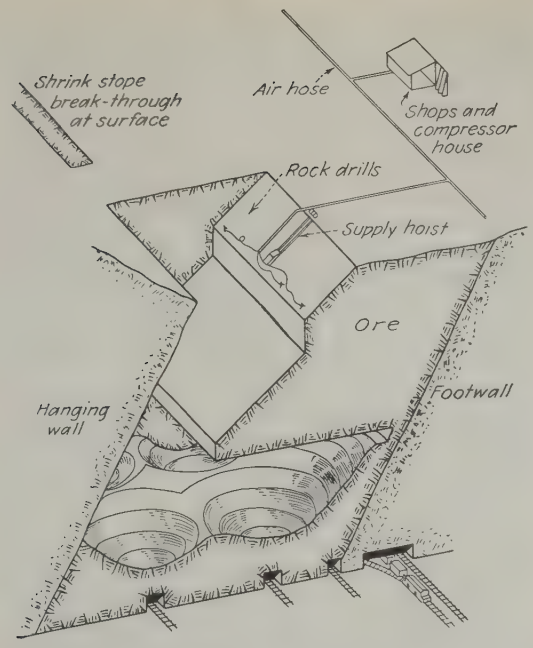


FIG. 1. A mining method in which ore is mined in the open, from above, and blasted down into draw holes cut from the solid rock and transferred to mine cars in the drifts below for tramming to the shaft.

it is pushed out. Since one end of the piston is placed on the ground, the other supports the hammer and keeps it pressed against the rock as it drills the hole. The Leyner drill is used mostly for horizontal holes and is a fully automatic pneumatic drill. The machine has a screw gear feed for advancing the drill shaft into the rock and withdrawing it. Holes are drilled from 1½ to 3 inches in diameter. Much attention is paid to the type of drill bit which is used as it is an important item of expense. In softer rock such as coal, salt, or potash deposits, augur-type drills are used. These are rotary drills, in contrast to the pneumatic percussion drills, and may be driven by compressed air or electricity. To operate these pneumatic drills and other air-driven equipment, compressor plants are used. They may be situated on the surface or underground and are usually electrically driven. The average air pressure is about 90 psi (pounds per square inch) at the drills. An advantage of the use of compressed air for driving mining machinery is that it provides an additional source of air supply for ventilating the mine openings.

Underground Loading Machines.—These are made in several different types. The simplest device is the slusher. This consists of an air- or motor-driven hoist which pulls a scraper back and forth across the ground, pulling the ore to a loading chute. Other type loaders are mounted on track, rubber tires, or crawlers, and use buckets for scooping up the rock and loading it into cars. They are especially designed for working in confined openings and are driven by air, electricity, or Diesel engines.

The standard type loading machine, used in driving tunnels in metal mines, is a compact, sturdy, compressed-air-driven machine. It moves on a track and has a carriage with rigidly mounted, flanged wheels. On top of the wheel truck is a turntable which permits the shovel to swing in a wide arc. The dipper is trapizoidal in cross section and is rigidly supported on rockers or arms which, in turn, are fastened to a journal fulcrum on which they swing through a vertical arc. This permits the machine to pick up broken rock in front of it and transfer it directly over the machine, and empty it into a mine car hooked on behind the loader. The arms or rockers may be moved by a sprocket chain which winds on a drum powered by a compressed-air motor. The air motor also moves the loader forward and backward on the track. The operator of the machine stands on a platform or walks beside the loader, and controls its operation by two air valves and the weight of his body to swing the dipper from side to side. One air valve controls the propulsion of the loader and the other regulates the action of the dipper.

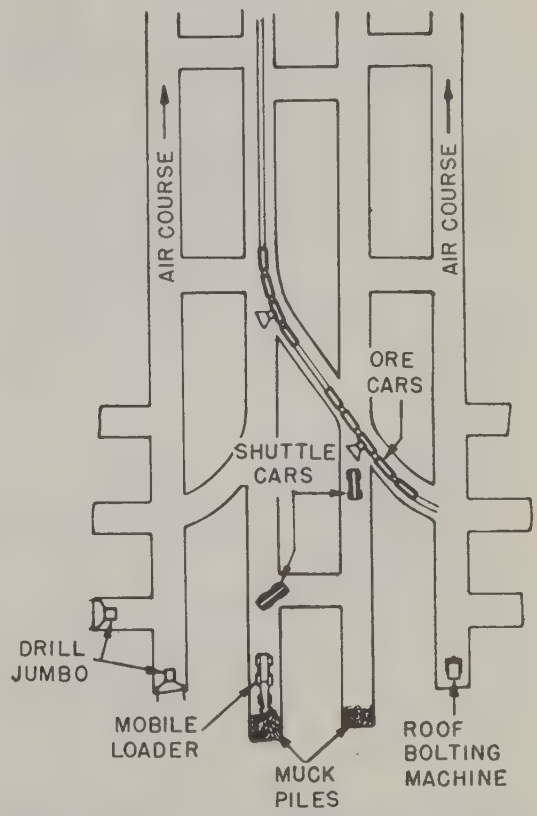


FIG. 2. Mechanization and cyclical operations feature the operation of modern iron ore mines. These methods are equally applicable to other flat lying massive ore deposits such as coal.

In mines where larger openings can be made because the rock is strong enough to sustain them, caterpillar mounted loaders are used. These, because of their great maneuverability, can do a more thorough cleanup job.

Another type of loader, which is used in driving fairly large diameter tunnels, is mounted on a track but has a conveyor boom in front with the dipper attached. The dipper receives its motion from cables winding on drums and the digging action of the dipper resembles that of flexing the wrist holding the palm up. The conveyor on the boom has an articulated joint so that it can be swung with the boom without disrupting the conveyor.

One type of coal loader consists of a scoop, inside which are two groups of hooks fastened to endless chains which revolve toward each other and gather up the coal as the scoop is pushed into the broken coal pile. The hooks carry the coal to

the top of the scoop and discharge it on to a conveyor which carries the coal to the back of the machine where it is dumped into a car. The scoop, conveyor, and motors are mounted on a self-propelled carriage moving on tracks or rubber tires.

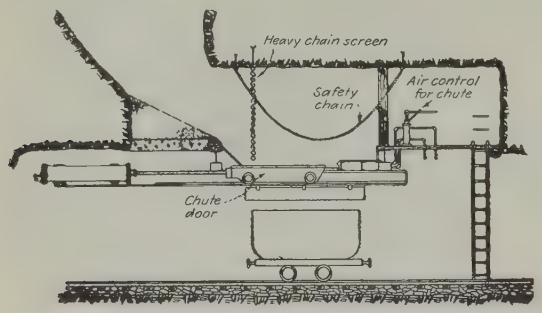


FIG. 3. A chute for loading broken ore from a stope into mine cars. Here an air-piston operated gate is used.

Hauling.—Haulage of the broken ore out of the mine may be accomplished by battery, trolley, compressed air, or Diesel-powered locomotives pulling cars on rails; by battery or trolley rubber-tired cars, known as shuttle cars; by shaker and/or belt conveyors; and by trucks where the mine openings are big and access is through a tunnel. The shuttle car is either of the storage battery or trolley-reel type. It is a rubber-tired vehicle designed to work in openings with restricted headroom. In the bottom of the car is a chain conveyor which unloads it.

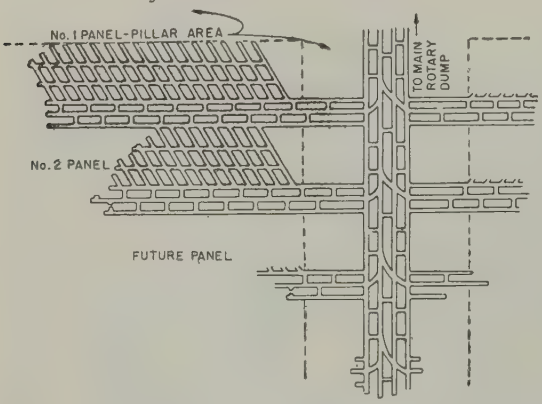


FIG. 4. Typical plan for the entry system and panel mining of coal. All of the rectangles are pillars of coal which are left to support the roof.

Hoisting.—When vertical or inclined shafts are sunk to reach the ore body, it is necessary to install one or more hoists to carry men and materials to and from the surface and to lift the ore from the mine. An enclosed platform called the cage is used for hoisting men. Buckets with capacities from 1 to 15 tons are used for carrying the ore; they are called skips. Ore hoisting is usually done with balanced skips, that is, one skip goes up as the other goes down and the rope may be wound on one drum, or two direct-connected or clutch-connected drums. Balanced hoisting saves power. Electric motors are used almost exclusively for driving the hoisting drums. A tower, known as a headframe, is usually erected over the collar of the shaft so that there can be a silo for storing the ore between the point on the headframe where the skips are dumped and the mouth of the shaft. The ore is drawn from the bottom of the silo and transported to the concentrating or preparation plant. There is usually ground water flowing into mine workings in addition to the water that is used for keeping the dust down while drilling, so that it is necessary to pump it out to keep the workings from becoming flooded.

Ventilation.—This is also an important problem in mining. In big mines, giant blowers are placed at the surface or at the bottom of one shaft and the air is circulated along a course through the mine by placing barriers to direct it in the planned circuit. Two means of access to mines are required so that it is convenient to use one tunnel or shaft for the incoming air and one for the exhaust air. Small auxiliary blowers are used to bring ventilation air to out-of-the-way places in the mine.

In mines where explosive gases may be present, as in coal mines, so-called permissible equipment must be used. This means that the equipment must not cause any sparks that might set off explosions or start fires.

Diamond Drilling.—This is the only sure method of finding out whether there is an ore body in the ground without sinking a shaft or tunneling into the earth. It is the main instrument used in exploration. The machine is capable of drilling a hole a few inches in diameter to depths exceeding 10,000 feet, at the same time cutting a core of rock which is periodically removed from the hole. The core gives the geological information necessary to determine the presence of an ore body.

Equipment consists of the drill, drill rods, drill bits, hoist, pump, and source of power. Gasoline engines are used extensively, but steam, electric, and compressed-air engines are also used. The drilling machines can be differential-gear-screw feed or hydraulic feed. In the latter, the piston motion is transformed into a rotary motion by piston, bevel gear, pinions, and crankshaft. The drill rod is held in a chuck which rotates it. Drill rods are made of seamless tubing which comes in standard lengths of 1 to 10 feet, sometimes longer. The rods are screwed together, and also screwed to the core barrel which is equipped with a beveled ring that grips the core of rock when there is an upward pull on the drilling tools. Drill bits are made in numerous designs but, essentially, they are like steel nipples, threaded at one end, and with diamonds set in the other end, and around the outside and the inside periphery of the bit for a fraction of an inch back of the leading edge. The bit is also carefully machined to provide appropriate grooves and orifices for supplying water to cool the bit and carry away the cuttings from the bottom of the hole. The drill bits are expensive because of the diamonds and handwork used in setting them.

The bits may have cut stones set a fraction of an inch apart, or a fine diamond powder may be sprinkled in a hard-metal matrix on the cutting surfaces. After the stones become dull they are returned to the manufacturer so that the diamonds may be recovered, sharpened, and reset. The bits are manufactured in different diameters because, as the drill hole gets deeper it gets narrower, and it becomes necessary to use smaller diameter drilling bits.

Concentration.—Ore from the mine cannot be marketed without some preparation. For instance, ore containing five per cent copper cannot be economically treated at the smelter. Coal usually must be separated from waste rock before

it can be sold, and traprock to be used for making roads must be of specified size. Ore dressing, often called beneficiation, consists of mechanical crushing and separation processes. Ore is crushed to prepare it for use or for some future steps in processing. In the case of ores of nonferrous metals, which are the most complicated in their metallurgical treatment, the particles of ore are crushed to the average size of the mineral particles constituting it so that in the separation processes the waste may be discarded with as little mineral waste as possible; conversely, the separated valuable mineral or minerals will have as little waste mixed in as possible.

In the crushing phase of ore dressing, many different types of crushing and grinding machines are used, each of which is particularly adapted to making a certain size reduction or to handling a certain type of material. A yardstick for comparing crushers is the reduction ratio, which is the ratio of the coarsest particle of feed to the coarsest particle of the crushed product.

Crushers.—Jaw crushers are standard primary crushing machines and are made in several different designs. The machine consists of two crushing faces or jaws, one of which is stationary and the other moves alternately toward and away from the stationary face. The motion of the moving jaw is relatively small and is a swinging movement about a fulcrum which may be either at the top of the jaw structure or at the bottom. The machines are of rugged construction and have replaceable alloy steel faces on the crushing surfaces. The opening through which the ore is fed into the crusher is relatively large as it must take the coarsest pieces as they come from the mine. The discharge opening can be adjusted to deliver the size product desired but is a matter of inches in width.

The Blake-type jaw crusher has the fulcrum at the top of the moving jaw. It receives its movement from a shaft driven by belts from a motor. An eccentric on the shaft moves a vertical "pitman" similar to a connecting rod which is in turn attached to a toggle which transmits the motion to the movable jaw. Flywheels are used with jaw crushers because of the variable load imposed on them. The Telsmith jaw crusher is similar to the Blake except that the main shaft eccentric works the jaw directly through a horizontal pitman. The jaw crusher is a large capacity machine able to crush 300 tons of rock received through a 60- by 48-inch opening to a 9-inch size in an hour. A reduction ratio of 7 is frequently attained.

Gyratory crushers were developed after the jaw crushers to supply a machine with even greater capacity. The stationary crushing surface in this machine is a hollow truncated cone with the smallest opening at the bottom. The moving, crushing element is also a truncated cone placed inside the stationary cone but with its largest cross section at the bottom. In the suspended-spindle type of gyratory, the moving cone is rigidly fastened to a spindle which is suspended from the top. A motion which is gyratory in the horizontal plane is imparted from an eccentric sleeve which is fastened to the bottom end of the spindle and, also, to a bevel gear that meshes with another bevel gear which receives its motion from the main shaft. The rock enters at the top of the crusher and is crushed between the cone surfaces by the gyratory motion of the inner cone. The discharge opening of the gyratory crusher can also be adjusted for different sized products. One of the largest size gyratories has a 72-inch receiving opening and will handle roughly 3,000 tons per hour reducing the rock to a maximum size of 12 inches. The most frequent trouble encountered with crushers is that they may become jammed if a piece of metal too large for the discharge opening gets caught between the crushing surfaces. Some designs overcome this difficulty by automatically increasing the size of the discharge opening when a stress is put on the crushing surface which exceeds that necessary to break the rock for which the crusher was designed. After the obstruction has been passed the crusher automatically returns to its normal setting.

Cone crushers are modifications of gyratory crushers. The crushing surfaces are two truncated cones one set on top of the other but, unlike the gyratory, the apices of the two cones are on top so that the crushing opening is between two nearly concentric surfaces. This arrangement permits increased volume for the discharge and, therefore, greater capacity for the crusher as compared with the crushers previously described. The top crushing surface is held in place by springs which permit it to move up to pass "tramp" metal.

It is frequently necessary to do the crushing of rock, preparatory to the separation processes or the grading of different size marketable products, in more than one stage of crushing. In such cases, screens are used in series, following the crushers to separate the rock according to size. The oversize material is usually passed through another crusher to reduce it to the proper dimensions. Gyratory and jaw crushers are used as primary crushers whereas cones most frequently are used for the large volume of finer crushing.

Crushing rolls consist of two revolving cylinders rotating toward each other between which the ore is crushed. One cylinder is held by stationary bearings but the other is held in spring-cushioned bearings so that there will be sufficient play to pass tramp material between the rolls without breaking them. Rolls are characterized by a small reduction ratio and the production of a minimum of fines. This latter is probably true because the rock remains in the crushing area only briefly.

Grinders.—This differs from crushing only in the size of the particles being reduced, grinding dealing with the finer material. The reduction ratio is much higher, being of the magnitude of 50 to 100. The grinding phase, when used, is the final pulverizing step before the ore is subjected to separation processes.

Ball mills are grinding machines which use steel or iron balls as a grinding medium. The vessel in which the operation is performed is usually a steel cylinder but may be a cylindro-conical drum which revolves about a horizontal axis. The drum is supported on trunnions which ride in bearings mounted on concrete pedestals. The drum is made to rotate by a giant gear which encircles the drum and meshes with another gear fastened to the drive shaft. The material to be ground is fed into the mill by a spiral scoop fastened to one of the trunnions, and is crushed by the tumbling action of the balls. Three methods of discharging the pulp are recognized: through screens along the shell, by free overflow through one of the trunnions, and

through a grate across the full section of the mill and then over the lip of the discharge trunnions. Inside the mill, liners are generally used to prevent wear on the drum shell and sometimes to aid in lifting the grinding medium so that it may fall on the material to be treated. Types of liners are smooth, shiplap, wave, and wedge bar; they are replaced as they wear out. Grinding may be wet or dry depending upon whether the addition of water will be helpful or detrimental to later stages of preparation. The consumption of grinding media and liners is a considerable item of cost in grinding mill operation.

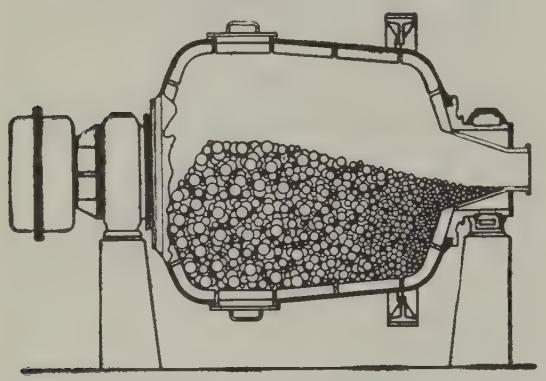


FIG. 5. A new type of ball mill, the Hardinge Tricone, which is used for grinding ores.

Rod mills are similar to ball mills in design and operation. Steel rods are used instead of balls for grinding medium, and the cylindrical vessel is of greater length than diameter which may not be the case with ball mills. The rod mill is characterized by more uniform grinding as the rods are held apart by the coarser particles which receive preferential grinding.

Screens.—In commercial practice, during all crushing and grinding operations, it is necessary to separate material according to sizes, reducing the load on machines by bypassing material which has been sufficiently reduced in size. In the coarser crushing operations screens are used, but in the finer grinding operations classifiers do the sizing.

The simplest type of screen is the *grizzly*, which consists of parallel bars spaced according to the maximum size material that it is desirable to handle. Grizzlys may be placed underground in the mines so that the big boulders will be broken up before being hoisted to the surface. Steel rails are frequently used for making this type of grizzly.

Moving type screens are more common, as they give better screening and act as feeders. Trommels, and vibrating and shaking screens, are the common types.

Trommels are, commonly, cylindrical shells of punched plate revolving about a central axis, which is set at a slight angle to the horizontal, so as to feed the material through the cylinder. Water may be used with a trommel to wash the fine material from the coarse. The coarse material not passing through the holes is delivered at the end of the trommel.

Vibrating screens utilize a reciprocating motion of the screen normal to the bed. The vibration may be imparted mechanically or electrically. Mechanical vibration can be accomplished by a cam with a return-motion spring or by unbalanced flywheels. In electrically vibrated screens the motion is imparted by the action of an electromagnet on an armature. Vibrating screens are frequently decked one on top of another so that several sized products may be extracted. It is important that a minimum of the vibration be imparted to the mounting, that the vibrating mechanism be dust proof for protection from damage, that the screens may be easily changed, and that there be a minimum of loss of headroom in the screening operation.

Classifiers.—These are used to make separations according to size or specific gravity, depending on the nature of the processes for which the ore is being prepared; for flotation, a size separation is necessary, whereas for tabling, the accent is on specific gravity.

There are several types of classifiers for making separations according to specific gravity and they all use the hindered settling principle. The crushed material along with water is fed into a vessel, where settling takes place against a rising column of water. The heavier particles settle rapidly and are removed, whereas the lighter particles overflow into the next chamber where the process is repeated but with a different velocity of the rising water column. The process may be repeated as many times as necessary for the number of minerals of different specific gravity.

Sizing classifiers utilize free settling as much as possible to permit the coarser particles to settle to the bottom while the finer particles are overflowed. No more water is required than is already in the suspension. The rake classifier is a common machine of this type. It consists of an inclined tank, usually of metal, in which is suspended a series of rakes which move in a rectangular motion with rounded corners. The top end, over which the sand or coarse particles are discharged, is open while the bottom is only partially closed permitting water with the fine material to overflow. The action of the rakes intermittently pushes the sand to the top and permits the fines to settle. The rakes receive their motion through appropriate gears, cams, cranks, and connecting links. This process may be used with multiple-rake machines.

The spiral classifier operates on the same principle as does the rake classifier except that one or more spiral ribbons may be used to impart the upward motion to the coarser material. This machine has fewer moving parts and the spiral may be lifted from the tank easily when the machine is not in operation.

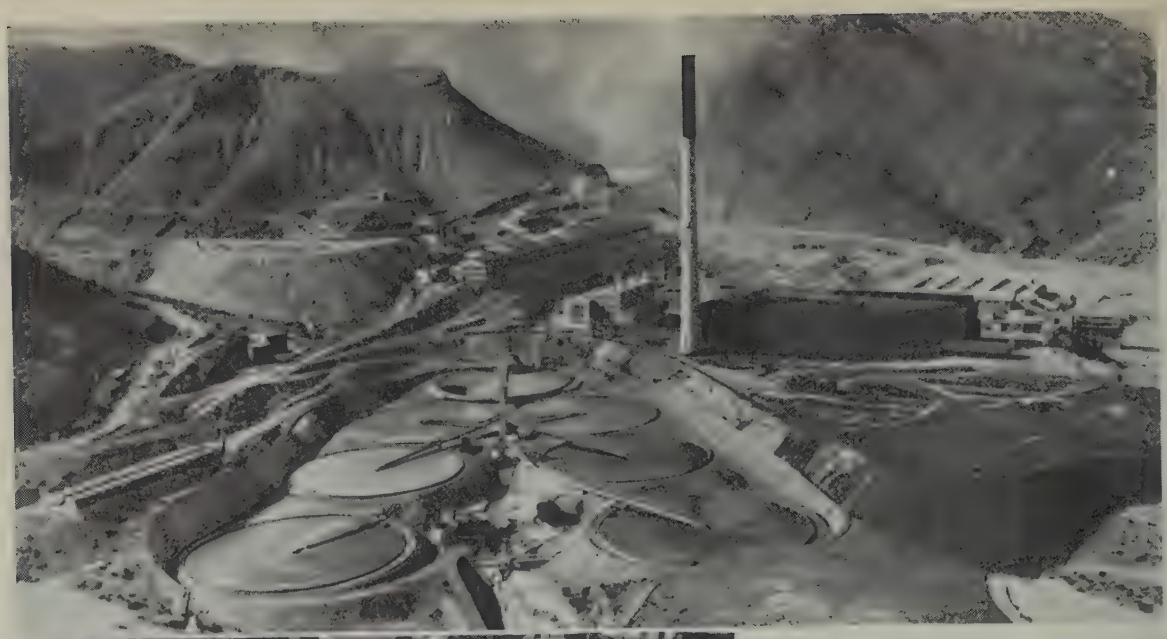
Jigging.—A method of concentration of ore depending for its effectiveness on the difference of specific gravity of the mineral to be concentrated and of the gangue or waste. The separation is accomplished on or through a sieve upon which is a dense suspension or bed of minerals to which is imparted a pulsating motion. The pulsating motion is usually provided by the action of a piston in an adjacent compartment connected to the jigging compartment with a fluid, to transmit the pulsating movement of the piston. This action causes an alternating, more open, and more compact bed which permits rearrangement of the minerals, so that the dense ones work their way to the bottom where they may be removed or passed through the sieve, and removed in the compartment below, called the "hutch." When it is desired to have a hutch product, it is necessary to have a bed of suitably high specific gravity minerals on top of the sieve, to prevent the waste

Courtesy Clyde Anderson

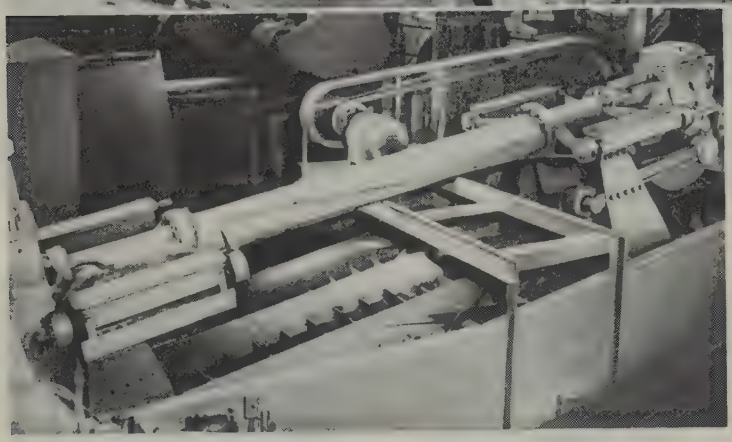
Spiral-type classifiers being used to separate the coarse particles for further grinding in the mill.

Courtesy Allis-Chalmers

Screening iron ore on a low head vibrating screen at the Holman Cliffs Mine, Taconite, Minnesota.

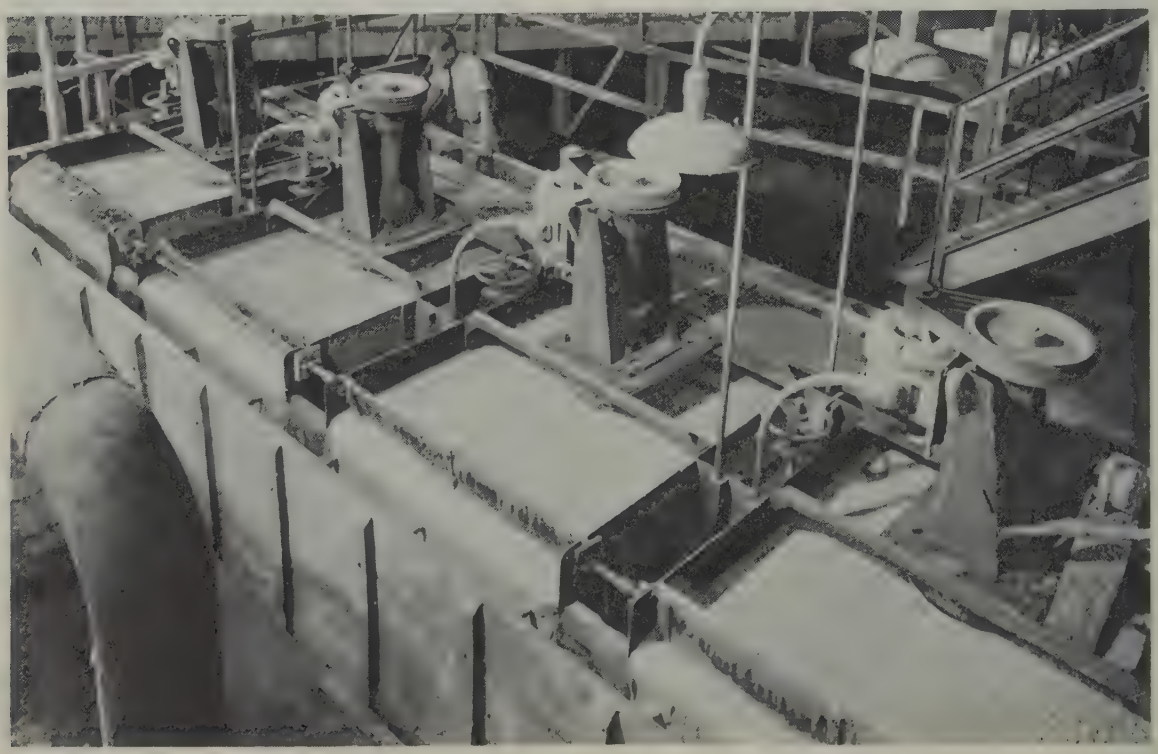


Seven Dorr traction thickeners in the foreground recovering water from 50,000 tons of copper waste per day in the arid southwest of the United States.



A Dorr classifier, overflowing 700 tons of copper ore per day at the Chino Mines, Hurley, New Mexico.

MINING MACHINERY AND MILLING MACHINERY



Fargergren flotation machines making a potash concentrate in a mill at Carlsbad, New Mexico.

or lighter minerals from passing through the sieve and mingling with the concentrate.

Various designs of jigs are made for suitable concentration of materials, ranging from the extreme specific gravity of gold in small particles to the lighter and larger size pieces of coal. Material ranging in size from 5 inches to 20-mesh may be treated in jigs of appropriate design.

Shaking Tables.—These are devices for concentrating minerals by their difference in specific gravity, although their shape and size has some effect on the process. The table is roughly rectangular in shape and is tilted on its long axis. On the surface are a series of parallel riffles or cleats which are fastened to the linoleum top of the table. Each riffle is longer than the next one above it, making a diagonal line from the bottom corner at the discharge end, so that only about two thirds of the table is cleated. At the top corner, opposite the discharge end, is the feed box and, along the top edge of the table, is the wash-water trough with a series of baffles for regulating the flow of water along the entire length of the table. A shaking motion is imparted to the table by a pitman and toggle-type head motion; the speed of the table ranges from 180 to 270 strokes per minute with strokes from ½ to 1½ inches in length. The material to be concentrated is fed on the table near the head motion, and travels along it because of the shaking motion, while wash water passes over the particles at right angles to their direction of travel. The coarser, denser particles work to the bottom of the table where they are discharged, while the lighter ones pass off at the end of the table.

Flotation.—This is a concentration process which utilizes the addition of chemicals to the suspension of crushed ore and water, known as pulp, to create a froth to which the mineral particles adhere and are floated away from the pulp into the concentrate launder. There are several vessels of different design which are made to facilitate this process. Classification of the machines may be made according to the method by which air is introduced into the cell. The agitation cell entrains the air in a vortex in the pulp by the agitation of the impeller. The subaeration cell admits air through holes at the bottom of the impeller to which the air is piped. The cascade cells catch the air by tumbling the pulp. In pneumatic cells, the air is introduced by blowing. There are certain common features that all of these cells must provide in order that flotation of the valuable mineral may take place.

There must be a means for admitting the pulp to the cell, and an outlet for it. There must be a means for allowing the pulp to settle, for carrying off the froth, for admitting the air, and to regulate these features. The cells are compartmented and arranged in batteries so that correct circulation is assured, that s, one cell receives the defrothed pulp from the preceding cell.

The cell walls are made of metal or wood. The pulp enters the cell from the bottom and is agitated and pumped by the action of an impeller, which is driven by a vertical shaft attached to a motor atop the flotation cell. The agitation in the cell, the air, and the froth, forming chemicals, cause bubbles to form to which the mineral particles adhere. The froth is raked over the side of the cell into a launder by mechanically operated paddles. The level of the pulp is maintained by a weir. The defrothed pulp is channeled to the next cell. In order for each mineral particle to have the opportunity to come in contact with an air bubble, it is necessary to allow from 5 to 15 minutes to float all of the mineral. This is accomplished by passing the pulp through a series of cells. Banks of 8 or 12 cells are common, the froth from the first 4 cells being called a concentrate, and the froth from the last 8 a "middling product," which is re-treated.

In the flotation process, the finely ground pulp may contain one or more valuable minerals which may be recovered separately or as a bulk concentrate, which is treated further by flotation to separate and recover the different valuable minerals. For instance, a pulp containing a lead and zinc sulphide mineral, galena and sphalerite respectively, will have the lead mineral floated off first, and then the pulp is treated by flotation, again using different chemicals for floating the zinc mineral.

Magnetic Separators.—Used for concentrating certain ores by taking advantage of the difference in magnetic properties between minerals. One type of magnetic separator consists of a horseshoe electromagnet with a "keeper." In the gaps between the two poles of the magnet and the keeper revolve two drums built up of alternating laminations of permeable and impermeable material. The ore is fed to the first roll where the susceptible particles adhere to the roll until it is in a position where the strength of the adjoining secondary pole is nil, when they drop from the roll into a chute. The nonsusceptible particles leave the roll sooner and fall into a different hopper.

The wet-type magnetic separator consists of a tank divided into several compartments. An endless belt moves through the tank and is backed up by a series of electromagnets. Water and crushed ore are admitted at one end and the solid material is picked up by the belt. The gangue or nonmagnetic material is dropped in the first compartment, and the other particles leave the belt in the order of their susceptibility, the weakest dropping first, and the concentrate is delivered in the last compartment. The particles drop from the belt because of the winnowing action of the alternating pole magnets and the water currents.

After an ore is concentrated by magnetic means, it is usually necessary to demagnetize it, as the particles retain a certain amount of residual magnetism. Demagnetizing may be accomplished by passing the ore through an alternating current coil of diminishing diameter in the direction of flow, so that there is a reduction in the intensity of the field as the ore passes through the coil.

Magnetic pulleys are also used for removing tramp iron from the ore being fed to a concentrating plant. They are of the electromagnetic type.

Thickening.—A process used in the first stage of dewatering the concentrate pulp. It is necessary to remove the water from the concentrate when smelting is to be used for the recovery of metal; also, it is not economical to pay freight on the moisture when the concentrate is shipped. Thickening is a settling process which is performed in a large cylindrical tank, about 10 feet deep, with a flat-conical bottom. It is often located outside the mill building, which reduces construction costs, and is sometimes as much as 200 feet in diameter. It may be constructed of concrete, metal, or wood. The pulp to be thickened is conducted by a launder to the feed well at the center of the tank. The clear water over-

flows into a duct which is around the inside periphery of the tank, while the solid particles settle to the bottom of the tank. Paddles slowly rake the bottom of the tank, moving the solid particles to the center discharge opening. A diaphragm pump lifts the solids from the bottom discharge opening. The paddles used to rake the bottom are attached to a central revolving shaft which is driven through speed reducers by a motor, located on a platform at the center of the tank or on the edge of the tank. If the motor is at the edge, it is placed on a platform which moves on wheels on a track which is around the outside periphery of the tank, the driving assembly being connected to the central shaft by a steel truss. In arid regions, the recovery of clear water for recycling in the mill is as important as thickening the concentrate. The thickened solids from the tank are then filtered before shipment.

Filtering.—A continuous operation performed for the most part on drum or disc-type filters which are covered with cloth. In either case the drum or disc revolves, partially submerged in the thickened concentrate. The disc or drum is divided into compartments so that suction or pressure may be applied as required. Suction is applied as the filter cloth passes through the concentrate, holding it to the surface of the cloth, and the suction continues as the disc or drum revolves, pulling out the filtrate. When the drum turns to a position over the discharge hopper, pressure is applied, blowing the filter cake from the cloth. Filtering machines are necessarily expensive and intricate, because of the valve arrangement for providing pressure and suction.

Heavy Density Separation.—A commercial adaptation of the mineralogical laboratory heavy-liquid separation technique. Essentially, the process uses some heavy mineral, such as finely ground silica sand, galena, or ferrosilicon to make a liquid-solid suspension of an intermediate density between the mineral and waste constituents of the ore. The process uses a variety of equipment, including screens, classifiers, thickeners, magnetic separators, pumps, motors, and a separatory vessel which may be a cone, spiral, or drum type.

In essence, heavy-density separation can perform the following operations: (1) production of a finished concentrate and a rejectable waste in one operation; (2) sorting of the waste from the ore, leaving an enriched product which may be treated further after reduction in size; (3) production of a finished concentrate and low-grade reject for additional treatment.

The basic steps in the heavy-density separation process are: preparation of feed, heavy-density separation, removal of the medium from the separated product, and reclamation and cleaning of the medium for re-use.

Preparation of the feed comprises wetting of the ore to wash off slimes and fines which dilute the medium, and to separate particles adhering together so that they will react better to the settling process. Use of ferric media and magnetic concentration make it unnecessary to remove all the slime, as the magnetic concentration of the medium rejects it.

Heavy-density separation apparatus comprises a tank containing the medium, means for agitating as desired, means for feeding the ore, and taking away the sink-and-float products. The cone and spiral separator are types of vessels used. The cones are either closed- or open-top with inside or outside air lift for removing sink. The closed-top cone is better suited to ores such as those of iron from which a relatively large amount of sink is to be removed. The open-top cone finds more use where there is a large quantity of float, as in coal cleaning. Sizes of ore up to 3¼ inches are introduced near the top of the cone, which contains a medium of a preselected gravity. The particles of higher specific gravity sink and are removed by an air lift while the particles of less specific gravity than the medium float on the surface and overflow a weir opposite the point of entry. Rakes mounted on a vertical shaft move the sink down the side of the cone and keep the medium in suspension. Cone sizes vary from 3 to 20 feet in diameter, the capacities depending on the specific gravity of the sink-and-float materials, the size of the feed, and the closeness of separation required. About 600 tons per hour may be handled by a 20-foot cone.

Products of the separatory vessel are drained and washed separately, the undiluted medium from the drain screen is returned to the separator, and the diluted medium from the washing screen is pumped through a constant magnetic field to magnetize the medium for acceleration of its settling rate. The pump discharges into a thickener which reduces the volume of pulp going to the magnetic separator, and it also acts as a storage tank from which medium losses may be replenished easily. The overflow may be used as spray water or sent to another thickener for further clarification before being used as spray water on the washing screens. The rake product of the thickener goes to the primary magnetic separator, and the reject goes to the secondary magnetic separator, from which the tailing goes to the waste pile or to some further form of treatment if it contains values. The clean medium from the magnetic separator is transferred to a spiral densifier that acts as a thickener, storage reservoir, and deslimer for clean medium. The clean medium is returned to the separatory vessel, passing through a demagnetizing coil which imparts a dispersing effect giving fluidity to the medium.

Heavy density separation processes are applied commercially to the washing of coal, and iron ore, to the concentration of lead, diamonds, spodumene, and garnet. See also COAL—*Mining—Coal Preparation;* GOLD MINING.

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MINISTER, a high officer of state entrusted with the administration of any department of state government. Collectively, the persons who constitute the administration are called in Europe the ministry, and also the Cabinet. The term minister is seldom applied in the United States to members of the Cabinet, but is used, as in Europe, to designate diplomatic officers who differ from ambassadors in that the latter hold power as personal representatives of the head of the government. The technical title of ministers is envoy extraordinary or minister plenipotentiary. In Great Britain the term is used to

designate the entire body of secretaries which is called the ministry. The executive government of France is divided into 10 departments or "ministries." See also AMBASSADOR; CABINET; ENVOY; CONSUL; AMERICAN DIPLOMACY.

MINISTER'S WOOING, The, a novel by Harriet Beecher Stowe, first published in serial form in the *Atlantic Monthly* in 1859. The scene is laid in New England, and deals with the habits and traditions of the close of the 18th century. The "minister" in the tale is the famous Samuel Hopkins (q.v.) 1721–1803, the founder of "Hopkinsianism." The central purpose in this story is to show the sternness and inflexibility of the New England conscience, which clings to the Calvinistic doctrines through all phases of life. The struggle that goes on in the heart of the heroine and her mother when the brother and son, James, is supposed to be drowned and unconverted is a graphic delineation of the moral point of view at that time.

MINIUM. See LEAD.

MINIVER, the Siberian squirrel, which has fine white fur; also the fur itself.

MINK, a circumpolar species of weasel (family *Mustelidæ*), valuable as a fur-bearer, known in North America as *Putorius vison,* and in the Old World as *P. lutreola,* although substantially the same animal. The mink is a true weasel, with 34 teeth and not a marten with 38; but it is of larger size, being 24 to 27 inches long, one-fourth of which belongs to the tail, and has a stouter form and bushier tail, more like the martens. Males are much larger than females. The mink differs greatly from both weasels and martens, and in those points in which it is modified toward this mode of life, namely, the half-webbing of the toes, short ears and close-set, bristly, glistening pelage, it makes an approach toward the others. In color the mink ranges from dull yellowish-brown to a rich blackish chocolate-brown. The ordinary color is a dark reddish-brown, growing blackish on the tail and marked by a white patch on the chin of variable extent. The pelage consists of a dense, soft, matted underfur, mixed with long, stiff, lustrous hairs on all parts of the body and tail. The gloss is greatest on the upper parts; on the tail the bristly hairs predominate. Northern specimens have the finest and most glistening pelage; but the rough treatment given its coat by the animal in scrambling through holes and crevices in rocks, rotten logs and broken ice so rapidly damages its fur that only the pelts taken in early winter show the fur to perfection and yield full value to the trapper. Both sexes are extremely odorous, due to the secretion, equally in both sexes, of a fetid musky scent in small perineal sacs opening near the orifice of the rectum, on each side; the smell is powerful, penetrating and lasting, and is under voluntary control of the animal, but it cannot be discharged like that of the skunk, and is by no means so overpowering. The purpose of this secretion is undoubtedly the attraction of the sexes, and it is used to advantage by trappers as a scent-bait for their traps.

Minks occur in all parts of North America, and are so prolific, so well supplied with food and so secretive that they survive numerously even in the more thickly settled parts of the country. They abound near the coast and in the neighborhood of the larger lakes, rivers and marshes, but are to be found along almost every stream, even in the dryest portions of the interior. The minks cling to the water-courses, where they find plentiful food in the form of meadow-mice, frogs, mussels, fishes (especially eels) and insects. In New England, at least, they feed largely on earthworms, getting them in plenty even in midwinter; and when very hungry, or a good opportunity offers, do not hesitate to attack larger animals, as muskrats — which they are able to pursue through underwater ways into their houses,— rabbits partridges, ducks and poultry. They search the stream-banks for prey, diving and swimming long distances with ease, go about under loose ice and snow, climb rough-barked trees and penetrate crevices and hollows almost with the ease of a serpent, so that nothing is safe from their inquisitive ferocity, and in winter they wander widely.

Their own homes are made in burrows, usually but not always opening in the bank of a stream, and are more often accidental than carefully contrived. In some such retreat the female brings forth in early spring her litter of four or five young, which she guards with great care and courage from all enemies, including the males of her own species. The kittens, and the older ones indeed, exhibit the same playfulness in and out of the water which characterizes otters.

No fur-bearing animal is so unsuspicious of traps and so easily caught as the minks; and they are the victims of boys and amateurs as well as of professional trappers in all parts of the country. The value of the pelts varies with their color, condition, size and the varying demands of changing fashion, but good ones are always of sufficient worth to make them reward the trouble of taking. When captured young they are easily habituated to confinement in suitable pens, and are tamable to a certain degree. They will breed in captivity, and there are several thousand mink farms in the United States and Canada which breed the animals for their pelts. The minks are fed upon fish and coarse meat, etc. The sexes are kept separate except during the month of March, and reproduction begins when the female is one year old. Tame minks make excellent ratters, doing the duty of ferrets.

Consult Audubon and Bachman, 'North American Quadrupeds' (Washington 1851); Coues, 'Fur-bearing Animals' (1877); Cram, 'Little Beasts of Field and Wood' (New York 1899); Stone and Cram, 'American Animals' (ib. 1902); Hollister, 'A Synopsis of American Minks' (Washington 1913); Seton, 'Life Histories of Northern Animals' (New York 1909).

MINK FROG (*Rana septentrionalis*), a small frog inhabiting the northwestern United States. It measures two and one-quarter inches from nose to vent and is dark olive-green above with sooty brown bars and spots and is pure white beneath. In general effect the hue resembles that of the mink, whence its name. Its habits are quiet and solitary. Consult article by H. Garnier in *The American Naturalist* (Vol. XVII, Philadelphia 1883).

MINNA VON BARNHELM. Lessing's *Minna von Barnhelm or The Soldier's Fortune,* a comedy of five acts in prose—begun 1763, published 1767—is most important for the rise of modern German literature since it was the first dramatic work of timely interest growing out of great national events (consult Goethe, *Dichtung und Wahrheit,* Book 7). It takes place at a hotel in Berlin about six months after the conclusion of the Seven Years' War (1756–1763), and, according to Goethe, purposes to relieve in a simile, as it were, the hostile tension between the defeated Saxons and the victorious Prussians. The Prussian Major von Tellheim desires to be guided above all by his rigid sense of honor, which forbids him to owe his entire good fortune to a woman or to make a woman share in a life which, as far as appearances go, may be exposed to contempt. Minna von Barnhelm, his fiancée, a beautiful and rich young lady of Saxony, fixes her eyes steadily upon Tellheim's sterling character, disregards the opinion of the world and by a well-meant artifice makes him realize that love's highest gratification is to stand by the beloved person in trouble. Minna conquers. True love proves superior to an extreme feeling of honor, although the value of the latter is by no means denied. In *Minna von Barnhelm* a deep moral problem is proposed and carried almost to a tragic turn. But the charm of Minna and the naturalness of Franziska and the sergeant captivate the spectator; the rascals are easily seen through, the atmosphere is conciliatory, the jokes to the point. For all this, the genuine spirit of comedy is ever present, and *Minna von Barnhelm* can maintain its place among the best specimens of the higher type of comedy.

Consult edition of Lessing's works in *Deutsche National-Literatur* (1882–1898, vol. 2); English translation in Harvard Classics, vol. 26; Kettner, G., *Ueber Lessings Minna* (Berlin 1896); Kettner, G., *Lessings Dramen in Lichte unserer Zeit* (Berlin 1904); von Stockmayr, *Die deutschen Soldatenstücke des 18. Jahrhunderts seit Lessings Minna von Barnhelm* (Weimar 1898).

EWALD EISERHARDT.

MINNEAPOLIS, city, Kansas, Ottawa County seat, altitude 1,380 feet, on the Solomon River and on the Atchison, Topeka and Santa Fe and the Union Pacific railroads, 25 miles northwest of Salina. Surrounded by an agricultural area, producing grain, poultry, and livestock, the city's business has to do principally with the processing of foods. It has a mayor and council. The water supply, light, and power systems are all municipally owned. Pop. (1950) 1,796.

MINNEAPOLIS, Minn., is the largest metropolis in Minnesota, the county seat of Hennepin County; a principal cultural, financial, and industrial center, serving the vast agricultural region of the upper Midwest. In 1950 its population was 521,718. It is located in the gently rolling terrain of eastern Minnesota on both sides of the Mississippi River, 1,900 miles from its mouth at New Orleans and 550 miles (channel distances) from its source in Lake Itaska in northwestern Minnesota. A beautiful city with gleaming skyscrapers, modern mills, and spacious residences sprinkled among the lakes within its boundaries, it is often called "a park with houses." Within the city boundaries are 22 lakes—large and small. Minneapolis has an elevation of 838 feet at its airport, Wold Chamberlain Field. Its climate is characterized by wide variations in temperature, scanty winter precipitation, normally ample summer rainfall, and a general tendency toward extremes in all climatic features. Winter temperatures frequently drop as low as —20°F.; in summer, maximum temperatures exceeding 90°F. occur on an average of 15 days, but heat waves are usually of short duration. The average mean temperature for winter is 16°F., and for summer 70°F. The average annual precipitation is 27.08 inches: more than 50 per cent (14.44 inches) is normally received during May, June, July, and August.

History.—The first white man to visit the present site of Minneapolis was Father Louis Hennepin (q.v.) on a voyage of exploration in 1680. The falls which he saw there he named after his patron saint, St. Anthony. The next recorded explorer to pass through the area was Jonathan Carver, an American colonist who arrived in 1766. After the Louisiana Purchase (q.v.) transferred the area to the United States, Zebulon M. Pike, in 1805 on a mission for the new republic, was deceived by fur traders into believing that he had arranged a site for a military post there. Following his departure the American flag was torn down. In the next decade the American rights to the Louisiana Purchase were made secure, and in 1820 a fort that was first called St. Anthony and later Snelling was established a short distance south of the falls at the confluence of the Mississippi and Minnesota rivers. Its chief purpose was to protect American fur traders from the forays of hostile Indians. A few settlers began to move in. The village of St. Anthony was platted in 1848 and incorporated as a city in 1855. Meanwhile, Col. John Harrington Stevens filed claim in 1849 to a large section of what is now the downtown district of Minneapolis and platted it as a town in 1854. Its name had already been chosen when, at a meeting of citizens in 1852, Minneapolis was adopted as the official name. It combined an Indian word meaning water (minne) and the Greek word meaning city (polis) now popularly translated as the "city of falling water." Minneapolis was incorporated as a town in 1856 and, after 1860, began to grow very rapidly. It was chartered as a city in 1867, and in 1870 had a population of 13,066. The two cities of St. Anthony and Minneapolis were united by act of legislature into the city of Minneapolis in 1872. The natural waterfalls of St. Anthony provided power to drive the early lumber and flour mills. Eventually, as the agriculture of the region burgeoned, the mills of Minneapolis became known as the world's largest producers of flour.

Population.—Minneapolis is peopled with an ambitious and energetic citizenry. Approximately 86 per cent are native-born whites, 13 per cent are foreign-born whites, and 1 per cent are nonwhite. The native-born whites and foreign-born whites are principally of Anglo-Saxon and Northern European stock—predominantly of Scandinavian origin. Minneapolitans pride themselves on their neat homes and well-kept premises; 51 per cent of the residents within the city own their homes, and the suburban homes are about 80 per cent owner-occupied.

In addition to Minneapolis proper, another 112,000 persons dwell in the girdle of park-like suburbs that surround the city. Minneapolis' ten principal suburbs are related to her not only through economic ties, but also for services such as electric power, water, sewerage, and gas. An estimated 80 per cent of the suburban wage earn-

ers are employed in Minneapolis, commuting in and out of the city daily.

Government.—Under the provisions of the home rule charter adopted in 1920, the voters of Minneapolis elect many of their city officials, both policy-making representatives and executive officers. The elective positions include the mayor, city treasurer, city comptroller, a city council (composed of aldermen elected by wards), the 7 members of the board of education, 12 of the members of the board of park commissioners, 6 of the members of the library board, and 2 of the members of the board of estimate and taxation. Three of the boards to which members are elected also have ex officio members, and on all boards the city treasurer acts as treasurer and the city comptroller as comptroller. These boards act in both policy-making and administrative capacities. They may appoint their own employees, subject to civil service limitations, and each may levy a tax upon city property, subject to millage limitations imposed by the charter.

In addition to the partially or totally elective bodies, there are several appointive boards responsible for specific city government functions. The powers and duties of the department of public welfare are exercised and performed by an executive board composed of the mayor, two city council members appointed by the city council, and four members appointed by the mayor with the approval of the city council. This board has general and specific responsibilities for city health, hospitals, relief, penal and correctional agencies and institutions, vital statistics, and the appointment of the commissioner of health and other employees.

The city planning department is headed by a city planning commission, composed of the mayor; a member each elected from and by the city council, the board of education, the board of park commissioners, and the county board of Hennepin County; and four resident voters appointed by the city council.

The police and fire departments each have a single executive head. The mayor is empowered to appoint the chief of police, but the chief fire engineer is appointed by the city council. Other appointees of the council include a city clerk, a city attorney, a city engineer, several street commissioners, a wharfmaster, an assessor, a purchasing agent, water works employees, and all other officers deemed necessary for the proper management of the city.

Industries and Businesses.—The metropolitan area of Minneapolis and its twin city, St. Paul (q.v.) include all of Hennepin, Anoka, Dakota, and Ramsey counties. The federal Census of Manufactures for 1947 showed the year's production (value added by manufacture) for the area to be $714,565,000. Minneapolis itself produces a wide variety of manufactured products. More than 1,300 manufacturing establishments were in operation in 1950. Industrial products range from heavy construction equipment to delicate heat-regulating devices and electronic controls.

For more than 70 years the flour mills and millers of Minneapolis have played an important role in supplying the world with the main ingredient of the staff of life. Minneapolis is headquarters for the five largest wheat flour milling companies in the world. The Minneapolis mills have a daily capacity of nearly 7,000,000 pounds of flour. These mills produce an annual average of 16 million 100-pound sacks of flour, and export to every region of the world. Within the switching limits of the city are 71 terminal elevators with a total combined storage capacity of 93 million bushels. The Minneapolis Grain Exchange, a nonprofit association, is the world's largest cash grain market (1950). Grain receipts at the Minneapolis market have exceeded 300 million bushels a year.

The manufacture of linseed products is also a leading Minneapolis industry. Minnesota, North Dakota, and South Dakota raise about 80 per cent of the nation's flax crop, most of which comes to Minneapolis' linseed mills for processing into linseed oil and cake. Soybeans, another crop becoming increasingly important in the upper Midwest, also are processed in these mills. Probably because of the ready source of linseed oil, the manufacture of paint began early in Minneapolis. As of 1950, there were five large factories and several smaller plants with an annual production of about 6,000,000 gallons of paint, in addition to industrial preservatives and finishes. Among the city's other large industries are machinery, printing and publishing, dairy products, and apparel. Among less common products for which the city has acquired international fame are powdered milk and artificial limbs.

Minneapolis is the home of the 9th Federal Reserve District Bank. In 1950, the city had 3 bank corporations, 10 national banks, 7 state banks, and 1 savings bank, with total bank deposits running well over $1,000,000,000.

The business district of Minneapolis is conveniently laid out. Hennepin Avenue, named for the discoverer of St. Anthony Falls, is the Broadway of the city; here are many of the city's theaters and places of amusement. Nicollet Avenue, so called in honor of another distinguished pioneer, is often referred to as the Fifth Avenue of the Upper Midwest, and is the center of retail shopping, not only for the residents of Minneapolis but also for many in neighboring communities and states. Marquette Avenue is known as the Wall Street of Minneapolis and runs through the financial district of the city.

The trade area of which Minneapolis is the center covers a large area of the upper Midwest. On the wholesale level, Minneapolis is the center of distribution for Minnesota, North Dakota, South Dakota, most of Montana, the northern third of Iowa, and the western half of Wisconsin. Some of the larger firms extend their operations into the upper peninsula of Michigan, and cover the entire area to the Pacific Ocean and as far south as Kansas and Utah. The retail trade area of Minneapolis includes Minnesota and its neighboring states.

Transportation.—Minneapolis is the railroad center of the upper Midwest. It is served by 10 trunk line railroads, four of which are transcontinental. These trunk lines operate over nearly 60,000 miles of track in 21 states. In 1950, five bus companies made daily runs in and out of Minneapolis and connected with bus routes serving the entire nation. In addition, 115 motor freight carriers operated regular service to provide quick and convenient transportation to any point in the United States. A network of fine highways centers on the city. A number of airlines provide daily service to distant points and, with its regularly scheduled service to the Orient, one of them has made Minneapolis a great national inland port. The city's 1,085-acre airport, Wold Cham-

berlain Field, ranks among the largest in air traffic volume in the nation. Minneapolis' municipal docks below St. Anthony Falls provide docking service for barges from all points on the Mississippi and Ohio rivers. The new Upper Harbor (scheduled for completion in 1954) is intended to provide more docking area above St. Anthony Falls and accommodate many new industries along the river's waterfront. Four pipelines deliver gasoline and light oil to Minneapolis at the rate of two and one-half million gallons daily (1950).

Education.—The University of Minnesota, a state institution, is located along the Mississippi River in Minneapolis. Its beginnings antedate the city itself. The development of the university, particularly since World War II, has brought it up among the leading educational institutions of the nation, not only in size of enrollment, but also in educational standing and national prestige. Affiliated with the medical school of the university is the Mayo Foundation for Graduate Medical Education and Research. (See also MINNESOTA, UNIVERSITY OF.) Among the other institutions of higher learning within the city are Augsburg College and Theological Seminary (Lutheran), the MacPhail College of Music, the Minneapolis School of Fine Arts, and the Dunwoody Institute, which last is one of the largest privately endowed trade schools in the United States.

In 1950, the Minneapolis public school system embraced 93 schools employing a staff of some 2,400 educators. Seventy of the schools were elementary, 11 were junior high schools, 10 were senior high schools, and 2 were vocational schools. The total enrollment was 67,020.

Cultural and Recreational Facilities.—The Minneapolis Symphony Orchestra (q.v.), one of the most traveled symphonies in the United States, has brought more fame to Minneapolis than any other cultural institution. Its home is the Northrop Memorial Auditorium on the campus of the University of Minnesota. Other cultural facilities include the University of Minnesota Art Gallery, the Walker Art Center, which is particularly noted for its collection of ceramics and jade; the Minneapolis Institute of Art, with its paintings, prints, tapestries, and furnished period rooms; and the Institute of Swedish Arts, Literature and Science, with its exhibits of glassware, textiles, and antique furniture.

Minneapolis has 147 magnificently landscaped parks interlacing its 22 lakes and lakelets, which with 14 public beaches, provide for both winter and summer sports. The park area totals nearly 6,000 acres. The largest park is Theodore Wirth Park with 681 acres. The parkway system known as "Grand Rounds," is 62 miles long and almost completely encircles the city. Deeply wooded Minnehaha Parkway winds along Minnehaha Creek and links Lake Hiawatha, Lake Nokomis, Lake Harriet, Lake Calhoun, Lake of the Isles, and Cedar Lake with Minnehaha Park in which are the Minnehaha Falls, commemorated in Longfellow's poem, *The Song of Hiawatha.* Minnehaha Parkway itself covers 144 acres of wooded hills and shelters the Stevens House, the earliest frame building in Minneapolis west of the Mississippi River. The Minneapolis park system is said to be one of the most outstanding in the United States from the standpoint of the number of acres, types of properties, character of development, and quality of maintenance.

There is a playfield for every square mile of residential area in Minneapolis. As of 1950, the city had 36 playgrounds conveniently placed throughout the park system. There were 45 baseball diamonds, 137 softball diamonds, 198 tennis courts, 45 skating rinks, and 5 golf courses. The five 18-hole golf courses are located in widely separated sections of the city and are easily accessible by motor or trolley. In addition, there are 11 private golf courses. Two of the courses keep their clubhouses open throughout the winter months.

The Minneapolis Aquatennial, a summer festival, provides colorful pageantry. The Aqua Follies, one of its special features, combines an original format of Olympics swimming and diving champions with stage and concert stars. Women students at the University of Minnesota train throughout the year for the precision routine of these water ballets. The Follies are staged at Glenwood Lake, one of the lakes within the corporate limits of Minneapolis. Another annual feature is the world famous Shipstad and Johnson Ice Follies which began in Minneapolis in 1933. The shows feature a dazzling array of talented skaters, gorgeous costumes, and novelties in under-ice lighting. Sustained brisk weather is responsible for the popularity of winter sports programs in Minneapolis. Skiing and skating are especially popular. Because of the numerous hills around the city, as well as the city's policy of training beginners, Minneapolis is considered the kindergarten for ski-jumping enthusiasts. The Minneapolis Park Board maintains an active program designed to teach youngsters and adults alike the fundamental of skiing.

Minneapolis, a city of lakes, is itself surrounded by many chains of lakes. The largest lake adjacent to the city is Lake Minnetonka with 110 miles of beautiful shore line. The area around Lake Minnetonka is a popular suburban district and many live at "the lake" throughout the entire year. All the lakes in and around Minneapolis are abundantly supplied with game fish. Each week end, winter and summer, thousands of residents take to the lakes to try their luck. Winter fishermen angle in the open through holes in the ice, or in fish houses which are darkened to permit underwater spearing.

Other Points of Interest.—Minneapolis has 371 churches, representing practically every faith and denomination. The city has 34 hospitals and also several outstanding clinics staffed by prominent medical specialists. Minneapolis early recognized the threat of infantile paralysis and invited the famed Australian nurse, Sister Elizabeth Kenny, originator of a new treatment for the disease, to come to the city and set up the Kenny Institute. The institute is now self-supporting and has treated thousands suffering from poliomyelitis.

The Minneapolis Public Library has 424 distributing agencies, including the main library, 15 community branches, a business branch, a social service branch, and a bookmobile branch. In addition, the library services hospitals, business offices, factories, elementary school stations, classroom libraries, and summer camps. The Minneapolis Public Library also operates the Hennepin County Library under a contract with the Hennepin County commissioners.

Minneapolis has two general newspapers: The *Minneapolis Star* (evening) and the *Minneapolis Morning Tribune.* There are also many weekly

and monthly publications devoted to trades, professions, and commerce including one issued by the Minneapolis Chamber of Commerce which contains articles of civic and commercial interest. The city is a convention center, often drawing delegates from all over the United States. Some 300 conventions are usually held in Minneapolis each year, a majority of which are state and regional. In 1950 there were 10 radio stations in Minneapolis and 2 television stations.

Bibliography.—Atwater, Isaac, *History of Minneapolis and Hennepin County* (New York 1895); Hudson, Horace B., *A Half Century of Minneapolis* (Minneapolis 1908); Shutter, Marion D., *History of Minneapolis* (Minneapolis 1923); Federal Writers' Project of the Works Progress Administration, *Minnesota, A State Guide* (New York 1938); Mantz, G. F., *Your Minneapolis Guide* (Minneapolis 1946); Minnesota Historical Society, *Minnesota* (St. Paul 1946); Bitterman, Arch, *The Civic Digest* (Minneapolis 1949); Hubert, H. Humphrey, *Territory of Minnesota* (U.S. Government Printing Office 1949).

GORDON W. COWAN,
News Editor, "Greater Minneapolis."

MINNEAPOLIS SYMPHONY ORCHESTRA, founded in 1903 by Emil Oberhoffer and Elbert L. Carpenter. Oberhoffer was its first conductor and continued until 1921. By this time the orchestra had become nationally known and was famous for its annual tours which started around 1910. After Oberhoffer's retirement the orchestra was led for two seasons by guest conductors until the appointment in 1923 of Henri Verbrugghen. He in turn was succeeded by Eugene Ormandy who conducted the orchestra from 1931 to 1935. Following another season of guest conductors, Dimitri Mitropoulis was permanent conductor from 1936 to 1949, when he was succeeded by Antal Dorati. In its programs and performance the organization ranks as one of the leading orchestras of the United States.

MINNEHAHA, mĭn-ĕ-hä'hä, **Falls of** (Sioux, *Mini-haha,* curling water), a cascade in the Minnehaha River, now in the Minnehaha Park, which belongs to Minneapolis, Minn. The cascade has a fall of about 60 feet and is in a picturesque glen which extends to the Mississippi River. Just below the falls the river is spanned by a rustic bridge. The name has become world-known through Longfellow's *The Song of Hiawatha.*

MINNESINGER, mĭn'ĕ-sing-ĕr, or **MINNESANGER** (from the German *minne,* "love"), is the name given to the knightly poets and singers in Germany who were counterparts of the French Troubadours and Trouvères (q.v.). The Minnesinger flourished chiefly in the 12th and 13th centuries, and they were the leading representatives of German music during the Middle Ages. Strictly speaking, the name of the Minnesinger indicates that their songs were concerned exclusively with love, but actually the words of the *Minnesang* embodies the entire literature of German lyric poetry of the 12th and 13th centuries, dealing not only with the chivalric love of a knight for his lady, but also with religion and with political matters. The influences that shaped the songs of the Minnesinger were varied. The idea of knightly love came from Provençal literature; the sacred elements show a Gregorian background; and the erotic phases of medieval Latin poetry add a secular note. The result was a fusion of Christian spiritualism, with its ascetic spirit of self-denial and a secular-eroticism. The Minnesinger themselves sang their own compositions, even though some of them were ignorant of musical notation.

While there is a close relationship between the Minnesinger and the Troubadours, the songs of the Minnesinger differ materially from those of the Troubadours and the Trouvères. The songs of the Minnesinger are, with a few exceptions, more of a narrative type, and often devotional. Some of them are songs to the Virgin. Musically the songs are closer to the ecclesiastical modes than the French melodies. Also, the musical notation of the *Minnesang* was similar to that then used in the Church. The fusion of ecclesiastic and secular elements resulted in the songs of the people becoming known in the courts, and in the songs of the Church and of the aristocracy becoming known to the people.

Modern music-lovers know of the Minnesinger chiefly through the music-dramas of Richard Wagner. Tannhauser was an actual Minnesinger who lived from 1205 to 1270, as were two other characters in the opera *Tannhauser*—Walther von der Vogelweide (c. 1170–1230) and Wolfram von Eschenbach (fl. 1200–1220). The last named composed an epic poem called *Parzival,* which was the basis for Wagner's *Parsifal* and part of *Lohengrin.* Even though Wolfram was one of the greatest of the Minnesinger, he was never proficient at writing and found it necessary to dictate his *Parzival* to a scribe. Walther von der Vogelweide was a lyrical genius whose place in German literature has been compared to that of Goethe. He himself belonged to the nobility, but his writings combined the art of the wandering minstrel and of the knightly poet-musician. Thus he mixed the popular and the aristocratic elements of his day, and as he wandered from court to court singing his own poems, which were set to music he had himself composed, he united the elements of German folk song and the artistic song of the Minnesinger. During the latter years of Walther's life, the art of the Minnesinger began to deteriorate, and in the hands of the later Minnesinger, the songs descended to trivial and unpoetic themes. By the 14th century feudalism had passed its prime, and there was less taste for poetry and music at court. Power passed from the hands of princes, nobles and prelates, and passed to the burghers and artisans, who became known as Meistersingers (q.v.).

Others of the Minnesinger include the following: Neithart von Reuenthal (c. 1180–1240), Bruder Wirner, Meister Alexander, Konrad von Wurzburg, Heinrich von Meissen (d. 1318), Wizlav von Rugen, Hermann der Damen, Friedrich von Hausen, Hugo von Salza, Heinrich von Morungen, Heinrich von Rugge, and Ulrich von Gutenberg. Many of the Minnesongs are preserved in medieval manuscripts. A number of them were said to have been collected by Rudiger Manesse (d. 1325) and his son, who gathered them into the Great Heidelberg Manuscript. During the Thirty Years' War this manuscript was taken to Paris, but was later returned to Heidelberg. In the 19th Century the contents of this manuscript were published by von der Hagen in Leipzig (1838), by Pfaff in Heidelberg (1899), and by Mathieu in Paris (1850).

Bibliography.—Villari, L., *Oswald von Wolkenstein; A Memoir of the last Minnesinger of Tyrol* (London 1901). (Except for the foregoing, all reference material on the Minnesinger is in German.) Lyon, O., *Minnesang und Meistergesang,* (Leipzig, 1883); Lachmann, K., and Haupt, M., *Minnesangs Frühling* (Leipzig, 1884);

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MINNESONG (German *Minnesang, Minnegesang,* from *minne,* love, and *sang,* song), a medieval type of German love-lyric, written chiefly by knightly poets in the 12th, 13th and 14th centuries, in the Middle High German dialect. The earliest of the 300 or more names of Minnesinger that have been preserved are Kürnberger, Memlo von Sevelingen, and Dietmar von Aist, but only about 160 of them have left poems that are still accessible. Some groups of Minnesinger were very distinctly under the influence of French (Provençal) and Italian models, such as Friedrich von Hausen, Rudolf von Fenis, Ulrich von Gutenberg, Heinrich von Rugge and von Morungen, etc. The flower of the type blossomed in Walther von der Vogelweide and Reinmar von Hagenau about the year 1200, coincident with the great medieval German epic, the *Nibelungenlied.* Most of these songs were intended for musical performance and are divided into classes, distinguished by the names lied, leich and spruch. Rüdiger Manesse (d. Zürich 1325) and his son are said to have collected them in the Great Heidelberg Manuscript, which was taken to Paris in the course of the Thirty Years' War, and later returned to Heidelberg. It contains 137 miniatures and over 7,000 strophes; published by von der Hagen (Leipzig 1838), Pfaff (Heidelberg 1899), Mathieu (Paris 1850). But many poems not in the Manesse manuscript are found in other manuscripts. Later Minnesinger, such as Ulrich von Lichtenstein, began to regard the occupation of producing such poems as a sort of sport or handicraft and the art passed out of the hands of the lower nobility into those of the burgher "masters" (see MEISTERSINGERS) and roaming minstrels. Consult Lyon, O., *Minnesang und Meistergesang* (Leipzig 1883); Lachmann, K., and Haupt, M., *Minnesangs Frühling* (Leipzig 1884); Grimme, F., *Geschichte der Minnesinger* (Paderborn 1897).

JACOB WITTMER HARTMANN.

MINNESOTA, mĭn-ĕ-sō'tȧ, one of the West North Central states of the United States. It is bounded on the east by Wisconsin and Lake Superior, on the north by the Canadian provinces

State flag.

of Ontario and Manitoba, on the west by North and South Dakota, and on the south by Iowa. The name of the state was derived from the Dakota Indian words meaning "sky-tinted water."

Land area	80,009 square miles
Water area	4,059 square miles
Total area	84,068 square miles
Latitude	43° 34′—49° 23′ N.
Longitude	89° 34′—97°12′ W.
Altitude	602 to 2,230 feet
Population (1940)	2,792,300
Population (1950)	2,982,483
Capital city—St. Paul; Pop. (1950)	311,349
Admitted as a state	May 11, 1858
Bird (unofficial)	American goldfinch
Flower	Pink-and-white moccasin flower, adopted February 1902
Motto	*L'Etoile du Nord* (Star of the North)
Nicknames	Gopher State, North Star State, Bread-and-Butter State, Land of Sky-Blue Waters, Land of Ten Thousand Lakes, Theater of Seasons
Song	*Hail! Minnesota,* adopted April 1945
Tree	Norwegian pine, adopted 1953

The state motto, "Star of the North," points up the fact that Minnesota includes the northernmost point of land in the United States: the Northwest Angle lying to the west of Lake of the Woods.

State seal.

Physical Characteristics.—*Topography.*—Rocks of practically every geologic age are to be found within Minnesota's borders, but its surface features are chiefly the handiwork of four great glaciers that one after another covered all but the southeastern tip of the state. These glaciers carried with them large quantities of rock fragments. In the northeast their scouring action exposed rock outcroppings in some places and in others scooped out great hollows that became the border lakes. Then, as the ice sheets melted, they dropped their burden of boulders, pebbles, sand, and clay in a jumbled mixture called drift. This was deposited in hilly moraines interspersed with more level stretches, both dotted with thousands of small pockets or basins that filled with water to become lakes.

The last of the rivers of ice dammed the outlet of the Red River basin, and when it melted it formed a huge lake 700 miles long and some 200 miles wide—called Lake Agassiz by the geologists. As the ice receded, Lake Agassiz drained away to the north but left behind traces of its lowering beach lines in many ridges of sand and gravel. Glacial Lake Agassiz was finally reduced to the size of Lake Winnipeg, and its level, fertile bottom became the valley of the Red River of the North.

Especially important is the fact that in north central Minnesota the old Laurentian highland survives as a divide from which originate three of the continent's great river systems: one draining northward through the Red River to Hudson Bay, one eastward by way of the Great Lakes and the St. Lawrence River to the Atlantic

MINNESOTA

1950 Total Population 2,982,483

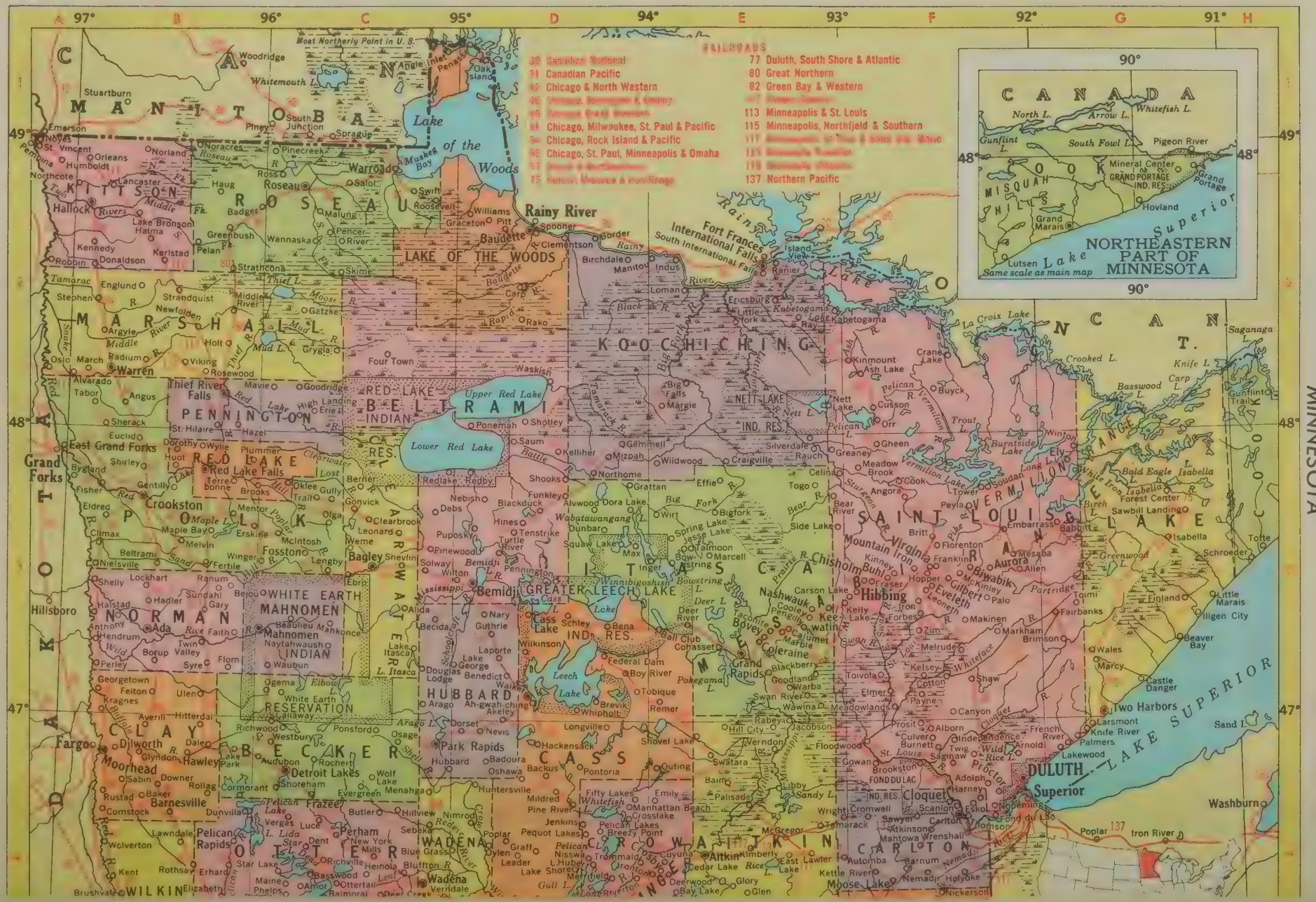
Ada ◉(B3) 2,121
Adams (F7) 663
Adrian (C7) 1,115
Afton (F6) 142
Ah-Gwah-Ching (D3) 360
Aitkin ◉(E4) 2,079
Akeley (D3) 525
Albany (D5) 1,196
Albert Lea ◉(E7) 13,545
Alberta (B5) 139
Albertville (E5) 238
Alden (E7) 668
Aldrich (C4) 131
Alexandria ◉(C5) 6,319
Alma City (E6) 150
Almelund (F5) 175
Almora (C4) 82
Alpha (D7) 230
Altura (G6) 269
Alvarado (B2) 317
Amboy (D7) 585
Amiret (C6) 90
Angus (B2) 100
Annandale (D5) 899
Anoka ◉(E5) 7,396
Appleton (C5) 2,256
Arco (B6) 178
Argyle (B2) 846
Arlington (D6) 1,313
Ashby (C4) 443
Askov (F4) 387
Atwater (D5) 880
Audubon (C4) 275
Aurora (F3) 1,371
Austin ◉(F7) 23,100
Avoca (C7) 281
Avon (D5) 386
Backus (D4) 367
Badger (B2) 448
Badoura (D4) 250
Bagley ◉(C3) 1,554
Balaton (C6) 723
Bald Eagle (E5) 1,650
Bald Eagle (lake) (G5)
Ball Club (E3) 100
Barnesville (B4) 1,593
Barnum (F4) 344
Barrett (B5) 402
Basswood (lake) (G2)
Battle Lake (C4) 714
Baudette ◉(D2) 929
Baxter (D4) 507
Bayport (F5) 2,502
Beardsley (B5) 435
Beauford (D7) 250
Beaulieu (C3) 100
Beaver Bay (G3) 100
Beaver Creek (B7) 245
Becker (E5) 264
Bejou (B3) 173
Belgrade (C5) 659
Belle Plaine (E6) 1,708
Bellechester (F6) 225
Bellingham (B5) 388
Beltrami (B3) 199
Belview (C6) 381
Bemidji (D3) 10,001
Bemidji (lake) (D3).
Bena (D3) 331
Benson ◉(C5) 3,398
Benton (lake) (B6).
Beroun (F5) 120
Bertha (C4) 577
Bethel (E5) 250
Big Bend City (C5) 650
Big Falls (E2) 441
Big Fork (riv.) (E2).
Big Lake (E5) 480
Big Stone (lake) (B5)
Bigelow (C7) 238
Bigfork (E3) 463
Bingham Lake (C7) 229
Birch (lake) (G3)
Bird Island (D6) 1,333
Biwabik (F3) 1,245
Blackduck (D3) 732
Blakeley (E6) 98
Blomkest (D6) 150
Blooming Prairie (E7) 1,442
Bloomington Lake (G6) 11,118
Blue Earth ◉(D7) 3,843
Blue Earth (riv.) (D7)
Bluffton (C4) 239
Bois de Sioux (riv.) (B4)
Borup (B3) 200
Bovey (E3) 1,320
Bowlus (D5) 233
Bowstring (E3) 300
Bowstring (lake) (E3)
◉County Seat

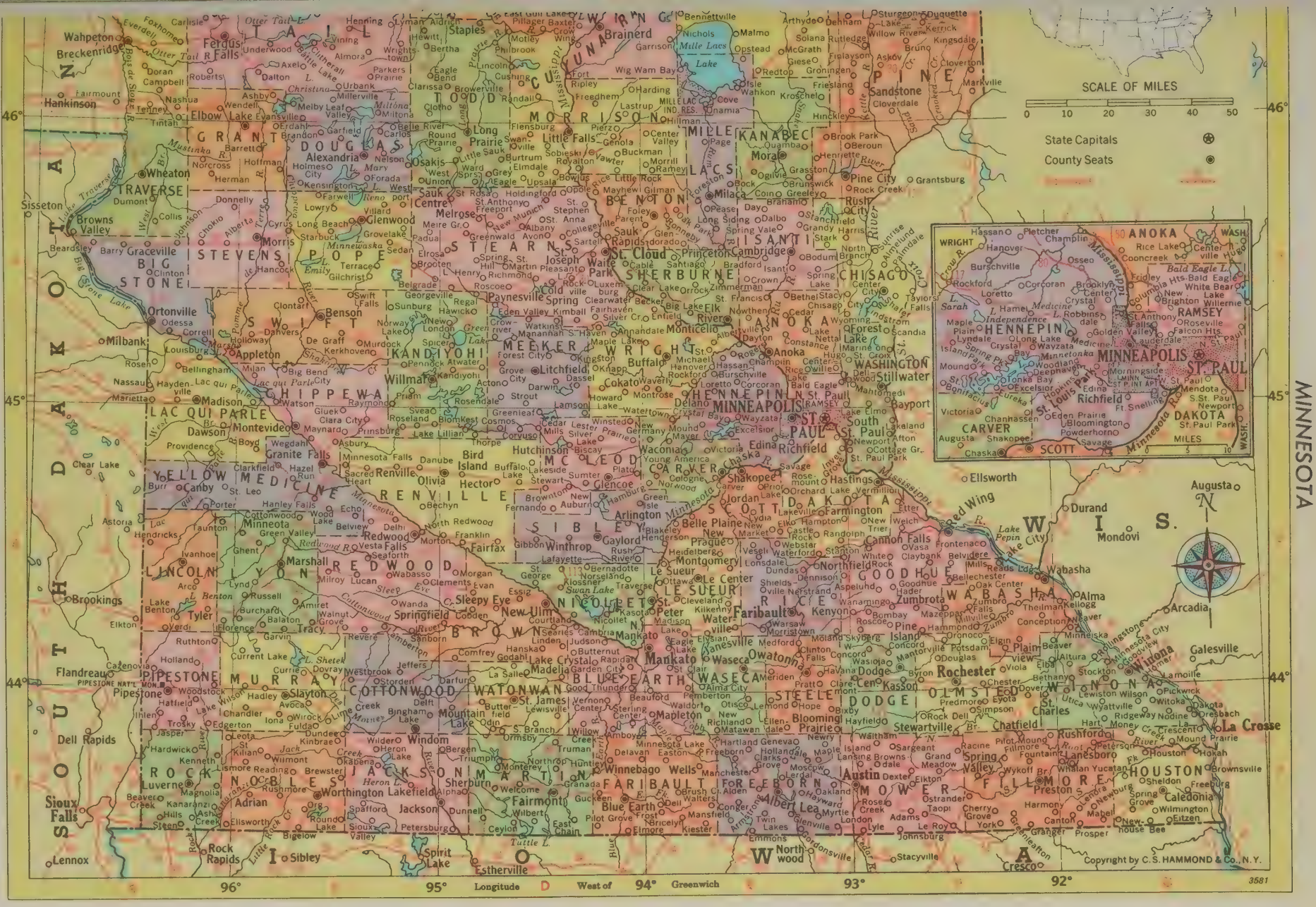
Boyd (C6) 496
Braham (E5) 697
Brainerd ◉(D4) 12,637
Brandon (C5) 319
Breckenridge ◉ (B4) 3,623
Brewster (C7) 478
Bricelyn (E7) 639
Brook Park (F5) 148
Brooklyn Center (G5) 4,284
Brooks (B3) 184
Brookston (F4) 180
Brooten (C5) 669
Browerville (D4) 735
Browns Valley (B5) 1,117
Brownsdale (F7) 493
Brownsville (G7) 330
Brownton (D6) 696
Bruno (F4) 193
Brunswick (E5) 100
Buckman (D5) 173
Buffalo ◉(E5) 1,914
Buffalo (riv.) (B4)
Buffalo Lake (D6) 724
Buhl (F3) 1,462
Burntside (lake) (F3)
Burtrum (D5) 194
Butterfield (D7) 592
Byron (F6) 385
Caledonia ◉(G7) 2,243
Callaway (C3) 193
Calumet (E3) 854
Cambridge ◉(E5) 2,978
Campbell (B4) 391
Canby (B6) 2,173
Cannon Falls (F6) 1,831
Canton (F7) 459
Canyon (F3) 115
Carlos (C5) 233
Carlton ◉(F4) 650
Carp (lake) (G2)
Carson Lake (E3) 700
Carver (E6) 548
Cass (lake) (D3)
Cass Lake (D3) 1,936
Castle Rock (E6) 100
Cedar Mills (D6) 99
Center City ◉(F5) 311
Centerville (E5) 209
Ceylon (D7) 618
Champlin (E5) 828
Chandler (C7) 331
Chanhassen (F6) 182
Chaska ◉(E6) 2,008
Chatfield (F7) 1,605
Cherry Grove (F7) 100
Chester (F6) 100
Chippewa (riv.) (C5)
Chisago City (E5) 703
Chisholm (E3) 6,861
Chokio (B5) 541
Christina (lake) (C4)
Clara City (C6) 1,106
Claremont (F6) 426
Clarissa (C4) 650
Clarkfield (C6) 1,012
Clarks Grove (E7) 254
Clear Lake (E5) 297
Clearbrook (C3) 539
Clearwater (D5) 224
Clements (D6) 239
Cleveland (E6) 325
Climax (B3) 271
Clinton (B5) 718
Clitherall (C4) 175
Clontarf (C5) 206
Cloquet (F4) 7,685
Cobden (D6) 118
Cohassett (E3) 484
Cokato (D5) 1,403
Cold Spring (D5) 1,488
Coleraine (E3) 1,321
Collegeville (D5) 480
Cologne (E6) 462
Columbia Heights (G5) 8,175
Comfrey (D6) 642
Comstock (B4) 139
Conception (F6) 300
Conger (E7) 161
Cook (F3) 482
Cooley (E3) 113
Coon Creek (G5) 275
Correll (B5) 130
Cosmos (D6) 382
Cottage Grove (F6) 143
Cottonwood (C6) 709
Cottonwood (riv.) (C6)
Courtland (D6) 251
Cromwell (F4) 197
Crooked (lake) (G2).
Crookston ◉(B3) 7,352
Crosby (D4) 2,777
Crow (riv.) (F5)
Crow Wing (riv.) (D4)

Crystal (G5) 5,713
Crystal Bay (E6) 250
Currie (C6) 551
Cushing (D4) 71
Cuyuna (E4) 112
Cuyuna (mt. range) (D4)
Cyrus (C5) 363
Dakota (G7) 300
Dalton (C4) 279
Danube (C6) 437
Danvers (C5) 162
Darfur (D6) 150
Darwin (D5) 273
Dassel (D5) 962
Dawson (B6) 1,834
Dayton (E5) 363
De Graff (C5) 270
Dead (lake) (C4)
Deephaven (F5) 1,823
Deer Creek (C4) 349
Deer River (E3) 1,033
Deerwood (E4) 572
Delano (E5) 1,386
Delavan (D7) 302
Delft (C7) 125
Delhi (C6) 152
Dellwood (F5) 245
Denham (F4) 96
Dennison (E6) 163
Dent (C4) 187
Des Moines (riv.) (C7)
Detroit Lakes ◉(C4) 5,787
Dexter (F7) 316
Dilworth (B4) 1,429
Dodge Center (F6) 1,151
Donaldson (B2) 128
Donnelly (B5) 396
Dora Lake (D3) 140
Doran (B4) 126
Douglas (F6) 102
Dover (F7) 263
Dovray (C6) 127
Downer (B4) 135
Dresbach (G7) 200
Duluth ◉(F4) 104,511
Dumont (B5) 223
Dunbar (D3) 76
Dundas (E6) 469
Dundee (C7) 179
Dunnell (D7) 242
Eagle Bend (C4) 691
Eagle Lake (E6) 310
East Chain (D7) 80
East Grand Forks (B3) 5,049
East Gull Lake (D4) 238
East Lake (E4) 65
East Swan (riv.) (F3)
Easton (E7) 379
Ebro (C3) 70
Echo (C6) 490
Eden Prairie (G6) 100
Eden Valley (D5) 792
Edgerton (B7) 961
Edina (E6) 9,744
Effie (E3) 202
Eitzen (G7) 151
Elba (F6) 147
Elbow Lake ◉(B4) 1,398
Elgin (F6) 438
Elizabeth (B4) 168
Elk River ◉(E5) 1,399
Elko (E6) 111
Elkton (F7) 141
Ellendale (E7) 476
Ellsworth (C7) 630
Elmdale (D5) 119
Elmer (F3) 216
Elmore (D7) 1,074
Elrosa (C5) 173
Ely (G3) 5,474
Elysian (E6) 402
Embarrass (F3) 450
Emily (E4) 200
Emmons (E7) 356
Erdahl (C5) 120
Erhard (B4) 145
Ericsburg (E2) 210
Erskine (B3) 608
Esko (F4) 300
Essig (D6) 88
Etter (F6) 100
Euclid (B3) 120
Evan (D6) 141
Evansville (C4) 478
Eveleth (F3) 5,872
Excelsior (E6) 1,763
Eyota (F7) 495
Fairfax (D6) 1,143
Fairhaven (D5) 200
Fairmont ◉(D7) 8,193
Falcon Heights (G5) 3,884
Faribault ◉(E6) 16,028
Farmington (E6) 1,916

Federal Dam (D3) 225
Felton (B3) 258
Fergus Falls ◉(B4) 12,917
Fertile (B3) 890
Finland (G3) 175
Finlayson (F4) 195
Fisher (B3) 302
Flensburg (D5) 281
Floodwood (E4) 667
Florence (B6) 137
Florenton (F3) 95
Foley ◉(D5) 1,089
Fond du Lac (F4) 500
Fond du Lac Ind. Res. (F4)
Forada (C5) 89
Forbes (F3) 125
Forest Center (G3) 100
Forest Lake (F5) 1,766
Foreston (E5) 301
Fort Ripley (D4) 88
Fort Snelling (G5) 1,096
Fosston (C3) 1,614
Fountain (F7) 312
Foxhome (B4) 217
Franklin (F3) 115
Franklin (D6) 546
Fraser (F3) 134
Frazee (C4) 1,021
Freeborn (E7) 300
Freeport (D5) 558
Fridley (G5) 3,796
Frontenac (F6) 151
Frost (D7) 326
Fulda (C7) 1,149
Garden City (D6) 273
Garfield (C5) 244
Garrison (E4) 150
Garvin (C6) 264
Gary (B3) 278
Gaylord ◉(D6) 1,229
Gemmell (D3) 150
Geneva (E7) 332
Gentilly (B3) 100
Georgetown (B3) 192
Ghent (C6) 336
Gibbon (D6) 830
Gilbert (F3) 2,247
Gilman (E5) 150
Glencoe ◉(D6) 2,801
Glenville (E7) 672
Glenwood ◉(C5) 2,666
Glyndon (B4) 411
Golden Valley (G5) 5,551
Gonvick (C3) 375
Good Thunder (D6) 476
Goodhue (F6) 489
Goodland (E3) 450
Goodridge (C2) 144
Goodview (G6) 777
Gordonsville (E7) 100
Graceville (B5) 962
Graff (D4) 125
Granada (D7) 403
Grand Marais ◉ (G2) 1,078
Grand Meadow (F7) 766
Grand Portage (G2) 150
Grand Portage Ind. Res. (G2)
Grand Rapids ◉(E3) 6,019
Grandy (E5) 175
Granger (F7) 158
Granite Falls ◉(C6) 2,511
Grasston (E5) 154
Grattan (D3) 100
Greaney (F3) 100
Greater Leech Lake Ind. Res. (D3)
Green (lake) (D5)
Green Isle (E6) 332
Green Valley (C6) 121
Greenbush (B2) 713
Greenwald (D5) 207
Grey Eagle (D5) 400
Grove City (D5) 481
Grygla (C2) 216
Guckeen (D7) 116
Gull (lake) (D4)
Gully (C3) 183
Gunflint (lake) (F1)
Hackensack (D4) 272
Hadley (C7) 139
Hallock ◉(A2) 1,552
Halma (B2) 177
Halstad (B3) 635
Hamburg (D6) 184
Hamel (F5) 200
Hammond (F6) 192
Hampton (E6) 275
Hancock (C5) 852
Hanley Falls (C6) 320
Hanover (E5) 228
Hanska (D6) 473
Harding (E4) 124
Hardwick (B7) 297
Harmony (F7) 1,022
Harris (F5) 569
Hartland (E7) 300

Hastings ◉(F6) 6,560
Hatfield (B7) 110
Hawley (B4) 1,196
Hayfield (F7) 805
Hayward (E7) 241
Hazel Run (C6) 129
Hector (D6) 1,196
Henderson (E6) 762
Hendricks (B6) 781
Hendrum (B3) 352
Henning (C4) 1,004
Herman (B5) 752
Heron Lake (C7) 837
Hewitt (C4) 312
Hibbing (F3) 16,276
Hill City (E4) 501
Hills (B7) 520
Hinckley (F4) 902
Hines (D3) 100
Hitterdal (B4) 262
Hoffman (C5) 575
Hokah (G7) 643
Holdingford (D5) 458
Holland (B6) 263
Hollandale (E7) 360
Holloway (C5) 264
Holmes City (C5) 116
Holt (B2) 172
Homer (G6) 200
Hope (E7) 148
Hopkins (G5) 7,595
Hopper (F3) 175
Houston (G7) 973
Hovland (G2) 300
Howard Lake (D5) 931
Hubbard (C4) 140
Hugo (E5) 440
Humboldt (A2) 143
Huntley (D7) 118
Hutchinson (D6) 4,690
Ihlen (B7) 135
Independence (lake) (F5)
Inger (D3) 100
International Falls ◉ (E2) 6,269
Inver Grove (E6) 667
Iona (C7) 355
Iron (F3) 128
Ironton (D4) 828
Isabella (riv.) (G3).
Isanti (E5) 422
Island Park (F5) 1,357
Isle (E4) 674
Itasca (lake) (C3)
Ivanhoe ◉(B6) 682
Jackson ◉(C7) 3,313
Jacobson (E4) 106
Janesville (E6) 1,287
Jasper (B7) 840
Jeffers (C6) 516
Jenkins (D4) 170
Jordan (E6) 1,494
Judson (D6) 153
Kabetogama (lake) (E2)
Kanaranzi (B7) 100
Kandiyohi (D5) 293
Karlstad (B2) 804
Kasota (D6) 600
Kasson (F6) 1,353
Keewatin (E3) 1,807
Kelliher (D3) 336
Kellogg (G6) 409
Kelly Lake (F3) 700
Kennedy (B2) 480
Kenneth (B7) 119
Kensington (C5) 354
Kent (B4) 178
Kenyon (E6) 1,651
Kerkhoven (C5) 664
Kettle (riv.) (F4)
Kettle River (E4) 223
Kiester (E7) 541
Kilkenny (E6) 174
Kimball (D5) 479
Kinbrae (C7) 85
Kingston (D5) 140
Kinney (F3) 336
Klossner (D6) 88
Knife River (G4) 375
La Crescent (G7) 1,229
La Croix (lake) (F2)
La Salle (D6) 144
Lac qui Parle (B5) 100
Lac qui Parle (lake) (C5)
Lafayette (D6) 438
Lake Benton (B6) 863
Lake Bronson (B2) 438
Lake City (F6) 3,457
Lake Crystal (D6) 1,430
Lake Elmo (F6) 386
Lake Fremont (Zimmerman) (E5) 169
Lake George (D3) 95
Lake Henry (D5) 97
Lake Hubert (D4) 125
Lake Lillian (C6) 358


RAILROADS
30 Canadian National
31 Canadian Pacific
42 Chicago & North Western
45 Chicago, Milwaukee, St. Paul & Pacific
50 Chicago, Rock Island & Pacific
66 Chicago, St. Paul, Minneapolis & Omaha
77 Duluth, South Shore & Atlantic
80 Great Northern
82 Green Bay & Western
113 Minneapolis & St. Louis
115 Minneapolis, Northfield & Southern
137 Northern Pacific
CANADA
NORTHEASTERN PART OF MINNESOTA
Same scale as main map
Most Northerly Point in U. S.
Lake of the Woods
Rainy River
Fort Frances
International Falls
Lake Superior
Mississippi River
Red River of the North
MINNESOTA


MINNESOTA
SCALE OF MILES
0 10 20 30 40 50
State Capitals
County Seats
ANOKA
HENNEPIN
RAMSEY
MINNEAPOLIS
ST. PAUL
CARVER
SCOTT
DAKOTA
WASH.
WRIGHT
SHERBURNE
CHISAGO
ISANTI
KANABEC
PINE
MORRISON
TODD
WADENA
CASS
CROW WING
AITKIN
BENTON
STEARNS
MILLE LACS
GRANT
DOUGLAS
POPE
STEVENS
TRAVERSE
BIG STONE
SWIFT
KANDIYOHI
MEEKER
WRIGHT
WASHINGTON
CHIPPEWA
LAC QUI PARLE
YELLOW MEDICINE
RENVILLE
MCLEOD
CARVER
SCOTT
DAKOTA
GOODHUE
WABASHA
LINCOLN
LYON
REDWOOD
SIBLEY
NICOLLET
LE SUEUR
RICE
STEELE
DODGE
OLMSTED
WINONA
PIPESTONE
MURRAY
COTTONWOOD
BLUE EARTH
WASECA
FREEBORN
MOWER
FILLMORE
HOUSTON
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
WATONWAN
LINCOLN
LYON
LAKE
LAKE OF THE WOODS
BELTRAMI
HUBBARD
CASS
CROW WING
AITKIN
KANABEC
PINE
CARLTON
Mississippi R.
Minnesota R.
St. Croix R.
Red River
Lake Superior
Lake Pepin
Lake Mille Lacs
Lake of the Woods
Leech Lake
Red Lake
Upper Red Lake
Lower Red Lake
Rainy Lake
Lake Winnibigoshish
Lake Vermilion
Lake Kabetogama
Lake Bemidji
Lake Itasca
Lake Traverse
Big Stone Lake
Lake Benton
Lake Shetek
Lake Winnebago
Lake Sarah
Lake Independence
Bald Eagle L.
White Bear Lake
Medicine L.
Minnetonka
Lake Elmo
Lake Minnetonka
Lake Calhoun
Lake Harriet
Lake Nokomis
Lake Como
Lake Phalen
Lake Johanna
Lake Owasso
Lake Gervais
Lake Josephine
Lake Owasso
Lake Valentine
Lake Wabasso
Lake Shakopee
Lake Minnetonka
Lake Waconia
Lake Minnewashta
Lake Lotawana
Lake Riley
Lake Susan
Lake Ann
Lake Lucy
Lake Virginia
Lake Bavaria

Lake of the Woods (lake) (D1) .....
Lake Park (B4)..... 689
Lake Shore (D4)..... 326
Lake Wilson (B7).... 434
Lakefield (C7).....1,651
Lakeville (E6)..... 628
Lakewood (G4)..... 917
Lamberton (C6).....1,208
Lancaster (B2)..... 536
Lanesboro (G7).....1,100
Lansing (F7)..... 240
Laporte (D3)..... 189
Larsmont (G4)..... 185
Lastrup (D4)..... 158
Lauderdale (G5).....1,033
Lawler (E4)..... 75
Le Center ◉(E6).....1,314
Le Roy (F7)..... 959
Le Sueur (E6).....2,713
Leech (lake) (D3)...
Lengby (C3)..... 206
Leonard (C3)..... 88
Leota (C7)..... 250
Lester Prairie (D6).. 663
Lewiston (G7)..... 786
Lewisville (D7)..... 362
Lida (lake) (C4).....
Lindstrom (F5)..... 729
Lismore (B7)..... 317
Litchfield ◉(D5).....4,608
Little Falls ◉(D5)....6,717
Little Sauk (D5)..... 100
Littlefork (E2)..... 671
Littlefork (riv.) (E2) .....
Loman (E2)..... 80
London (E7)..... 100
Long Beach (C5)..... 181
Long Lake (F5)..... 399
Long Prairie ◉(D5)2,443
Longville (D4)..... 116
Lonsdale (E6)..... 510
Loretto (F5)..... 179
Louisburg (B5)..... 93
Lower Red (lake) (C3) .....
Lowry (C5)..... 285
Lucan (C6)..... 246
Lutsen (F2)..... 75
Luverne ◉(B7).....3,650
Lydia (E6)..... 93
Lyle (F7)..... 609
Lynd (C6)..... 275
Mabel (G7)..... 788
Madelia (D6).....1,790
Madison ◉(B5).....2,303
Madison Lake (E6).. 357
Magnolia (B7)..... 260
Mahnomen ◉(C3)....1,464
Mahtomedi (F5).....1,375
Mahtowa (F4)..... 150
Makinen (F3)..... 255
Manchester (E7)..... 113
Mankato ◉(E6).....18,809
Mantorville ◉(F6).. 477
Maple (riv.) (E7)....
Maple Bay (B3)..... 110
Maple Island (E7).... 175
Maple Lake (D5).... 780
Maple Plain (F5).... 479
Mapleton (E7).....1,083
Marble (E3)..... 867
Margie (E2)..... 100
Marietta (B5)..... 380
Marine on Saint Croix (F5) 334
Markham (F3)..... 310
Markville (F4)..... 100
Marsh (lake) (B5)..
Marshall ◉(C6).....5,923
Mary (lake) (C5)....
Mayer (E6)..... 153
Maynard ◉(C6)..... 507
Mazeppa (F6)..... 523
McGrath (E4)..... 135
McGregor (E4)..... 322
McIntosh (C3)..... 881
McKinley (F3)..... 196
Meadowlands (F3).. 134
Medford (E6)..... 409
Medicine Lake (G5) 284
Meire Grove (C5).... 128
Melby (C4)..... 75
Melrose (D5).....2,106
Melrude (F3)..... 109
Menahga (C4)..... 849
Mendota (G5)..... 243
Mentor (B3)..... 321
Meriden (E6)..... 131
Merrifield (D4)..... 78
Middle River (B2).... 356
Milaca ◉(E5).....1,917
Milan (C5)..... 561
Mille Lac Ind. Res. (E4) .....
Mille Lacs (lake) (E4) .....
Millerville (C4)..... 173
Millville (F6)..... 168
Milroy (C6)..... 268
Minneapolis ◉ (E5) 521,718
Minneota (C6).....1,274
Minnesota (riv.) (E6) .....
Minnesota City (G6) 201
Minnesota Falls (C6) 150
Minnesota Lake (E7) 609
Minnetonka (lake) (G5) .....
Minnewaska (lake) (C5) .....
Misquah (hills) (F2)
Mississippi (riv.) (D4)
Mizpah (D3)..... 166
Monterey (D7)..... 315
Montevideo ◉(C6)..5,459
Montgomery (E6)....1,913
Monticello (E5).....1,231
Montrose (E5)..... 300
Moorhead ◉(B4)....14,870
Moose Lake (E4)....1,603
Mora ◉(E5).....2,018
Morgan (D6)..... 949
Morningside (G5)....1,699
Morris ◉(C5).....3,811
Morristown (E6)..... 533
Morton (C6)..... 794
Motley (D4)..... 435
Mound (E6).....2,061
Mountain Iron (F3)1,377
Mountain Lake (D7)1,733
Mud (lake) (C2).....
Murdock (C5)..... 393
Muskeg (bay) (C2).
Mustinka (riv.) (B5) .....
Nashua (B4)..... 181
Nashwauk (E3).....2,029
Nassau (B5)..... 205
Naytahwaush (C3).. 220
Nelson (C5)..... 160
Nerstrand (E6)..... 228
Nett Lake Ind. Res. (E2) .....
Nevis (D4)..... 332
New Auburn (D6).... 290
New Brighton (G5)..2,218
New Germany (E6).. 286
New London (C5).... 726
New Market (E6).... 193
New Munich (D5).... 277
New Prague (E6)....1,915
New Richland (E7).. 908
New Ulm ◉(D6).....9,348
New York Mills (C4) 977
Newfolden (B2)..... 367
Newport (F6).....1,672
Nicollet (D6)..... 493
Nielsville (B3)..... 189
Nisswa (D4)..... 578
Nopeming (F4)..... 474
Norcross (B5)..... 179
North Branch (F5).. 769
North Mankato (D6)4,788
N. Redwood (D6).... 215
N. St. Paul (E5).....4,248
Northfield (E6).....7,487
Northome (D3)..... 349
Northrop (D7)..... 157
Norwood (E6)..... 749
Odessa (B5)..... 283
Odin (D7)..... 208
Ogema (C3)..... 249
Ogilvie (E5)..... 362
Okabena (C7)..... 236
Oklee (C3)..... 494
Olivia ◉(C6).....2,012
Onamia (E4)..... 704
Orchard Lake (E6).. 150
Ormsby (D7)..... 190
Oronoco (F6)..... 200
Orr (F2)..... 309
Ortonville ◉(B5).....2,577
Osage (C4)..... 184
Osakis (C5).....1,488
Oslo (A2)..... 440
Osseo (G5).....1,167
Ostrander (F7)..... 191
Otter Tail (lake) (C4) .....
Otter Tail (riv.) (B4)
Ottertail (C4)..... 237
Outing (E4)..... 150
Owatonna ◉(E6)....10,191
Palisade (E4)..... 212
Palo (F3)..... 700
Park Rapids ◉(D4)..3,027
Parkers Prairie (C4) 900
Paynesville (D5).....1,503
Pease (E5)..... 179
Pelican (lake) (F2).
Pelican (riv.) (B4)...
Pelican Lakes (D4).. 154
Pelican Rapids (B4).1,676
Pemberton (E7)..... 152
Pennock (C5)..... 238
Pepin (lake) (F6)....
Pequot Lakes (D4).. 552
Perham (C4).....1,926
Perley (B3)..... 204
Petersburg (C7)..... 100
Peterson (G7)..... 318
Pickwick (G7)..... 122
Pierz (D5)..... 856
Pillager (D4)..... 362
Pine City ◉(F5).....1,937
Pine Island (F6).....1,298
Pine River (D4)..... 835
Pipestone ◉(B7).....5,269
Pipestone Nat'l Mon. (B6) .....
Plainview (F6).....1,524
Plato (D6)..... 263
Plummer (B3)..... 340
Pokegama (lake) (E3) .....
Pomme de Terre (riv.) (C5) .....
Ponemah (D2)..... 200
Ponsford (C4)..... 250
Porter (B6)..... 291
Preston ◉(F7).....1,399
Princeton (E5).....2,108
Prinsburg (C6)..... 390
Prior Lake (E6)..... 536
Proctor (F4).....2,693
Prosit (F4)..... 227
Racine (F7)..... 175
Rainy (lake) (E2)....
Rainy (riv.) (D2)....
Randall (D4)..... 425
Randolph (E6)..... 259
Ranier (E2)..... 227
Raymond (C5)..... 580
Reading (C7)..... 160
Reads Landing (F6) 201
Red (riv.) (A2).....
Red Lake (riv.) (B2)
Red Lake Falls ◉(B3) 1,733
Red Lake Ind. Res. (C2) .....
Red Wing ◉(F6)....10,645
Redby (D3)..... 210
Redlake (C3)..... 350
Redwood Falls ◉(C6) 3,813
Remer (E3)..... 412
Reno (lake) (C5)....
Renville (C6).....1,323
Revere (C6)..... 198
Rice (D5)..... 328
Rice (lake) (E4).....
Rice Lake (E5)..... 100
Richfield (E6).....17,502
Richmond (D5)..... 700
Richville (C4)..... 141
Riverton (D4)..... 148
Robbinsdale (G5)..11,289
Rochert (C4)..... 120
Rochester ◉(F6)....29,885
Rock (riv.) (B7).....
Rock Creek (F5)..... 100
Rockford (F5)..... 369
Rockville (D5)..... 288
Rogers (E5)..... 268
Rollingstone (G6).... 315
Roosevelt (C2)..... 228
Root (riv.) (G7).....
Roscoe (D5)..... 182
Rose Creek (F7)..... 314
Roseau ◉(C2).....2,231
Roseau (riv.) (B2)...
Rosemount (E6)..... 567
Roseville (G5).....6,437
Rothsay (B4)..... 537
Round Lake (C7).... 435
Royalton (D5)..... 500
Rum (riv.) (E5).....
Rush City (F5).....1,175
Rushford (G7).....1,270
Rushmore (C7)..... 368
Russell (C6)..... 508
Ruthton (B6)..... 534
Rutledge (F4)..... 163
Sabin (B4)..... 211
Sacred Heart (C6).... 745
Saganaga (lake) (H2)
Saint Anthony Falls (G5) 1,406
Saint Bonifacius (F5) 438
Saint Charles (F7)....1,548
Saint Clair (E6)..... 324
Saint Cloud ◉(D5)28,410
Saint Croix (riv.) (F5) .....
Saint Francis (E5).... 125
Saint Hilaire (B2).... 276
Saint James ◉(D7)..3,861
Saint Joseph (D5)....1,246
Saint Kilian (C7)..... 126
Saint Leo (C6)..... 128
Saint Louis (riv.) (F4) .....
Saint Louis Park (G5) 22,644
Saint Martin (D5).... 195
Saint Michael (E5).. 487
SAINT PAUL (E6) 311,349
Saint Paul Park (G6)2,438
Saint Peter ◉(E6)....7,754
Saint Stephen (D5).. 234
Saint Vincent (A2).. 272
Sanborn (C6)..... 613
Sand Hill (riv.) (B3)
Sandstone (F4).....1,097
Sargeant (F7)..... 121
Sartell (D5)..... 662
Sauk Centre (C5)....3,140
Sauk Rapids (D5)....3,410
Savage (E6)..... 389
Sawyer (F4)..... 183
Scandia (F5)..... 200
Scanlon (F4)..... 572
Schoolcraft (riv.) (D3) .....
Schroeder (G3)..... 200
Seaforth (C6)..... 136
Searles (D6)..... 102
Sebeka (C4)..... 802
Sedan (C5)..... 134
Shafer (F5)..... 127
Shakopee ◉(E6).....3,185
Shelly (B3)..... 329
Sherburn (D7).....1,221
Shetek (lake) (C6)..
Shevlin (C3)..... 242
Side Lake (E3)..... 120
Silver Creek (D5).... 104
Silver Lake (D6)..... 603
Sioux Valley (C7).... 200
Slayton ◉(C7).....1,887
Sleepy Eye (D6).....3,278
Snake (riv.) (E4).....
Sobieski (D5)..... 189
Solway (C3)..... 124
Soudan (F3).....1,190
South Branch (D7).. 698
South Haven (D5).... 305
South International Falls (E2).....1,840
South Saint Paul (F6) 15,909
Spicer (C5)..... 566
Spooner (D2)..... 420
Spring Grove (G7)..1,093
Spring Hill (D5)..... 91
Spring Park (F5)..... 500
Spring Valley (F7)..2,467
Springfield (C6).....2,574
Squaw Lake (D3).... 132
Stacy (E5)..... 150
Stanchfield (E5)..... 100
Staples (D4).....2,782
Star Lake (B4)..... 125
Starbuck (C5).....1,143
Steen (A2)..... 228
Stephen (A2)..... 877
Stewart (D6)..... 695
Stewartville (F7).....1,193
Stillwater ◉(F5).....7,674
Stockton (G6)..... 235
Storden (C6)..... 398
Strandquist (B2)..... 208
Strathcona (B2)..... 143
Sturgeon (riv.) (F3)
Sturgeon Lake (F4) 189
Sunburg (C5)..... 151
Superior (lake) (G3)
Swan (lake) (D6)....
Swanville (D5)..... 373
Swatara (E4)..... 100
Swift Falls (C5)..... 120
Taconite (E3)..... 322
Tamarac (riv.) (A2)
Tamarack (E4)..... 132
Taopi (F7)..... 118
Taunton (B6)..... 217
Taylors Falls (F5).... 520
Tenstrike (D3)..... 206
Theilman (F6)..... 95
Thief (lake) (C2)....
Thief River Falls ◉(B2) 6,926
Thomson (F4)..... 170
Tintah (B5)..... 235
Tofte (H3)..... 100
Toimi (G3)..... 100
Toivola (F3)..... 312
Tonka Bay (F5)..... 899
Tower (F3)..... 773
Tracy (C6).....3,020
Trail (C3)..... 123
Traverse (lake) (B5) .....
Triumph (D7)..... 561
Trommald (D4)..... 117
Trosky (B7)..... 140
Truman (D7).....1,106
Twin Lakes (E7)..... 124
Twin Valley (B3).... 899
Two (rivers) (A2)...
Two Harbors ◉(G3)4,400
Tyler (B6).....1,121
Ulen (B3)..... 525
Underwood (C4)..... 336
Upper Red (lake) (D2) .....
Upsala (D5)..... 366
Urbank (C4)..... 162
Utica (G7)..... 194
Vergas (C4)..... 301
Vermilion (lake) (F3) .....
Vermilion (mt. range) (F3) .....
Vermillion (F6)..... 112
Verndale (C4)..... 576
Vernon Center (D7) 344
Veseli (E6)..... 132
Vesta (C6)..... 340
Victoria (E6)..... 302
Viking (B2)..... 130
Villard (C5)..... 288
Vining (C4)..... 180
Virginia (F3).....12,486
Wabasha ◉(F6).....2,468
Wabasso (C6)..... 693
Wabatawangang (lake) (D3) .....
Waconia (E6).....1,569
Wadena ◉(C4).....3,958
Wahkon (E4)..... 202
Waite Park (D5).....1,639
Waldorf (E7)..... 266
Walker ◉(D3).....1,192
Walnut Grove (C6) 890
Walters (E7)..... 139
Waltham (F7)..... 212
Wanamingo (F6)..... 496
Wanda (C6)..... 178
Warba (E3)..... 125
Warren ◉(B2).....1,779
Warroad (C2).....1,276
Warsaw (E6)..... 150
Waseca ◉(E6).....4,927
Wasioja (F6)..... 150
Watertown (E6)..... 837
Waterville (E6).....1,627
Watkins (D5)..... 659
Watson (C5)..... 284
Waubun (C3)..... 426
Waverly (E5)..... 493
Wayzata (E6).....1,791
Weaver (G6)..... 105
Welcome (D7)..... 712
Wells (E7).....2,475
Wendell (B4)..... 284
West Concord (F6).. 770
West Saint Paul (G5) 7,955
West Swan (riv.) (F3) .....
West Union (C5)..... 100
Westbrook (C6).....1,017
Whalan (G7)..... 176
Wheaton ◉(B5).....1,948
White Bear Lake (G5) 3,646
White Earth (C3).... 800
White Earth Ind. Res. (C3) .....
Whiteface (riv.) (F3) .....
Whitefish (lake) (D4) .....
Wild Rice (lake) (F4) .....
Wild Rice (riv.) (B3)
Wilder (C7)..... 118
Wilkinson (D3)..... 200
Willernie (H5)..... 592
Williams (D2)..... 414
Willmar ◉(C5).....9,410
Willow River (F4).. 294
Wilmont (C7)..... 473
Windom ◉(C7).....3,165
Winger (B3)..... 283
Winnebago (D7).....2,127
Winnibigoshish (lake) (D3) .....
Winona ◉(G6).....25,031
Winsted (D6)..... 941
Winthrop (D6).....1,251
Winton (G3)..... 184
Wirt (E3)..... 138
Wolverton (B4)..... 198
Wood Lake (C6)..... 504
Woodstock (B7)..... 277
Worthington ◉ (C7) 7,923
Wrenshall (F4)..... 148
Wright (E4)..... 199
Wykoff (F7)..... 509
Wyoming (F5)..... 325
Young America (E6) 365
Zimmerman (E5)..... 169
Zumbro (riv.) (F6).
Zumbro Falls (F6).. 172
Zumbrota (F6).....1,686

◉County Seat

Ocean, and one southward by way of the Mississippi River to the Gulf of Mexico.

Climate.—Minnesota is subject to great and sudden fluctuations of weather. The mean annual temperature is 44°F. The winters are often severe, marked at times and in places by extremes far below zero. The summers are characterized by rapid changes and occasional intense heat waves. Temperatures in some counties may range from 35° below zero to 108° above. January is the coldest month, July the hottest.

The growing season is longest, 160 days, in the south central and southeastern sections; in the northern counties it is much shorter, in some places only 100 days, but there long hours of summer daylight tend to offset the short season. Rainfall varies from an average of 32 inches along the central and southeastern boundary to as little as 20 inches in the northwestern prairies. In most of the state the prevailing winds are from the northwest.

In the early decades of its history, Minnesota's hyperborean climate threatened to discourage settlement, but the enterprising residents made a virtue of the cold, and boldly advertised the therapeutic properties of their "pure and invigorating air." For many years Minnesota was the number-one health resort of the nation, vying successfully with Florida for the attention of sufferers from tuberculosis, malaria, and ague. In the 1930's and 1940's, Minnesotans were again making their severe winter an asset, cultivating its advantages for winter sports as an attraction for tourists.

Rivers and Lakes.—Minnesota is exceptionally well watered. Explorers and trappers found its network of rivers and lakes excellent highways for their canoes, and the early settlers stayed close to the same water highways until railroads came to break paths into the interior. The development of lumbering and flour milling would have been much delayed without the many watercourses to provide power for the mill wheels, and transportation from forest to sawmill for the logs. Later generations make equally good use of the state's waters for recreation in fishing, swimming, and canoeing.

Each of the larger rivers is fed by numerous good-sized tributaries: the Mississippi by the Crow Wing, Rum, Minnesota, St. Croix, Cannon, Zumbro, and Root; the Minnesota by the Blue Earth, Cottonwood, Redwood, Chippewa, Pomme de Terre, and Lac qui Parle; the Red by the Red Lake and Wild Rice; the Rainy by the Vermilion, Big Fork, and Little Fork; the St. Croix by the Little and the Snake. All these tributaries lie wholly within the state.

The exact number of Minnesota's lakes is undetermined, but there are at least a thousand more than the 10,000 of legend and slogan. They range in size from a few acres to the 440 square miles of Red Lake and the 200 square miles each of Leech and Mille Lacs. Perhaps the most famous is Lake Itasca, principal source of the Mississippi River. The best and longest known as a fashionable resort is storied Lake Minnetonka near the Twin Cities. Within the city limits of St. Paul and Minneapolis are 13 lakes of notable size and excellent beaches.

Political Divisions.—*Cities.*—Minnesota is predominantly an agricultural state, and though its population in 1950 was 54.5 per cent urban, few of its cities are large. Only three cities have populations of over 100,000; three others of over 25,000; and 17 others of over 10,000.

The cities of St. Paul and Minneapolis, with Anoka, Dakota, Hennepin, and Ramsey counties, make up Minnesota's most important metropolitan area, which in 1950 had an estimated population of 1,107,366. The intense rivalry of early years between these twin cities on the Mississippi declined as the two grew physically into one so completely that the visitor and often the resident cannot tell when he leaves the one and enters the other. The two remain distinct, however, in government, economic activities, and general characteristics. St. Paul, in addition to being the seat of the state government, has become predominantly a commercial and jobbing center, Minneapolis a financial, transportation, and manufacturing center. Together the two cities constitute the cultural as well as the economic capital of a vast upper midwest hinterland.

Duluth is their nearest rival, physically and economically. Founded on lumbering, its real growth came with the development of iron mining. Because of its strategic site at the head of the Great Lakes, it became a great shipping center, sending out from the docks in its lake harbor tons and tons of ore and grain, and receiving back heavy cargoes of coal and other bulky commodities. As a corollary of this activity, it has developed a considerable list of manufactures and become a distributing center for a wide area reaching westward into the Dakotas.

Several of the smaller cities also have special distinctions. For example, Rochester as the home of the Mayo Clinic and Foundation is a world famous medical center; South St. Paul and Austin are nationally known meat-packing centers; Cloquet and International Falls specialize in the making of paper and other wood products; Red Wing manufactures pottery from Minnesota clays; Brainerd makes a lucrative business of being the gateway to the "Paul Bunyan country" for tourists; Northfield is a college town, the seat of both St. Olaf College and Carleton College; St. Cloud is well known to American architects for the fine granite it quarries. On the whole, however, most Minnesota cities are "agricultural service stations," centers of trade for the farming areas immediately surrounding them. For population of cities and towns, see back of state map.

Counties.—Minnesota's 87 counties vary widely in population and size. Fifty-seven of them were organized before statehood, 21 more before 1879, and the remaining 9, all in the timbered areas of the far north, were added by executive proclamation thereafter.

County	County Seat	County	County Seat
Aitkin	Aitkin	Douglas	Alexandria
Anoka	Anoka	Faribault	Blue Earth
Becker	Detroit Lakes	Fillmore	Preston
Beltrami	Bemidji	Freeborn	Albert Lea
Benton	Foley	Goodhue	Red Wing
Big Stone	Ortonville	Grant	Elbow Lake
Blue Earth	Mankato	Hennepin	Minneapolis
Brown	New Ulm	Houston	Caledonia
Carlton	Carlton	Hubbard	Park Rapids
Carver	Chaska	Isanti	Cambridge
Cass	Walker	Itasca	Grand Rapids
Chippewa	Montevideo	Jackson	Jackson
Chisago	Center City	Kanabec	Mora
Clay	Moorhead	Kandiyohi	Willmar
Clearwater	Bagley	Kittson	Hallock
Cook	Grand Marais	Koochiching	International Falls
Cottonwood	Windom	Lac qui Parle	Madison
Crow Wing	Brainerd	Lake	Two Harbors
Dakota	Hastings	Lake of the Woods	Baudette
Dodge	Mantorville		

County	County Seat
Le Sueur	Le Center
Lincoln	Ivanhoe
Lyon	Marshall
McLeod	Glencoe
Mahnomen	Mahnomen
Marshall	Warren
Martin	Fairmont
Meeker	Litchfield
Mille Lacs	Milaca
Morrison	Little Falls
Mower	Austin
Murray	Slayton
Nicollet	St. Peter
Nobles	Worthington
Norman	Ada
Olmsted	Rochester
Otter Tail	Fergus Falls
Pennington	Thief River Falls
Pine	Pine City
Pipestone	Pipestone
Polk	Crookston
Pope	Glenwood
Ramsey	St. Paul
Red Lake	Red Lake Falls
Redwood	Redwood Falls
Renville	Olivia
Rice	Faribault
Rock	Luverne
Roseau	Roseau
St. Louis	Duluth
Scott	Shakopee
Sherburne	Elk River
Sibley	Gaylord
Stearns	St. Cloud
Steele	Owatonna
Stevens	Morris
Swift	Benson
Todd	Long Prairie
Traverse	Wheaton
Wabasha	Wabasha
Wadena	Wadena
Waseca	Waseca
Washington	Stillwater
Watonwan	St. James
Wilkin	Breckenridge
Winona	Winona
Wright	Buffalo
Yellow Medicine	Granite Falls

The People.—*Origins.*—Minnesota's population, even more than that of most American states, is a mixture of peoples, chiefly from Europe. Its percentage of foreign born to total population has been consistently higher than that for the United States as a whole.

The earliest inhabitants of the Minnesota country were, of course, Indians, of two tribes: the Sioux or Dakota, and the Chippewa or Ojibway. Some 15,000 descendants of these tribesmen still live on reservations in Minnesota. The scattered earliest settlers included French, English, Scotch, Swiss, and French Canadians. But when settlement began in earnest, the first wave was made up chiefly of native Americans moving westward. It was these who gave the state's institutions and folkways their characteristic stamp, for the overseas immigrants who followed did their best to discard their own language, costumes, and customs for the ways of the earlier Americans.

Needing more people to work in the logging camps and lumber mills and to clear and till the fertile land, the enterprising early settlers reached out to sell the idea of Minnesota, through personal agents and glowing campaign literature, to the oppressed, ambitious, and discontented of Europe. The first rush of immigration in response was made up principally of Germans, Irish, Norwegians, and Swedes. By 1890, there were 460,000 foreign born living in Minnesota, and, of these, all but 30,000 were Germans, Scandinavians, or immigrants from English-speaking countries. The Scandinavians alone made up 215,000 of the number. Nonetheless, Germany continued to lead all nations in the numbers sent to Minnesota until 1910; then Sweden took first place.

During the 1880's and 1890's the earlier trickle of Czechs, Slovaks, and Poles became a good-sized stream; now the iron mines as well as the lumber industry needed laborers. The Finns, however, soon became the largest group in this so-called new immigration, and by 1930 there were 60,000 of them in the state. Also, in smaller numbers, came Slovenes, Russians, Icelanders, Italians, and Greeks. The latest comers included Mexicans who came to work in the sugar beet fields and Japanese Americans relocated from the west coast during World War II. In 1940 there were 9,928 Negroes in Minnesota, 8,785 of whom lived in Minneapolis and St. Paul.

Population Trends.—Throughout the 19th century the growth of the state's population was phenomenally rapid. In the census of 1850, Minnesota Territory, much larger than the later state, reported 6,077 residents. In 1860, two years after Minnesota became a state, her people numbered 172,023. The greatest growth occurred between 1880 and 1890, and thereafter, though the population mounted with every census, the increases became progressively smaller. In 1940 the population was 2,792,300—a density of 34.9 inhabitants per square mile. But by that time the population growth had come almost to a halt. In fact, reliable estimates indicated a loss of 10.6 per cent between 1940 and 1945. Although this was undoubtedly due to the drain of manpower for World War II, all the evidence pointed to Minnesota's having reached a stabilized population.

Three trends had become especially evident: (1) The movement of persons within the state was from the farms to the cities. From 1900 to 1940, the rural population increased from 1,153,000 to 1,400,000—a gain of some 20 per cent. But during the same period the urban population grew from 598,000 to 1,390,000—a gain of more than 130 per cent. Much of this urban growth came from the movement of rural residents to the cities. (2) The smaller cities were growing more rapidly than the larger. From 1910 to 1940, the three cities of the first class increased 50 per cent, whereas in the same period the smaller urban centers almost doubled in population. (3) The age level of the population was rising. In 1860, 70 per cent of the people were less than 30 years of age; in 1940, only 51 per cent were under that age.

Famous Men and Women.—Many Minnesotans (by birth or residence) have achieved national distinction in their professions or other activities. Among those famous enough to be known outside their special fields are these:

Politics and government: Ignatius Donnelly (Philadelphia, Pa., 1831–1901), political crusader and philosopher; John Albert Johnson (St. Peter, 1861–1909), Floyd B. Olson (Minneapolis, 1891–1936), and Harold Edward Stassen (Twin Cities, 1907–), governors; Frank Billings Kellogg (Potsdam, N. Y., 1856–1937), secretary of state under President Coolidge. *Business and industry*: John Sargent Pillsbury (Sutton, N. H., 1828–1901), Charles Alfred Pillsbury (Warner, N. H., 1842–1899), Cadwallader Colden Washburn (Livermore, Me., 1818–1882), and John Crosby (Hampden, Me., 1829–1887) in flour milling; Frederick Weyerhaeuser (Germany, 1834–1914) in lumbering; James Jerome Hill (Rockwood, Can., 1838–1916) in railroad building, and Charles Augustus Lindbergh (Detroit, 1902–) in aviation. *The professions*: William J. Mayo (Le Sueur, Minn., 1861–1939) and Charles H. Mayo (Rochester, Minn., 1865–1939), surgeons; Lotus Delta Coffman (Salem, Ind., 1875–1938) and George Edgar Vincent (Rockford, Ill., 1864–1941), university presidents; Thorstein Bunde Veblen (Cato tp., Wis., 1857–1929), economist and philosopher. *Arts and letters*: Sinclair Lewis (Sauk Centre, 1885–), F. Scott Fitzgerald (St. Paul, 1896–1940), and Ole Edvart Rölvaag (Norway, 1876–1931), novelists; Cameron Booth (Erie, Pa., 1892–), Adolf Arthur Dehn (Waterville, Minn., 1895–), and Dewey Albinson (Minneapolis, 1898–), painters; Paul Manship (St. Paul, 1885–), sculptor; Cass Gilbert (Zanesville, Ohio, 1859–1934), ar-

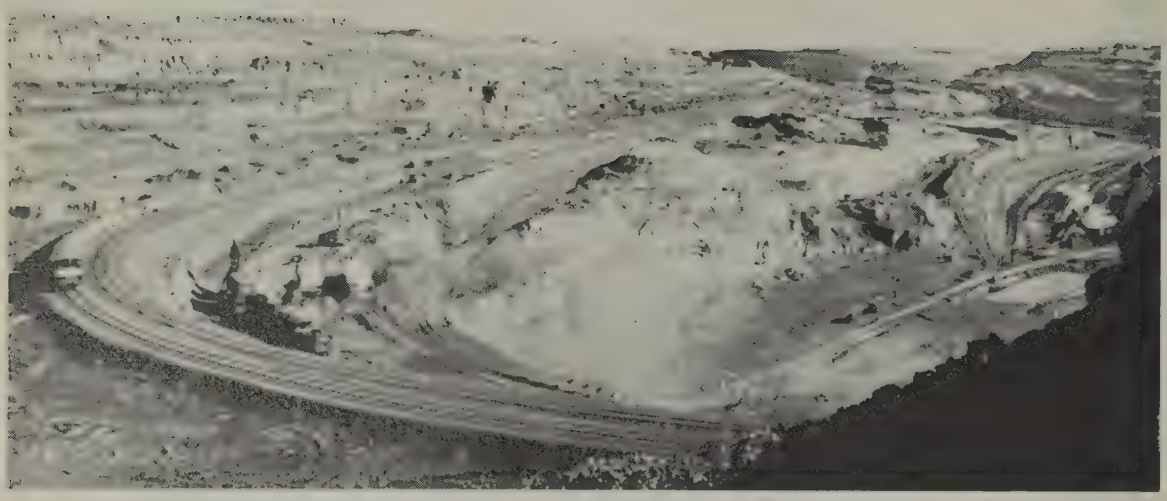
MINNESOTA

Courtesies: Top and bottom, St. Paul Association of Commerce; center, Duluth Chamber of Commerce

Top: The Minnesota capitol building on Capitol Heights in St. Paul.

Center: The canal entrance from Lake Superior to the Port of Duluth, and the downtown section of the city.

Bottom: The skyline of St. Paul's river front as seen from the Mississippi.



Mining ore at the Hull-Rust-Mahoning open-pit mine near Hibbing.

Courtesy Great Northern Railway

Butter, one of Minnesota's notable dairy products, being packaged in Minneapolis.

chitect; Wanda Gág (New Ulm, 1893–), writer and illustrator; Dimitri Mitropoulos (Athens, Greece, 1896–), symphony conductor; F. Melius Christiansen (Norway, 1871–), choral conductor and composer.

Natural Resources.—*Animals.*—Before the coming of the white man, buffalo and antelope roamed the western prairies in herds so large they were said to stretch "as far as the eye can see." Killed for their meat and skins, and deprived of their habitat for settlement, they have wholly disappeared from the state. The northern evergreen forests were in pioneer times full of elk, moose, and caribou. Now only a few hundred moose and from 30 to 40 head of caribou are left, and they have withdrawn into wilderness swamps far to the north. The white-tailed deer is the commonest of the big game remaining. Originally it lived in the southern hardwoods, but it now makes its home chiefly in the second-growth forests of the northern counties. The species is abundant, despite the thousands killed during the hunting season each year. Black bear are fairly numerous, and the beaver are multiplying rapidly under rigid protection, though they had been so extensively trapped as to be in danger of extinction. Even the prolific muskrat had to be protected for a time. Muskrat, marten, otter, and mink are trapped, and mink and red, silver, and black fox are bred on farms, for their pelts.

The shallow lakes and marshes of the northern counties make good feeding and breeding grounds for waterfowl, and 25 species of ducks and 4 of geese are found in Minnesota waters. There is also a fair abundance of partridge, sharp-tailed grouse, and the ring-necked pheasant. But the passenger pigeons, once so numerous that their flight darkened the sun like a cloud, have all been killed off.

Food fish of many kinds reward fishermen. The muskellunge is the largest of Minnesota fish, but more common are walleyed and northern pike, large- and small-mouth bass, brook and rainbow trout, crappies, perch, sunfish, bluegills, and whitefish. The supply is well maintained in spite of the enormous catch made every year. State hatcheries stock the lakes and streams with millions of fry and fingerlings yearly.

Plants.—The original vegetation was of three broad types: prairie grasses to the west and southwest, coniferous forest to the north and northeast, and a broad diagonal band of deciduous hardwoods in between. The prairies were treeless except along the rivers. There in the bottomlands still grow the willows and cottonwoods, and, on the higher banks, the box elder and sugar maple. Along the streams in the southern counties the thickets include wild plum and cherry trees festooned with grape vines and sheltering small fruits and other shrubs. Scattered over the prairies are wild strawberries, and in many forest openings blueberries and cranberries are plentiful enough to be economically valuable. In earliest spring the pasqueflower and the anemone appear on the prairies. Violets, columbines, bloodroots, geraniums, buffalo beans, wild roses, tiger and pond lilies, and sunflowers follow through the summer, and asters bloom until the first frost. Marshes shelter the fringed gentian, several kinds of ladyslipper, marigolds, and goldenrod in 36 varieties. Clovers, persistent and widespread, have fostered the development of dairying, and many varieties of grasses, especially alfalfa, have been introduced to supplement them for forage.

Forests.—The most important of Minnesota's plant resources was the timber that at one time covered more than two thirds of the state. In the hardwood zone the trees were principally sugar maple, basswood, white and slippery elm, red and green ash, butternut, and bur and white oak, with tamarack and black spruce in swamp openings. In the southeast black oak, black walnut, and river birch were added to the northern species. Little of this beautiful forest remains except along the rivers and in small farm woodlots. Its trees were cut to clear land for farming and its lovely undercover was grazed off or plowed under.

Much more valuable commercially were the great coniferous forests that covered the entire northern half of the state as far west as the Red River Valley. They accounted for most of Minnesota's 38 million acres of virgin timber. Including some hardwoods, the species that composed this wooded expanse were white, Norway, and jack pine, white and black spruce, tamarack, cedar, balsam, yellow and paper birch, aspen, balm of Gilead, green and black ash, basswood, elm, red and hard maple, ironwood, and pin cherry. The white and Norway pine, the species on which the lumber industry depended, occurred on the better soils in mixed stands that yielded from 20,000 to 60,000 board feet of lumber per acre.

Thanks to unrestricted logging and to devastating forest fires, only about half this original expanse remains forested, and in that half little is left of the virgin timber. The present forest consists of what foresters call fire species—jack pine, white birch, aspen, and pin cherry—because they return more quickly than others in a burned area. Only small and scattered remnants of timber of sawlog size remain. Much of the reproduction has not yet attained a merchantable stage, and what has is second growth of cordwood size.

Soil.—The prevailing soil is a black loam underlaid with clay. This soil is deep and rich in the southern part of the state and in the Red River Valley. It is somewhat shallower and sandier in the belt that skirts the pine woods, and quite sandy in the northeastern counties. The heavy soil produces all the varieties of grains and grasses, and on the sandier soils can be grown clovers and potatoes, vegetables and fruit. In the northern counties there are many large stretches of peat bog and muskeg swamp that are unfit for agriculture. About the time of World War I extensive tiling and ditching operations were undertaken to drain these areas and turn them into farms, but state officials soon had to give up the project because of its disastrous effects in lowering water levels, reducing wildlife, and increasing fire hazards. Much of the hopelessly rocky land of the northeastern counties is being reserved for reforestation and recreation.

Minerals.—Beginning in the 1880's, concentrated deposits of some of the richest iron ores on earth were located in three Minnesota ranges: the Vermilion range in northern St. Louis and Lake counties, the Mesabi range in St. Louis and Itasca counties, and the Cuyuna range in Aitkin, Crow Wing, and Morrison counties.

The deposits on the Vermilion range are hard ores, occurring in pockets or veins so complexly patterned that in spite of extensive exploration it is not certain all the pockets have been found.

They lie deep in the earth and can be mined only through vertical shafts and underground tunnels. The Mesabi ores are soft and lie near the surface in broad horizontal beds. To mine them it is necessary only to strip off the thin layer of glacial drift that covers them, then scoop out the ore with steam shovels and load it directly into waiting railroad cars. The Cuyuna ores are both hard and soft and contain manganese, an important element in steel making. They are mined by both the open-pit and underground shaft methods.

In 1947, it was estimated that at least a billion tons of high-grade ore remained to be mined in these three ranges, although a billion and a half tons had already been taken from them. The quantity of low-grade ores not merchantable without special treatment was estimated to exceed 30 billion tons.

Minnesota also has rich deposits of granite, limestone, sandstone, jasper, travertine, mica, and feldspar. Its deep beds of sand are used in making glass, its peats for insulation and packing materials, and its clay, sand, and gravel for tile and brick making, concrete work, and road building. Several of its clays are good for pottery manufacture. But the state has no deposits of precious metals, no coal, gas, or oil, and not enough waterpower for any considerable hydroelectric development. Its own peat beds and the lignite of North Dakota offer the only promise of fuel resources near at hand.

Conservation.—Minnesota's natural resources were so plentiful that the idea of any need to conserve them never entered the minds of the pioneer settlers. They accepted as fact the "legend of inexhaustibility" that underlay the ruthless logging of the pinelands, the mining of the soil's fertility, and the wanton slaughter of game and fish. The few men who foresaw an end to the days of plenty were unheeded voices until well toward the end of the 19th century.

Real efforts toward conservation began in the 1890's and a good deal was accomplished during the next three decades, though action was sporadic and haphazard. Not until the lgeislature in 1931 established a state department of conservation were systematic and organized measures undertaken for planning the wise and effective use of the state's natural resources. This department includes divisions for forestry, game and fish, lands and minerals, and water resources.

Some of the newer conservation problems the state has come to recognize are (1) guarding against soil erosion, (2) conserving the waters that tend always to flow out from Minnesota's natural divide, and (3) finding ways of making salable the vast quantities of low-grade ores in the iron ranges.

Parks, Forests, and Reservations.—*Parks.* An important part of the conservation movement was the setting up of a system of state parks and forests. The original purpose was to preserve trees and provide a cover for wildlife, but recreational values came quickly to the fore when the automobile made the reserved areas readily accessible. The first state park, Itasca, was set aside in 1891. By 1947, Minnesota had 57 such parks, "waysides," and "recreational reserves." Their combined areas totaled 83,372 acres, with a property replacement value of more than 6 million dollars.

Forests.—More than half of the state forests have been set aside since 1931, though the first one, Pillsbury State Forest, was established in 1899. In 1947, there were 32 of these forest reserves scattered through the northern two thirds of the state. Their combined area was 5,332,040 acres, of which some 2 million acres were state-owned. In addition there are two national reserves in Minnesota, the Chippewa National Forest and the Superior-Quetico National Forest, with a combined area of nearly 2 million acres.

Indian Reservations.—The two principal Indian reservations in Minnesota are at White Earth and Red Lake. The Red Lake Reservation is as nearly untouched by civilization as any area in the state, but White Earth is a reservation in little but name, most of the Indians having sold their land allottments, which the government mistakenly made transferable.

Other Points of Interest.—Both Bemidji and Brainerd are towns of unusual interest because of their association with the many stories of Paul Bunyan. Around Bemidji are the forests and lakes of the Paul Bunyan Playground, and on the shores of Lake Bemidji are the gigantic statues of Paul Bunyan and his blue ox, Babe. In both towns carnivals are held annually in his honor.

The Pipestone National Monument, established by Congress in 1937, in the southwestern corner of the state, is a 115.60-acre tract in which are situated the famous pipestone quarries. Indians have always considered this spot sacred and their peace pipes were made from the red pipestone or catlinite. Longfellow refers to this region in his poem *Hiawatha.*

A winter carnival is held annually in St. Paul at the end of January. For nine days there are parades, snow floats, and fireworks. A huge medieval ice palace is built in Como Park out of 4,500 tons or more of ice. The first winter carnival was held there in 1886.

Industries.—*Agriculture.*—Farming has been Minnesota's chief industry since 1850. From 1860 to 1880 wheat was virtually the sole farm crop throughout the state, and in the Red River valley the famous "bonanza" farms, thousands of acres each, became literally farm factories, using the new agricultural machinery and producing wheat in the millions of bushels. But one-crop farming exhausted the soil quickly, and the farmers, relying on a single crop for their income, were peculiarly at the mercy of nature and of fluctuations in the wheat market. Gradually, therefore, they were persuaded to diversify their product. By 1900 corn had pushed into first place, and in 1945 less than 10 per cent of the farm acreage was occupied by wheat.

Minnesota has become predominantly a livestock and dairying state. Much of the corn and grain it produces is fed to livestock and sold in the form of pork, beef, mutton, wool, poultry, and eggs. Great improvements in livestock breeding contributed to this development. Also, better forage crops and better breeds of milch cattle, added to improvements in mechanized equipment, in transportation and refrigeration, and in methods of packaging and marketing, made Minnesota in 1939 the leading state of the nation in butter production. It led the states also in the production of oats and clover seed; it ranked second in milk and milk powder, poultry and poultry products, and flax; it was fourth in corn, fifth in rye, and seventh in alfalfa and barley. It grows substantial crops also of potatoes, apples, strawberries, raspberries, plums, and vegetables of all kinds. From 1940 to 1945 its production of soy-

beans rose from 465,000 bushels to 3,741,000 bushels—a gain of 800 per cent.

In 1940, Minnesota's farm plant included 32,606,962 acres, broken into 197,351 individual farms, averaging 165.2 acres, with a recorded value of 1½ billion dollars and a gross annual income of 360 million dollars. These figures increased phenomenally in the next few years; for instance, from 1940 to 1947 farm income rose 133 per cent. But such increases were due to the demands of World War II and were probably not to be maintained.

The major problems of Minnesota agriculture at mid-century were three: (1) Soil erosion, especially on the level plains and prairies in the west and in the hilly terrain of the southeastern counties. Conservation experts were trying to teach farmers to use contour plowing and strip farming to reduce this hazard. (2) The farming of lands unsuited to cultivation. In 1940, 30,881 of Minnesota's farms had a sales and consumption total product averaging less than $400 per farm. The state was working to relocate the owners of these subsistence farms on more productive lands and to reforest the submarginal areas. (3) The increasing export of farm products. In 1910, one half the total product was used within the state, either for consumption or for manufacturing, but by 1940 only one third was so used. Since raw materials from Minnesota farms suffer the handicap of high transportation costs in national and international competition, state leaders were urging the development of more manufactures to process farm products within the state.

Flour Milling.—The early emphasis on wheat growing made flour milling a natural development, but there was an obstacle. The hard spring wheat of the area was of excellent quality, but because the bran coat of the grain was peculiarly brittle, the flour made from it was dark and speckled. Successful competition in the export market demanded a solution of this problem. Finally a device called the middlings purifier was developed to blow the bran specks from the flour, and this, together with the installation of rollers instead of the old millstones for grinding, sent Minnesota mills, most of them in Minneapolis, forging ahead of all competitors. By 1895, Minnesota flour was acknowledged to be the best made, flour was the state's leading manufactured product, and Minneapolis was the world's foremost milling center. The mills continued to increase their output to a peak of 29,389,889 barrels in 1916. Their advertising slogans, such as "Eventually, Why Not Now" of Gold Medal flour and the answering "Because Pillsbury's Best" became household words, as did the names of the many breakfast foods and other cereal items they added to their list of products.

But after 1916 the Minnesota mills gradually lost their pre-eminence, owing to a combination of several adverse factors: unfavorable freight rates, decline in the production of wheat, decline in the per capita consumption of wheat, and the rise of other milling centers nearer to eastern markets and to more productive sources of wheat. The 324 mills of 1900 declined to 81 in 1940, and the output decreased to 11,153,594 barrels. Nevertheless, flour milling still ranked fifth among Minnesota's manufacturing industries, and Minneapolis stood next to Buffalo and Kansas City as a national milling center.

Even in their heyday Minnesota's mills could not handle all the wheat as it poured from the fields at harvest time. Consequently, elevators for storage of the grain were built at every railroad station At first these were square wooden structures painted red, but they evolved into the massive clusters of towering cement pillars that are a distinctive feature of a Minnesota skyline and one of the state's acknowledged contributions to original and functional architecture in America.

Meat Packing.—With the diversification of agriculture and the rise of livestock raising, meat packing superseded flour milling as the state's biggest single manufacturing industry. When Minnesota farmers began exporting livestock, South St. Paul, where the lines of six railroads converged, became a watering place for animals being shipped to Chicago. In 1888, the railroads combined to build a union stockyard at the Minnesota town and a number of national packing firms promptly established branch plants nearby. From this beginning South St. Paul rose to be the third largest packing center in the nation. Austin is its nearest rival within the state.

Lumbering.—Logging and milling began in the St. Croix Valley in 1839 and a little later in the valleys of the Mississippi and the Rum. It then moved northward as the stands of uncut white and Norway pine receded. Methods of both logging and milling at first were crude and slow, depending on the brawn and skill of experienced lumbermen from Maine and Canada and on waterways for transportation and power. But with the coming of railroads, the extension of settlement, and the consequent expansion of the market, new machinery, techniques, and forms of power were introduced and lumbering became big business. At its height in Minnesota, about 1900, the industry produced 2½ billion board feet of lumber a year, and Minneapolis was the leading lumber milling center of the world. But the pine on which the industry was based was rapidly being exhausted, as it had been earlier in Maine, Michigan, and Wisconsin, and the industry declined rapidly. In the second decade of the century mill after mill closed its doors until only a few small ones far up on the northern border were left. By 1940, the annual cut had dwindled to 111 million feet, and Minnesota, far from supplying a major portion of the national demand for lumber, was importing the bulk of its own needs from the Pacific coast.

Nonetheless, Minnesota's forests remain one of its major resources. Science and technology have made the "weed trees" or "fire types" that grow from around the stumps and amid the ashes of departed pines into useful industrial materials. Among the products from this later forest are pulpwood as a raw material for the making of paper, rayon, and plastics, cedar poles and fence posts, mine timbers, piling, railroad ties, cooperage logs, match and clothespin bolts, lath and shingle stock, and, of course, firewood.

It was assumed during the golden age of the lumber industry that once the stumps had been cleared from the cutover lands, they would make productive farms. This assumption proved unfounded. During the 1930's almost 7 million acres of land in northeastern Minnesota became tax delinquent and, by 1940, some 5 million of these acres had been forfeited to the state, creating serious tax and relief problems for the counties in which they lay.

Iron Mining.—Since 1890, Minnesota's iron ore has been the backbone of the nation's heavy

industry, vitally important in peacetime and indispensable in time of war. By 1945, the mines had fed 1½ billion tons of ore into eastern smelting furnaces and steel mills. Before World War II, the annual output of the mines was between 40 and 50 million tons. During the war years production jumped to an annual average of 66 million tons, with peak shipments in 1942 of 75 million tons, almost 70 per cent of the national total.

Minnesota's advantage over other iron mining areas has lain in the richness of its deposits of ore that can be shipped directly from mine to furnace or mill. These are nearing depletion. Lower grade ores require some degree of beneficiation, that is, treatment by one or more methods —washing, crushing, screening, jigging, drying, sintering, and magnetic concentration—to remove impurities so as to achieve the 50 per cent or more of iron content demanded by the steel mills. By the end of the 1930's as much as 40 per cent of the output from Minnesota's mines had to be beneficiated before shipment. In 1945, it was estimated that at the prewar level of mining, the merchantable ores (direct-shipping ores and those requiring minor beneficiation) might last from 35 to 40 years longer, but that if the wartime rate of removal continued they could hardly last longer than 15 years. Against this eventuality a number of state agencies, as well as the mining companies themselves, were making heroic efforts to lower the costs of beneficiation and also to find ways of rendering the very low-grade taconite ores merchantable.

The iron mines are a vital element in the state's economy. They have given rise to a sizable subsidiary transportation industry involving ore railroads, lake freighters, and special docks at Duluth and Two Harbors. Within a relatively small geographical area, some 25 urban communities owe their existence to the mines and depend upon them for revenue. Exercising their right to tax the mining properties for public improvements, these range towns have rapidly and lavishly provided themselves with fine community centers, public schools, parks, and public libraries. In some of the towns the mining companies pay 99 per cent of all taxes levied.

State and local taxes paid by the mining interests—including an ad valorem tax, an occupation tax on the ore mined, and a tax on all royalties paid for ore that is privately owned—were in the middle 1940's amounting to 21 million dollars a year. In addition, royalties from state-owned mines to the amount of 58 million dollars had been paid into the permanent trust funds of the state by 1945.

Quarrying.—Since 1880 Minnesota has ranked high among the states in the production of building stones, especially granite. St. Cloud stands second only to Barre, Vermont, as a granite-producing area. Many of the 40-odd varieties of Minnesota stones are standard names and materials well-known to American architects. Kasota limestone, Winona travertine, and Kettle River sandstone, for instance, have been used in the construction of hotels, state capitols, and business buildings the country over—some for the buldings proper, others, because of their beauty in color or texture, as decorative trims.

Recreation.—The business of providing for tourists was classed in 1945 by the resources commission as one of the state's more promising industries. It was bringing into the state each year an estimated 1 million visitors, who spent for recreation and all their attendant needs an estimated 2 million dollars. Several agencies, including a state tourist bureau, were concerning themselves with the expansion of this profitable use of the state's recreational resources.

Geographical Position, an Economic Factor.—Industrially and commercially, Minnesota suffers a geographic handicap in its location a thousand miles from the Eastern seaboard and even more from the Pacific coast. Its goods must be shipped long distances to reach the nation's major markets and the high transportation costs are a serious disadvantage in competition with agriculture and industry nearer the big centers of population.

Historically the state's major market has extended westward. Minneapolis, St. Paul, and Duluth, all developed as distributing centers because they formed the gateway—the Twin Cities by river and railroad, Duluth via the Great Lakes —to vast regions of new settlement in western Minnesota, the Dakotas, and on into Montana. Homesteaders in these areas sent their wheat and livestock east to the Minnesota cities and in return bought their lumber, fuel, and manufactured goods from those cities. This flow of trade was furthered at first by the advancing railroads, but as these moved on across the continent and increased their network of feeder lines, they put the northern plains and prairies in touch with other centers and tended to lessen their dependence on Minnesota.

Nevertheless, the Twin Cities and Duluth remain the principal economic capitals of this northwestern empire, and its trade keeps Minnesota's wholesale sales substantially higher than its retail sales. Minneapolis and St. Paul are also the chief social and cultural center of the area. Conventions, ice and water carnivals, sports events, plays, symphony concerts, and grand opera seasons, all bring thousands of visitors to the two cities from hundreds of miles away. But the northern plains and prairies are, on the whole, sparsely peopled and their population tends to decline rather than expand. The promise of big and enduring markets lies elsewhere.

Transportation and Communications.—*Railroads.*—Minnesota has done what it could about its handicap of distance. Its transportation system is of high caliber. Twenty-seven railroads operate within the state, of which 13 are Class I roads and 3 (the Milwaukee, Great Northern, and Northern Pacific) are transcontinental lines. These railroads web the state so well that no community, except in the forest lands, is more than ten miles from a rail line. In 1948, ten fast streamliners a day were providing superior passenger service between the Twin Cities and Chicago, and trains to the west were equally good though not so many.

Water Transport.—Lake and river transportation, so vital in the early days, was again of increasing importance. The organization of the Federal Barge Lines in 1927 and the subsequent construction of a 9-foot channel with accompanying locks and dams in the upper Mississippi had restored the usefulness of the river for freight transportation during seven months each year. Commodities received in the Twin Cities via river barge increased from 158,047 tons in 1935 to 2,047,143 tons in 1943. Shipping via the Great Lakes, though possible for only 228 days a year on the average, seemed the state's main hope of reducing freight costs to the East, and business

leaders were working earnestly to promote federal government development of the proposed Great Lakes-St. Lawrence Waterway.

Airways.—Air transportation was becoming increasingly important in the 1940's and hopes were high that the Twin Cities might become a crossroads of international as well as national air traffic because of their strategic location on the northward, that is, the shortest air route to the Orient. In early 1948, Northwest and Capital airlines together were providing a dozen direct flights daily to and from New York City and Washington, D.C. Flights to Chicago were scheduled two or three hours apart. Northwest Airlines also had daily nonstop flights to the Pacific coast, three flights a week to Alaska, and three a week to Tokyo and Shanghai. Flights to Manila were scheduled as needed and the company was inaugurating service to Honolulu. Service between points within the Mississippi Valley was provided also by Mid-Continent Airlines. This air traffic centered in Wold-Chamberlain Field in the Twin Cities, but there were commercial airports also in several of the smaller cities. Though passenger service was paramount, air express was increasing. The freight carried by Northwest Airlines rose from 36 million pounds in 1935 to more than a billion pounds in 1944.

Highways.—The backbone of transportation within the state was (1948) its excellent system of highways. Of the 126,000 miles of road, some 15,000 were paved and improved state highways; the remainder were county roads, but the bulk of them were graveled or otherwise well surfaced. Thousands of trucks and buses conveyed freight and passengers along these roads. Minnesota was the birthplace of nationwide bus service. In 1914 a miner in Hibbing forsook his drills to start a jitney bus service between the town and the mine. Four years later he had organized a company, moved his headquarters to Duluth, and was running a fleet of 18 buses in northern Minnesota. From this beginning, by expansion, imitation, and merger grew the continnetal system of the Greyhound lines.

Radio.—In communications, besides good telephone and telegraph service and adequate newspaper coverage throughout the state, Minnesota had 21 radio stations in operation in 1947. Of the seven in the Twin Cities, two were 50,000-watt stations, two were offering FM broadcasts, and one had begun television. Each of the national networks was represented by one or more Minnesota stations.

Economic and Financial Factors.—*Labor Relations.*—Until well into the 20th century, the supply of labor in Minnesota usually exceeded the demand. Thousands of migrant workers, pouring into the state every spring and fall looking for work, principally in the lumber camps and the sawmills, made Minneapolis for many years the outstanding migratory labor center in the country. With this advantage—in spite of the organization of a Minnesota Federation of Labor in 1890 and the subsequent proliferation of labor unions—employers were able to maintain the prevalence of the open shop until after 1934, when the truck drivers of Minneapolis staged the most dramatic and effective of Minnesota's strikes.

Most of labor's gains in Minnesota, however, have been won through political action and the ballot box. The first law regulating working conditions in factories was passed in 1893; an effective child labor law followed in 1895; a workmen's compensation act was finally secured in 1913; and in 1921 an industrial commission was set up to exercise state supervision and protection for labor.

Minnesota's Labor Relations Act of 1939 has won widespread national attention. Under its provisions, workers or employers must notify the state labor conciliator ten days in advance of any projected strike or lockout. He attempts to settle the dispute. If he fails, and if the issue involves an industry in which work stoppage would be detrimental to the public interest, he may refer the matter to the governor, who may then name a three-man fact-finding commission to investigate the matter and report its findings and recommendations to him within 30 days. During this period the strike or lockout must be delayed. This "cooling off" period is considered the crux of the law. Neither the conciliator nor the fact-finding commission has judicial or police powers, and their recommendations are not binding on either party to the dispute.

Until the conditions of World War II tended to standardize wage levels in the United States, Minnesota's labor costs were well below the national average. In 1936, wage rates were still 36 per cent below those paid by eastern manufacturers, but by 1945 they were only 7 per cent below, and Minnesota industry was losing an important advantage in competition for national markets.

Cooperatives.—Minnesota has long been a leader among the states in the strength and scope of its cooperative movement—partly perhaps because its Danish and Finnish settlers were schooled in cooperative principles and methods in Europe, and partly because sound management policies are enforced by state laws enacted to protect and encourage cooperatives.

Though the major cooperative associations are rural in membership and deal in agricultural products, the thousands of cooperatives, large and small, in operation in the state cover marketing, processing, and consumption in many fields—grain marketing, butter production, milk and oil distribution, wholesaling for small independent storekeepers, fire insurance, rural electrification, dry cleaning, book buying, and food buying, to name only a few. From 1935 to 1943, the volume of sales by Minnesota's marketing cooperatives rose from 123 million dollars to well over 336 million dollars.

Wealth and Income.—Per capita wealth in Minnesota, in relation to the national average, rose steadily to a peak in 1904, held fairly steady for 18 years, then took an abrupt slump. In 1904, the state's per capita wealth was 32 per cent above the national average. In 1922 it was still 22 per cent above, but by 1924 it had dropped to the national average. By 1932 it was 18 per cent below that average, and there it has tended to remain. This was interpreted by the Minnesota Resources Commission to mean that the state's relatively simple agrarian economy has put it at a disadvantage.

Banks and Banking.—Thanks largely to the high level of agricultural income, Minnesota bank deposits were at an all-time high in the late 1940's. A tabulation by the Federal Reserve Bank in early 1947 listed the accumulated savings in the state at $3,530,322,087. At least half this amount was held by individuals, providing a sizable backlog for investment.

As of June 30, 1948, there were 943 state

financial institutions. Of these, 504 were state commercial, mutual savings, and private banks with total assets of $1,059,802,000 and total deposits of $992,636,000. The rest were loan companies, investment companies, credit unions, and the like.

To these were added, as of Dec. 31, 1948, 178 national banks operating within the state, with total assets of $2,121,184,000, and total deposits amounting to $1,979,662,000. Since 1914, Minneapolis has been the seat of the Ninth Federal Reserve District.

Government Finance.—From 1939 to 1943 the cost of carrying on the business of government in Minnesota was reduced from $220,500,000 to $198,000,000. Administration of the state government accounted for a relatively small part of these sums; most of the money was expended by 10,409 units of local government: counties, cities, villages, townships, and school districts. It was generally recognized that these local units were too many for efficient and economical operation, and there was considerable public support for the consolidation of townships and school districts and even, in some functions, of counties.

As of June 30, 1948, the state treasurer reported a total of $201,864,362 in the permanent trust funds and other invested funds of the state; a cash balance in the general revenue fund of $28,603,497; and a total cash balance in all funds of $103,274,570. At the same time the indebtedness of the state totaled $58,816,083.

Taxation.—In 1941, before the needs of World War II created an abnormal situation, Minnesota ranked twenty-first among the states with its per capita collection of $68.64 in state and local taxes. The major sources of tax income were: property tax, iron ore, motor fuel, alcoholic beverages, motor vehicle licenses, income, and miscellaneous small taxes. There is no sales or poll tax.

Government.—*State.*—Among the distinctive features of government in Minnesota are the School Lands Law (see *Education*); the Labor Relations Act (see *Economic and Financial Factors—Labor Relations*); a compulsory primary election law; the election of all state officials outside the executive branch on a nonpartisan basis, that is, without party designation; and a railroad and warehouse commission of three members elected by the people for six-year terms and charged with regulation in the general interest of rates and practices in a number of public services and utilities.

Executive.—The chief executive officers of the state are governor, lieutenant governor, secretary of state, attorney general, state treasurer, and state auditor. The governor is elected for a two-year term at a salary of $12,000 a year.

GOVERNORS

TERRITORIAL

Alexander Ramsey		1849–1853
Willis A. Gorman		1853–1857
Samuel Medary		1857–1858

STATE

Henry H. Sibley	Democrat	1858–1860
Alexander Ramsey	Republican	1860–1864
Stephen Miller	"	1864–1866
William R. Marshall	"	1866–1870
Horace Austin	"	1870–1874
Cushman K. Davis	"	1874–1876
John S. Pillsbury	"	1876–1882
Lucius F. Hubbard	"	1882–1887
Andrew R. McGill	"	1887–1889
William R. Merriam	"	1889–1893
Knute Nelson	"	1893–1895
David M. Clough	"	1895–1899
John Lind	Democrat	1899–1901
Samuel R. Van Sant	Republican	1901–1905
John A. Johnson	Democrat	1905–1909
Adolph O. Eberhart	Republican	1909–1915
William S. Hammond	Democrat	1915
Joseph A. A. Burnquist	Republican	1915–1921
J. A. O. Preus	"	1921–1925
Theodore Christianson	"	1925–1931
Floyd B. Olson	Farmer-Labor	1931–1936
Hjalmar Petersen	"	1936–1937
Elmer A. Benson	"	1937–1939
Harold E. Stassen	Republican	1939–1943
Edward J. Thye	"	1943–1947
Luther W. Youngdahl	"	1947–1951
C. Elmer Anderson	"	1951–1955
Orville L. Freeman	Democrat-Farmer-Labor	1955–

By an act of 1939, the state executive department was reorganized to integrate in an orderly arrangement of departments and divisions, the functions formerly assigned to a variety of uncorrelated agencies. An outstanding feature was the establishment of a department of administration which was given control over all state records, property, budgets, purchases, and contracts. All departments and agencies, except the legislature, judiciary, and state university, were made subject to the department. This process of integration has been continued. For example, in 1953 the divisions of public institutions and social welfare were merged into a single department of public welfare.

Legislature.—The state legislature consists of a Senate of 67 members and a House of Representatives of 131 members. It meets biennially in odd-numbered years for 90 legislative days beginning on the first Monday in January. Senators are elected for four years, members of the House of Representatives for two years.

Suffrage.—All adults are entitled to vote who have been citizens of the United States for at least three months and have resided in the state for six months and in a precinct for thirty days.

Courts.—The state judiciary is composed of a supreme court with a chief justice and six associate justices; one or more district courts in each judicial district; one probate court in each county; and a varying number of municipal courts and justices of the peace. All these judicial officers are elected by the voters, those in the supreme and district courts for six-year terms.

Local Government.—Minnesota's counties are governed by boards of five elected commissioners each, except St. Louis County, which has seven commissioners, and Ramsey County, which has six. Other elected county officers include an auditor, treasurer, register of deeds, sheriff, attorney, surveyor, coroner, clerk of court, and superintendent of schools.

Of the 96 communities classed as cities, 74 operate under home rule charters, giving Minnesota first place among the states in the number of its cities having home rule. They constitute almost 25 per cent of all cities in the United States having such independence. Five cities have adopted the city-manager form of government, sixteen operate under the commission form, and the remainder, including Minneapolis, still function with a mayor and city council.

Public Health.—Minnesota was one of the first states to establish a board of health, following only Massachusetts, California, and by one month, Virginia. This was in 1872. The naming of Dr. Charles N. Hewitt as professor of public health at the state university in that same year was the first such appointment in the United States.

The state board of health, consisting of nine

members appointed by the governor for three-year terms, is the official agency charged with performing the functions outlined in the state statute. It guides and supervises all local boards of health. Its policies are executed by a state department of public health.

Among the outstanding advances achieved by the public health agencies in Minnesota are these: (1) The lowering of infant and maternal death rates to an almost irreducible minimum. (2) A marked reduction in the mortality rates from the common communicable diseases, and from tuberculosis. (3) Reduction of the incidence of venereal disease to one of the lowest rates in the nation. (4) Development of an exceptionally efficient system for the registration of births and deaths. In a survey of the four months preceding the census of 1940, Minnesota was found to have 99.3 per cent of its births registered. Only one other state had a better record.

Among the newer developments that promise corresponding achievements are the establishment of a special division for cancer control and the inauguration of a program for the better sex education of children. Materials devised by the department staff in this latter program have been adopted for use by schools and public health agencies all over the country.

Minnesota's outstanding public health record has been made in spite of inadequate financial support. In 1915, Minnesota was fifteenth among the states with an expenditure of 3 cents per capita for public health. In 1940, the expenditure had risen to 11 cents per capita, but the rank among the states had fallen to thirty-second.

Social Welfare.—Minnesota has been relatively progressive in its assumption of public responsibility for the care of unfortunates. It was the first state in the Union to treat crippled children at public expense, and a successful campaign in 1949 for marked improvement in facilities for the mentally ill promises to put the state well to the fore in that respect.

Since the establishment of a board of corrections and charities in 1883, public institutions for the handicapped, the delinquent, and defectives have multiplied with the increase in population and with an expanding social conscience. In the reorganization of 1939 (see *Government*) earlier agencies charged with this phase of the state's activities were superseded by a state department of social security, comprising three divisions: (1) The division of social welfare supervises the expenditure of state funds for relief and for aid to the aged, to dependent children, and to the needy blind and other handicapped persons not in institutions. It is the legal guardian for dependent and neglected children. It operates the state tuberculosis sanatorium at Ah-gwah-ching and administers financial aid to the 15 county tuberculosis sanatoriums. It carries on a program of education and treatment for crippled children and a rehabilitation program for the visually handicapped. (2) The division of employment and security assists the unemployed in finding jobs and handles the payment of unemployment compensation. (3) The division of public institutions is charged with the administration of 18 state institutions: 7 hospitals for the mentally ill located at Anoka, Willmar, Hastings, Fergus Falls, Rochester, St. Peter, and Moose Lake; a colony for epileptics at Cambridge; a school for the feebleminded, a Braille and sight-saving school, and a school for the deaf at Faribault; a training school for boys at Red Wing; a home school for girls at Sauk Centre; the state reformatory for women at Shakopee; the state reformatory for men at St. Cloud; the state prison at Stillwater; the Gillette Hospital for Crippled Children in St. Paul; and a state school for the training of higher-grade feebleminded at Owatonna.

Education.—In Minnesota education is free for all young people from 5 to 21, and compulsory for all from 8 to 16. Responsibility for providing and maintaining the public schools lies with local district school boards elected by the people, but advice and assistance are provided by a state department of education headed by a commissioner elected by a five-man board of education appointed by the governor.

State support for the schools—amounting to about one third the total cost of maintenance—is derived from four sources: (1) An endowment fund consisting of income from the permanent school trust fund. When Congress made the customary land grant to the new Territory of Minnesota for the support of common schools, it generously set aside two sections in each township instead of the usual one. According to the School Lands Law all money derived from the sale or lease of these lands is held in a permanent trust fund, and some of them have turned out to be worth millions in timber and iron ore, so that by 1946 the permanent school fund exceeded 149 million dollars and was providing an annual income of almost 2 million dollars. (2) A current school fund derived from a general one mill tax. (3) Special state-aid funds biennially appropriated by the legislature. (4) The income tax fund. All state income tax is dedicated for school use, and the increased revenue from this source during the high-income years of World War II had by 1945 accumulated a surplus in this school fund in excess of 20 million dollars.

The endowment and current funds together constitute the general school fund, which is annually apportioned among the schools on the basis of attendance. The special aid fund is so distributed as to foster good standards and in some measure to equalize quality and opportunity among the several counties. From the income tax fund each district receives $10 a year for each child 6-16 years old living in the district, plus $10 for each youth 16-17 years old attending a public school.

But in spite of this state support, in the late 1940's a number of the state's school systems, notably those in Minneapolis and St. Paul, were in serious financial straits and found themselves unable to pay their teachers adequate salaries.

In 1946–1947 there were some 7,650 school districts in the state, maintaining 8,252 elementary and secondary schools with a total of 471,030 pupils and 20,194 teachers. It was generally recognized that there were too many small districts, some with as few as five pupils, and the movement for consolidation to reduce costs and improve quality was progressing, though slowly.

Higher education at public expense is provided by 11 junior colleges maintained by local school boards, 5 state teachers colleges, and the state university. The teachers colleges are located at Bemidji, Mankato, Moorhead, St. Cloud, and Winona.

The University of Minnesota (q.v.), chartered by the territorial legislature in 1851, is governed by a board of 12 regents elected for six-year terms by the state legislature. It has become one

of the three largest universities in the country. Although since the establishment of the Mayo Foundation in 1915, the university has offered part of its graduate medical education in Rochester, its work in general has been centered on the main campus in Minneapolis and the agricultural campus in St. Paul, the two being joined by special streetcar service. (Minnesota's federal land-grant college, set up under the Morrill Act of 1862, was made a college of agriculture, forestry, and home economics within the state university instead of the separate institution it is in most states.) A step toward decentralization, however, was taken in 1947, when the state teachers college at Duluth was reorganized as an outstate branch of the university.

There are also fourteen private colleges in the state, as follows:

College	Location
Augsburg College	Minneapolis
Carleton College	Northfield
College of St. Benedict	St. Joseph
College of St. Catherine	St. Paul
College of St. Scholastica	Duluth
College of St. Teresa	Winona
College of St. Thomas	St. Paul
Concordia College	Moorhead
Gustavus Adolphus College	St. Peter
Hamline University	St. Paul
Macalester College	St. Paul
St. John's University	Collegeville
St. Mary's College	Winona
St. Olaf College	Northfield

Libraries.—Minnesota is unusually well provided with libraries—public, college, and institutional—many with special collections of unusual importance. One of them is the James Jerome Hill Reference Library in St. Paul. In addition to its general list of books, the personal library of James J. Hill is housed there with its fine collection of Americana, containing data on western travels and American Indians. See also LIBRARIES—*United States* (Endowed Reference Libraries.)

The chemistry library of the University of Minnesota is exceptionally complete. It has a file of the *Annales de Chimie* dating back to its foundation in 1789, as well as numerous books and treatises on chemistry published as early as 1673. The law library of the university is also outstanding. It contains a large number of 15th and 16th century English law books and also many books of American statute law covering the colonial period and from 1800 to date. Its collection of laws of Indian tribes is one of the best in the United States. The Mayo Clinic Library in Rochester has many interesting old medical works.

HISTORY

Exploration.—The first white men to enter the Minnesota country were adventurous sons of New France seeking a route to the Pacific and on to Cathay. Pushing westward from their settlements on the lower St. Lawrence, they discovered the Great Lakes one after another, and then, lured on by Indian tales of a great river "called the Mechasipi" and of a western sea "whose waters are not fit to drink," they followed the river routes from Lakes Michigan and Superior into the upper Mississippi Valley. Participating, directly or indirectly, in this saga of exploration were such figures of the French regime in American history as Robert Cavelier de La Salle, Samuel de Champlain, Jacques Marquette and Louis Jolliet, Jean Nicolet, Pierre Esprit Radisson and Médart, Chouart de Groseilliers, Father Louis Hennepin, Daniel Greysolon Dulhut (Duluth), and Pierre de La Vérendrye. They did not find the riches of the fabulous East they sought, but they did discover untold wealth in the beaver, muskrat, and other fur-bearing animals of the north country. So they established temporary and scattered forts, opened trade with the Indians, and claimed the great northern wilderness as a part of the French Empire in America.

This it remained for a century. But when France yielded to Great Britain in the Treaty of Paris, 1763, the Union Jack replaced the flag of France in the Minnesota country east of the Mississippi. The area west of the Mississippi came under the sovereignty of Spain, but in actuality British traders and trading companies were in control of the entire upper Mississippi Valley. They carried on the work of exploration begun by the French, though this was now a byproduct of the fur trade more than of the search for the Northwest Passage. With the successful conclusion of the American Revolution, Minnesota East passed into the possession of the United States. It was joined by Minnesota West as a part of the Louisiana Purchase. But in actual fact the British remained in control of the region and its trade until well after the War of 1812.

Settlement.—The earliest effective step toward American occupation of the Minnesota country was the building of Fort Snelling in 1819 at the junction of the Mississippi and Minnesota rivers. This fort served not only as a military center on the frontier, but even more as a base for further exploration of the wilderness, and as a nucleus for settlement. Actual settlement got really under way with the government's purchase from the Indians, in 1837, of the triangle of land between the St. Croix and Mississippi rivers. Once this land had been bought and opened to settlers, the pioneer lumbermen, farmers, artisans, townsite speculators, storekeepers, doctors, and teachers began to arrive.

During this early period of settlement the Minnesota country was in succession a part of Michigan, Iowa, and Wisconsin territories—because as a state was formed from each of these, the excluded portion of the old territory was added to another political unit. Finally, in 1849, settlement had progressed far enough for Congress to authorize the organization of Minnesota Territory. And when, two years later, the federal government took over from the Indians the bulk of territorial lands west of the Mississippi, the influx of settlers, both from older communities to the east and from Europe, began in earnest. Within a decade the population of the new territory jumped from some 6,000 to more than 172,000. Towns sprang up, some actually and some on paper only, stagecoach lines began operation, railroads were chartered, hotels, churches, and schools were built, newspapers appeared. By 1858, Minnesota was organized and peopled enough to be admitted to the Union as the thirty-second state.

Its first years of statehood were marked by participation in the Civil War and, even more in the memories of Minnesotans, by the Sioux outbreak of 1862 within its own borders. This Indian uprising, one of the worst in American history, resulted in the complete and final expulsion of all the Sioux from Minnesota.

Maturity.—Minnesota remained a pioneer community for some years in its western and northern reaches, but in its older areas it soon be-

gan the development from youth to maturity that has been the central fact of its history since the Civil War. Most of the important aspects of this development have been touched on in foregoing sections: the change from a predominantly rural society to one marked by urbanization and industrialization; the stabilizing of the population; the shift from exploitation to conservation of natural resources; the conversion from one-crop farming to a diversified agriculture; the rise of labor; the growth of cooperatives; the increasing assumption by the state of responsibility for the public welfare. To these should be added the gradual replacement of frontier preoccupation with the interests of the local community by a growing sense of oneness with the nation and, more recently, with the world.

Politics.—One obvious fact about Minnesota's political history is the sustained strength and dominance of the Republican Party—of which the list of the state's governors (see *Government*) provides representative evidence. Equally important, however, has been the persistence of political protest expressed in a succession of third-party movements. Through the challenge these have offered to the control of the Republicans, they have had more influence on governmental policies and legislative developments than their relatively few victories at the polls would indicate.

Minnesota has been a center of what historians call "the agrarian crusade," and until recent decades the farmers have been considerably more important than labor in the protest groups; organized labor was slower to resort to direct political action as a means of achieving its goals. Nonetheless labor has been represented to some degree in virtually all the phases of the protest movement: the Anti-Monopoly Party and Greenback Party of the 1870's, the Farmers' Alliance Party of the 1880's, the Populist Party of the 1890's, and the Nonpartisan League of the 1910's. But the full-fledged union of the two forces came only with the organization of the Farmer-Labor Party and its election of Henrik Shipstead and Magnus Johnson to Congress in 1922 and 1923. The Farmer-Labor Party achieved control of the state in the 1930's with the election of Floyd B. Olson as governor for three terms (1931–1936), and Elmer Benson for one term (1937–1939). Weakened by factional strife, it functioned in the 1940's only in affiliation with the Democratic Party.

The Democrats have been for the most part an "also ran" group in Minnesota, but they have gained strength through the state's consistent vote for Franklin D. Roosevelt from 1932 to 1944 and for Harry Truman in 1948. (President Roosevelt was the first Democratic presidential candidate ever to win Minnesota's vote.) That Minnesota has so often in recent elections gone Democratic in its presidential vote and Republican for state officers is one evidence of a salient fact in its politics: its voters have become more than usually independent about following party lines. It is perhaps the persistence of a third-party group in some form, with all the shifting alliances and allegiances this has brought, that has made them so.

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MINNESOTA, a river, which rising in the northeastern part of South Dakota flows through Big Stone Lake on the boundary between Minnesota and South Dakota, then continues southeast in Minnesota a distance of about 350 miles, to where it receives the waters of the Blue Earth, when it turns and flows northeast to the Mississippi River. It enters the Mississippi just south of Minneapolis and opposite Saint Paul. The head waters of the Minnesota rising on the eastern slope and those of the Red River of the North rising on the northern slope of the Coteau des Prairiès—the Hill of the Prairies—of Dakota, are but a short distance apart. The Minnesota is navigable to a rapids about 40 miles from its mouth, and for small vessels nearly 300 miles above the rapids. Its whole length is about 475 miles.

MINNESOTA, University of. A coeducational state institution of higher learning on the east bank of the Mississippi River in Minneapolis, Minn., established by an act of the territorial legislature in 1851 and confirmed by the state constitution adopted in 1857. The present charter was adopted in 1868 and the first collegiate work was begun in the following year

under the direction of the first president, William Watts Folwell, a graduate of Hobart College, and a faculty of nine members. The government of the university is vested in a board of 12 regents appointed by the legislature for six-year terms, four members being elected at each biennial legislative session. The university comprises the following divisions: (1) The general college, offering a two-year curriculum in general education leading to the degree of associate in arts; (2) the college of science, literature and the arts, which offers liberal arts and pre-professional curricula; (3) the Institute of Technology, established in 1935, embracing the college of engineering, the school of architecture, the school of chemistry, and the school of mines and metallurgy; (4) the college of agriculture, forestry, home economics, and veterinary medicine offering (a) four-year courses in the fields of agriculture, forestry, and home economics, leading to the degree of bachelor of science or equivalent degree, (b) five-year curricula in forestry leading to the degree of master of forestry, and (c) a four-year curriculum in veterinary medicine, following the completion of two years preprofessional work, leading to the D.V.M. degree; (5) the law school offering courses leading to the degree of bachelor of science in law and the degree of bachelor of laws; (6) the college of medical sciences offering five principal courses: one for physicians, one for nurses, one for medical technologists, one for occupational and physical therapists, one to prepare personnel in all fields of public health, and in addition, in cooperation with the general extension division, a course in embalming and short courses for physicians; (7) the school of dentistry offering two principal courses—a four-year course for dentists and a two-year course for dental hygienists; (8) the college of pharmacy offering a four-year undergraduate course leading to the degree of bachelor of science in pharmacy; (9) the college of education offering many courses of study designed to train students for the different positions in public and private schools and in other educational agencies. The satisfactory completion of a four-year course leads to the bachelor of science degree and to a certificate for school work from the Minnesota State Department of Education. In many cases a five-year program leads to the master's degree; (10) the school of business administration offering a two-year course leading to the degree of bachelor of business administration; (11) the division of library instruction with a full year of professional training in librarianship for students of senior standing; (12) the university college offering to the student of mature age and adequate preparation the opportunity to draw upon any courses offered in the university in preparing a program of study suited to his special intellectual interests or professional aims. The satisfactory completion of an approved curriculum entitles the student to the degree of bachelor of arts or bachelor of science; (13) the graduate school, gathering into a single organization and uniting for the purpose of administration, all the activities of the university in all its schools and colleges insofar as they relate to advanced instruction offered for the second or higher degrees, namely, master of arts, master of science, master of business administration, electrical engineer, mechanical engineer, civil engineer, chemical engineer, and doctor of philosophy. Graduate work in medicine is maintained jointly in the medical school and the Mayo Foundation for Medical Education and Research; (14) the summer session, organized for two terms of six and five weeks respectively, and operated as a regular part of the university; (15) the general extension division, offering late afternoon and evening extension classes in the Twin Cities, Duluth, and in some other communities. Also administered by this division is KUOM, the University of Minnesota radio station, a 5,000-watt station using a new, modern transmitter; (16) the Duluth Branch, formerly a state teachers college, which became a part of the university July 1, 1947, offers a four-year course for training elementary teachers, a four-year liberal arts course, and pre-professional courses in agriculture, dentistry, engineering, forestry, journalism, medicine, pharmacy, social work, veterinary medicine, and law. The professional schools of law, dentistry, veterinary medicine, education, and business administration require two years of college preparation, and the medical school three years, prior to entrance.

MINNESOTA HISTORICAL SOCIETY. This society was organized in 1849 to collect and preserve materials relating to Minnesota history. It is supported mainly by legislative appropriation and by dues from its 1,500 members. Membership is open to all. The society has a library of 200,000 books, newspaper volumes, and pamphlets, which includes important collections in the fields of Minnesota history, general Americana, genealogy and biography, and the history of Scandinavians in America. In its manuscript division are noncurrent state and local archives and about 5,000 collections of personal papers of individuals, records of business firms, institutions, and organizations, copies of documents in institutions elsewhere, and maps. Its museum comprises a large collection of articles that visualize Minnesota's past, among them about 66,000 pictures. The society publishes a quarterly magazine, *Minnesota History*. It also publishes volumes of *Narratives and Documents,* of *Minnesota Historical Collections,* and of *Special Bulletins.*

MINNETONKA, Lake, mĭn-ĕ-tŏng'kà, lake, Minnesota, situated in Hennepin County, about 12 miles west of the center of Minneapolis. It is approximately 10 miles long and has a maximum width of 2.5 miles. Through Minnehaha Creek its waters are carried to the Mississippi. Minnetonka's natural beauty has been celebrated in such songs as *From the Land of the Sky-Blue Water,* and there are many resorts along its shores.

MINNOW, the common name of numerous fishes of the carp family (Cyprinidae, q.v.). In Europe it usually designates *Phoxinus phoxinus,* a three-inch freshwater fish used for bait. In North America there are more than 1,000 species, ranging in size from five-inch shiners of the Eastern genus *Notropis* to the three-foot squawfish of the Pacific coast. All species have pharyngeal teeth. The name is also applied to such cyprinodonts as the top minnow.

MINO DA FIESOLE, mē'nô dä fyâ'zô-lā, Italian sculptor: b. Poppi, Italy, c.1431; d. Florence, July 11, 1484. He is said to have been a pupil of Desiderio da Settignano, whom he re-

sembles in style, although his work is more uneven in quality. Except for sojourns in Rome in 1454 and 1463, and from about 1473 to 1480, he spent his life in Florence, and there and in nearby Fiesole are a number of his best works. Among them are the tomb of Bishop Leonardo Salutati and the altarpiece in Fiesole Cathedral; the tombs of Bernardo Giugni and Hugh, margrave of Tuscany, and the altarpiece in the Badia of Florence; a tabernacle in Sant' Ambrogio, and busts of Piero de' Medici, Giovanni de' Medici, and Rinaldo della Luna in the Bargello, Florence. In Rome he collaborated with Giovanni Dalmata on the tomb of Pope Paul II (of which fragments remain in the crypt of St. Peter's Basilica), and with Andrea Bregno on that of Cristoforo della Rovere in Santa Maria del Popolo. Among other Roman works are the monument of Niccolò Cardinal Forteguerri in Santa Cecilia in Trastevere and part of that of Pietro Cardinal Riario in Santi Apostoli. The National Gallery of Art in Washington, D.C., has several of his pieces, including *St. Catherine of Siena.*

MINOAN CIVILIZATION. See ARCHAEOLOGY—*Old World* (Neolithic and Later); CHRONOLOGY—*Minoan Chronology;* CRETE; GREECE—*2. Ancient History and Culture: To 330* A.D. (Prehistoric Greece [To c.1000 B.C.]).

MINOR, *in law,* is a person who has not reached the age (ordinarily 21 years) of legal capacity and of full civil rights. The term is often used synonymously with infant (q.v.).

In music, the term is applied to intervals and scales. The interval between one note and another of the diatonic scale is named according to the number of tones between them (both notes included), but some intervals—thirds, for example—have four semitones, and some only three. The former is a major interval or major third; the latter, a minor interval or minor third. (See also INTERVAL.) A minor scale differs from a major scale in that it has a minor third. When descending, it may also have a flatted seventh and sixth (melodic minor scale), or, both ascending and descending, a flatted sixth (harmonic minor scale).

MINOR FRIARS or **FRIARS MINOR.** See FRANCISCANS.

MINORCA, mĭ-nôr'kà (Span. MENORCA), island, Spain, situated in the Balearic Islands (q.v.), 23 miles northeast of Mallorca (Majorca). The second largest of the group, it has an area of 264 square miles (293 square miles with dependencies). Its greatest length, northeast to southeast, is 30 miles, and its average width is 10 miles. The coast is deeply indented and has several good harbors, of which the best is that of Mahón, the chief city. The surface is hilly in the north and center, rising to a height of 1,207 feet at El Toro. In the south the land is level and fertile, producing grain, olives, wine grapes, hemp, flax, sweet potatoes, and citrus fruit. Cattle, sheep, goats, and bees are raised, and iron is mined. Metalware, shoes, and textiles are manufactured. The island belonged successively to the Carthaginians, Romans, Vandals, Moors, and Spaniards. Occupied by the British in 1708, it was taken by the French in 1756, but was returned to British control in 1763. In 1783, Spain regained the island and held it thereafter except for a short resumption (1798–1802) of British rule. Pop. (1950) 42,478.

MINORITIES. The treaties and declarations made under the auspices of the League of Nations provided protection for "racial, religious or linguistic minorities," but in practice these words were found to be imperfectly descriptive of the groups whose protection was intended. Some sociologists have referred to minority groups of distinctive national and cultural characteristics, while others have given greater emphasis to the subjective element of national consciousness which might characterize minorities not distinguished from the rest of the population by obvious features of language, dress, habits, or physique. Without some easily recognizable characteristic associated by both the minority and the majority with stereotyped traits, a minority is likely to be rapidly absorbed and lose its identity. The term "minority" is not usually applied to groups when such absorption is not resisted by either the minority itself or the majority of the population.

At the World Congress of Sociology held in Zurich, Switzerland, in September 1950, Professor Louis Wirth of the University of Chicago emphasized the inferior status of minorities by defining them as "groups distinguished from the rest of society by racial or cultural characteristics [which have] become the objects of differential and inferior treatment, and [have] develop[ed] a consciousness of their inferior status" (*International Social Science Bulletin,* vol. 3, p. 410, Paris 1951). The United Nations Subcommission on Prevention of Discrimination and Protection of Minorities, however, excluded the ideas both of race and of inferiority from its definition, which included as minorities "only those non-dominant groups in a population which possess and wish to preserve stable ethnic, religious or linguistic traditions or characteristics markedly different from those of the rest of the population" (*Yearbook on Human Rights for 1950,* p. 490, New York 1952). The subcommission also insisted that the minority must include a number of persons sufficient by themselves to develop these characteristics, and that its members must be loyal to the country of which they may be nationals.

Origin and Character of Minorities.—The movements of peoples, ideologies, and political boundaries have meant that distinctive minorities have been common phenomena throughout history. This was true of the Samaritans in ancient Palestine, of Christians in the early Roman Empire, and of Jews and heretical sects like the Albigenses in medieval Christendom. This development has, however, been accentuated by the rise of nationalism in the post-Renaissance period and especially since the French Revolution. Under the influence of Giuseppe Mazzini and other advocates of the principle of nationality, the conception that political boundaries should conform to the national characteristics of the people became a political movement and stimulated governments and other groups to mold people by education, propaganda, and political and legal action to the national stereotype in the minds of the leaders of the movement. Minorities were groups that resisted such efforts at assimilation or that were so different from the majority that the latter did not wish to assimilate them. They remained distinctive groups in the nation and were consid-

ered an unfortunate derogation from the principle of nationality.

In the New World immigrant groups in general wished to be assimilated, and usually were after a generation or two. They consequently did not constitute minorities, although the Indians, Negroes, and Asians, as well as the French Canadians, manifest some characteristics of minorities.

In Buddhist, Confucian, and Hindu Asia the spirit of nationality developed much later, and the religious ideas in this area tended to minimize cultural differences as a foundation for political opposition, although the caste system in India may manifest the subordination of the Dravidian majority to the invading Aryan minority in the 2d millennium B.C. In this area converts to missionary religions such as Islam and Christianity also have some of the characteristics of minorities.

In Africa, European minorities have sought to dominate the natives as the Aryans did in ancient India, but such dominant groups are not usually considered minorities. In southern and eastern Africa the development of large Indian populations has presented a minority problem. In the Union of South Africa the white population, itself divided between English- and Afrikaans-speaking groups, attempts to treat both the Indian minority and the native African majority as minorities.

The Soviet Union, with some 150 distinct nationalities, has claimed to be a multinational state, according each group cultural autonomy, and those occupying large areas political autonomy. The dominant Great Russian nationality controlling the central organs of the monolithic Communist Party has, however, tended to develop minority problems among some of the smaller nationalities both within the USSR and in its surrounding satellite areas.

In western Europe, on the breakup of the medieval system, strong states governed by dynamic monarchs arose before the idea of nationalism had developed. By means of the printing press, education, and propaganda, their governments integrated populations into nations based largely on distinctiveness of language. The Scots and Welsh in Great Britain, the Bretons and Provençals in France, the Catalans, Andalusians, and Basques in Spain, and the Sicilians and Neapolitans in Italy can hardly be called minorities. Whether Italian- and French-speaking Swiss and Flemish-speaking Belgians are minorities is a more debatable question. In the Scandinavian countries there were few groups that could be called minorities. In the German Empire there were French, Polish, Danish, and Jewish minorities. The minority status of the last named, proceeding from religious and cultural distinctiveness, dates from the Middle Ages, and is typical of minorities in that the Jews usually wished to maintain their distinctiveness and were sporadically persecuted.

In eastern Europe and the Middle East the minority problem has been of major importance. Apart from Jews and gypsies who live in small groups throughout much of this area, Poles, Balts, Ukrainians (Ruthenians), Czechs, Slovaks, Yugoslavs, Hungarians, Greeks, Armenians, Syrians, and Arabs were minorities in the German, Russian, Austro-Hungarian, and Turkish empires before World War I. After the war most of these groups established independent countries in which they formed the majority, but it was impossible to devise boundaries which would exclude all minorities. In the 14 countries bound by minority treaties or declarations in 1930, which had a combined population of 130 million, minorities were estimated at about 30 million persons, of whom about half were divided equally among Jews, Germans, and Ruthenians, and the other half among some 22 other nationalities. The minorities therefore constituted about 23 per cent of the total population of these countries, ranging from over 30 per cent in Czechoslovakia and Poland to less than 10 per cent in Austria and Greece.

World War II, with its unparalleled persecutions, displacement of populations, and changes of boundaries, resulting in an extraordinary development of national, ideological, and political intolerance, greatly augmented the seriousness of the minority problem in eastern and central Europe, and extended the problem to Asia and Africa and even to the Americas.

The Minority Problem.—The rise of the principle of nationality and the practical propaganda of nationalism have created the general opinion that minorities are undesirable. Resistance to this principle by the Habsburg empire contributed to its demise after World War I. The theory of some liberals like the 1st Baron Acton, who opposed the principle of nationality and drew attention to the stimulating influence of many nationalities under a common government, has generally been discarded, although some advocates of this opinion can still be found in the United States and Great Britain, and it is the official doctrine of the Soviet Union. Advocates of this theory, at least in the West, believe that it can be realized only if education and propaganda are devoted to encouraging a spirit of tolerance and individual freedom, and if constitutional and legal guarantees support principles of human equality and freedom. Such methods, which had considerable influence in the 19th century in moderating the sentiment of nationalism, have declined in influence with the spread of international tensions and ideological conflicts characteristic of the 20th century.

Efforts to realize the principle of nationality, on the other hand, have led to demands for boundary changes which restore irredentas or which permit subject nationalities to become national states. Many such changes were effected after World War I, often as a result of plebiscites. Another possible solution is the conversion of minorities to the national way of life by means of education, propaganda, and legal pressure. Nearly all countries have at times indulged in such Germanization, Italianization, Americanization, or other assimilation movements. Treaties between Poland and Czechoslovakia in 1925 and between Germany and Poland in 1937 reciprocally forbade such denationalization efforts. Still another method of solving the problem is through an exchange of populations, such as those which took place between Greece and Bulgaria in 1919, between Greece and Turkey in 1923, and in the Tirol in 1939 by agreement between Benito Mussolini and Adolf Hitler after the German seizure of Austria.

The more barbarous method of expulsion or extermination of populations to assure national uniformity in the existing area of a country was initiated by Turkey in the case of the Armenians even before World War I, and was carried out on a larger scale by Nazi Germany, involving

the extermination of some 6 million members of Jewish and other minorities and the driving of many others into exile. Soviet Russia exterminated many Poles and deported or exterminated a considerable proportion of the Balts from Estonia, Latvia, and Lithuania. Poland and Czechoslovakia ejected millions of Germans from their territories after World War II, and the formation of the new state of Israel resulted in the migration of 800,000 to 900,000 Arab refugees. The separation of India and Pakistan displaced at least 6 million persons and cost the lives of hundreds of thousands.

These methods of realizing the principle of nationality, which was advanced in the early 19th century as a doctrine of liberalism, progressively increased intolerance and barbarity and raised a serious question as to the validity of the principle altogether.

Protection by the League of Nations.—The regime of minority protection as established under the League of Nations was a political rather than a legal device. It was based on a compromise between the principles of nationality and of liberalism which had been insisted upon by the great powers in treaty provisions intended to protect minorities in the Netherlands (1814), Greece (1830), and Turkey and the Balkans (1856, 1878). It was formally established through the acceptance of concrete obligations in treaties or declarations by the countries in which the problem was most serious, either as a condition of their recognition as independent countries or as a requirement for the establishment of peace in the case of countries which had been defeated in World War I. Such treaties were made after the war with Poland, Yugoslavia, Czechoslovakia, Rumania, and Greece, and minority protection provisions were included in the peace treaties with Austria, Bulgaria, Hungary, and Turkey. No such provisions were included in the peace treaty with Germany, but they were included in the conventions on Upper Silesia and Memel. Declarations accepting obligations similar to those in these treaties were made by Albania, Estonia, Latvia, Lithuania, and Iraq, and by Finland in regard to the Åland Islands. Each of these countries undertook to protect the lives, liberty, and religious freedom of all inhabitants without distinction of birth, nationality, language, race, or religion; to admit the inhabitants of newly acquired territories to its nationality with a right of option for another nationality within a year; to assure civil liberties and linguistic rights to all nationals; to assure special educational and cultural facilities to all nationals who constituted racial, religious, or linguistic minorities; and to accept the League of Nations guarantee of these provisions.

In order to maintain these provisions the League received petitions from individuals residing in the countries concerned. The petitions were screened by the Secretariat and, if found receivable, were considered by a committee of the League of Nations Council. The council would consider the situation indicated by the petition only if it was sponsored by a member of the League. This procedure indicated that the rights assured by the treaty were individual rather than group rights, and the encouragment of separatist movements among the minorities was thus avoided. It was assumed that the minorities were peaceful inhabitants of the country, or loyal citizens whose object was to remedy abuses and not to disrupt the existing political order. Out of respect for the domestic jurisdiction of the country concerned, petitions were not considered to initiate a legal procedure, but were regarded merely as information which might provide the basis on which some country interested in the minority could initiate a procedure in the council for enforcement of the obligation of the country bound by a minority treaty or declaration. The tendency of the League was conservative. The effort was to protect minority rights without preventing reasonable efforts of the country to assimilate the minorities if it desired to do so.

The concepts of civil liberties for minority individuals, of cultural self-determination for minority groups, and of national solidarity for the country concerned were difficult to reconcile. Minorities themselves usually felt that the protection given by the system was inadequate, often attributing this inadequacy to the political nature of the process and suggesting the establishment of an impartial minorities commission like the Permanent Mandates Commission under the League of Nations. This was not done, but in a few cases opinions were obtained from the Permanent Court of International Justice that were more satisfactory to the minorities than were the council's recommendations. A relatively small number of the petitions sent to the League by members of minorities were considered, and only a small number of those considered resulted in formal action by the council criticizing the country involved. The countries bound by minority agreements resented the discrimination between them and other countries with minorities that were not so bound, and urged that the minority principle either be made universal or be abandoned. They also believed that the system encouraged disloyalty, separatism, and irredentist movements and impeded assimilation.

The United Nations and Minorities.—The United Nations, established in 1945 when the world was slowly recovering from the shock of Hitler's massacres of Jews and other minorities, sought to meet the problem in a more general and more legalistic manner than had the League of Nations. The preamble of the United Nations Charter reaffirmed "faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations, large and small," and member nations expressed their determination "to practice tolerance and live together in peace with one another as good neighbors. . . ." These ideas were reasserted as purposes in Article 1, in which are included "respect for the principle of equal rights and self-determination of peoples" and "international cooperation . . . in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion." These purposes are implemented in various articles of the charter, most concretely in Article 56, by which members "pledge themselves to take joint and separate action in cooperation with the Organization for the achievement of the purposes set forth in Article 55," which include "promotion of universal respect for, and observance of, human rights and fundamental freedoms for all without distinction as to race, sex, language, or religion." Here, as under the League of Nations system, there is a compromise between the ideas of individual rights and group self-determination, but emphasis is placed on individual rights

to a greater degree than under the League of Nations system.

To implement these provisions of the charter the United Nations General Assembly approved without dissent a Universal Declaration of Human Rights in 1948, and the United Nations Human Rights Commission has drafted covenants of human rights which would define these rights as formal treaty obligations and provide procedures for their implementation. No such covenant has been approved by the General Assembly, and on April 6, 1953, United States Secretary of State John Foster Dulles, urged by Senate opposition to treaties which might encroach on domestic jurisdiction, said that it would not be the policy of the United States to approve such treaties. This attitude may have been influenced in part by the insistence of the General Assembly, under pressure by Soviet bloc and Asian states, that covenants should be drafted not only on civil liberties, but also on social and economic rights. Articles defining the right of self-determination of peoples were also drafted by the Human Rights Commission. Such provisions looking toward the welfare state and the self-government of subject nationalities and dependent peoples were more disturbing to the West than were provisions setting standards for the protection of civil liberties.

The Subcommission on Prevention of Discrimination and Protection of Minorities, set up under the Human Rights Commission, has studied various minority problems and prepared drafts on the subject for inclusion in the covenants on human rights. Many petitions on human rights were sent to the commission, and those dealing specifically with minority problems were transmitted to the subcommission, but neither body was given power to investigate or act on them.

Despite the many allusions to human rights in the charter and the great efforts of United Nations organs and private groups in the field, the United Nations has no procedure for dealing with minority problems. If the broad obligations of the charter binding members to respect human rights were observed, they would prevent discrimination against minorities, but no means of effective implementation has been devised. Discrimination against and persecution of minorities continue in many parts of the world. The proportion of the world's population suffering because of the failure of governments to respect and protect human and minority rights has probably never been greater in human history. Because the traditions of international law and the modern concept of national sovereignty have treated minority matters as within the domestic jurisdiction of a country, international action to remedy mistreatment is exceptionally difficult. Doubtless little can be done unless international tensions can be reduced, intense nationalism moderated, and a spirit of tolerance and respect for human dignity re-established. This is a problem involving education, political action, legislation, and adjudication, both national and international. Until the general atmosphere is changed, it is doubtful whether effective international procedures for protecting either human or minority rights will be widely accepted.

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MINORITY AND PROPORTIONAL REPRESENTATION. The election of a representative from a single-member district falls to the candidate receiving the highest vote. There is no representation for groups supporting other candidates, except insofar as the person elected gives voice to the wishes of such groups. Hence, direct representation is not afforded minority groups. To give them such representation, various European countries, with Norway taking the lead in its Constitution of 1814, have provided for systems of proportional representation, which necessarily operate in plural-member districts. If, for example, seven persons are to be elected to a city council, or from an election area to a larger legislative body, proportional representation among several parties may be accomplished by having three members come from one party with 42 per cent of the total vote, two from another party with about 30 per cent, and one each from two other parties sharing equally the remaining number of votes.

Many plans for voting have been devised, ranging all the way from a single vote per voter (regardless of the number of places to be filled) to a complicated preferential-and-transfer arrangement. If a single vote is allowed each voter, with election falling to the persons with the highest totals of votes, large factions may get no more representation than other groups winning seats. Through such methods as the limited vote, cumulative voting, and preferential voting, however, relative strength may be reflected.

Limited and Cumulative Voting.—Under the limited-vote method the voter casts his ballot for fewer than the number of persons to be elected—for example, he votes for five when nine are to be chosen. This plan permits at least one minority party to share seats with the leading party, preventing the winner-take-all result that characterizes some electoral systems.

In Illinois, under its 1870 constitution, cumulative voting for the House of Representatives is allowed for each of the state's 51 legislative districts. Three representatives are chosen to the legislature from each district, the voter casting all three votes for his favorite candidate, one and one-half votes for each of two candidates, or one vote for each of three different candidates. This plan has no counterpart in other states. The practical workings of the Illinois system have led the two major parties to offer two candidates each, thereby assuring two seats to the stronger party in a district and the third seat to the weaker party. But understandings in advance may lead simply to the running of two candidates by the admittedly stronger group and one candidate by the weaker, thus leaving no real choice to the voters unless there are strong competing minor parties or independent candidates.

List System of Proportional Representa-

tion.—Proportional representation operates according to the list system in several European countries. Under this system voters designate their party rather than the candidates of a party, and seats are assigned to the parties in proportion to their total vote. If, for example, 20 persons are to be elected and one party gets 55 per cent of the votes cast, it elects 11; the other party or parties with 45 per cent elect the remaining 9. Actually, more splintering than this takes place, and no party is likely to get more than 30 or 40 per cent of the vote. A party with 5 per cent of the total vote will receive 1 seat in 20. In countries not having the individual vote, party leaders name the sequence of candidates on the list, and those at the top are elected to the number of seats the party gets. A variation of the plan (as in France) allows the voter to indicate his preference as to candidates within each party, as well as to vote for a party list. Those candidates having the highest votes in a list are elected to the number of seats that the party is entitled to by proportional representation.

Under the Weimar Republic (1919–1933) the quota to elect a representative to the German Reichstag was 60,000. A party with 125,000 votes in a district elected two members and had a surplus of 5,000 votes. Surpluses in several districts could accumulate 60,000 votes and thus entitle the party to an additional member for the whole region. The Constitution of the Federal Republic of Germany (1949) provided for a single-member district system for three fifths of each state's representation in the Bundestag and proportional representation for election of the remaining two fifths. (In 1953 the Bundestag adopted a new combination election system.)

Americans often associate the weakness of the Weimar Republic and the Third and Fourth French republics with the multiparty systems of Germany and France, and therefore condemn proportional representation, which encourages the splintering of parties. Essential differences are revealed in the operation of two-party and multiparty systems. In a two-party system the factions of a party generally adjust their differences before an election campaign, but in a multiparty system adjustments are constantly taking place within Parliament after the election. The political pattern of France reflects a highly individualistic people.

Hare System of Proportional Representation.—Under this system, which is named for the English political reformer Thomas Hare and is used in some United States cities, the voter marks first, second, third, and other choices. Election is based on a quota determined by the following formula: The total vote cast is divided by the number of seats to be filled plus one, and one is added to the quotient. If 100,000 votes are cast and four seats are to be filled, divide by five to get a quotient of 20,000, then add one to get 20,001, which is the quota. A candidate receiving the quota of first-choice votes is elected. Surplus votes are counted for second choices, thus adding to the totals of other candidates. When other candidates reach the quota, their surpluses are distributed to later choices. The next calculation is to drop the lowest candidate and distribute his votes to the next choices marked. When the required number reach the quota, the counting terminates.

A party with a very popular candidate does not, under this system, waste votes beyond his quota, for the excess votes are distributed—probably to others in his party. Votes far down the scale are not wasted because the successive elimination of party members allows one man to be elected provided the total concentration reaches the quota. While this system provides for the single transferable preference vote, it must be distinguished from various forms of preferential voting, such as a plan of adding all second choices to all first choices or a plan for presidential preference primary voting.

In the United States the two most notable experiments with proportional representation have been in New York City (from 1936 to 1947, when it was abandoned largely because of distrust of Communist representation in the city council) and Cincinnati (adopted in 1924). About 20 other cities in the country have used proportional representation, but only half this number operated under it in 1955.

See also REPRESENTATION.

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MINOS, mī′nŏs, in Greek mythology, a king of Crete. The oldest traditions describe him as a wise lawgiver who became a judge of the underworld. He was the son of Zeus and Europa and, according to most accounts, the husband of Pasiphaë (other legends make this Minos a grandson of the same name), whose unnatural passion gave birth to the Minotaur (q.v.). He gained control of many lands through seapower and was overlord of Athens, from which—in revenge for the death of his son Androgeos at the city games—he exacted a periodic tribute of seven youths and seven maidens (the tribute was made yearly or, according to Plutarch, every ninth year). They were sacrificed to the Minotaur, who was kept in a labyrinth designed by Daedalus (q.v.). On the third occasion the great hero Theseus volunteered to join the group and, with the aid of Daedalus and Minos' daughter Ariadne, killed the Minotaur and led the others to safety. Minos himself is said to have been killed in Sicily while in pursuit of Daedalus. (See also LABYRINTH.) It is probable that Minos was a dynastic title borne by a number of rulers. The name is now applied to the Minoan civilization which flourished in Crete during the Bronze Age.

MINOT, mī′nŭt, Charles Sedgwick, American biologist and educator: b. West Roxbury, Mass., Dec. 23, 1852; d. Boston, Mass., Nov. 19, 1914. Following his graduation from the Massachusetts Institute of Technology in 1872, he studied at Leipzig, Paris, and Würzburg, and then at Harvard, from which he received his D.Sc. degree in 1878. From 1880 until his death he taught embryology and anatomy at Harvard Medical School, becoming a full professor in 1892. Minot did much to reform the system of medical education. He invented two forms of the microtome (q.v.) and made notable contributions to the study of embryology and of senility. His published works include *Human Embryology* (1892); *A Laboratory Text-Book of Embryology* (1903); *The Problems of Age, Growth, and*

Death (1908); and *Modern Problems of Biology* (1913).

MINOT, George Richards, American physician and pathologist: b. Boston, Mass., Dec. 2, 1885; d. Brookline, Mass., Feb. 25, 1950. He received his medical degree from Harvard University in 1912, and from 1928 to 1948 was professor of medicine at the same institution. During the same period he served as director of the Thorndike Memorial Laboratory at Boston City Hospital, his special field being in diseases of the blood. In 1924 he began his research on the value of liver in treating pernicious anemia, which work led to his winning of the Nobel Prize in physiology and medicine in 1934, this honor being shared with William P. Murphy and George H. Whipple. One of the most important of his many published works (in collaboration with William B. Castle) is *Pathological Physiology and Clinical Description of the Anemias* (1936).

MINOT, Laurence, English lyric poet: b. ?1300; d. ?1352. Nothing is known of his life, but from the detailed descriptions in his 11 extant poems it is generally believed that he accompanied Edward III on some of his famous campaigns. Among the battles celebrated in the poems are those of Halidon Hall (1333); Crécy (1346); Neville's Cross (1346); and Calais (1347).

MINOT, mī'nŭt, city, North Dakota, seat of Ward County; altitude 1,590 feet; on the Souris (Mouse) River, 100 miles northwest of Bismarck; served by the Great Northern and the Minneapolis, St. Paul and Sault Ste. Marie railroads. It is an important distribution point for a wheat-growing, stock-raising, and dairy-farming region. Industries include flour milling and the processing of dairy and poultry products. Railroad shops also furnish considerable employment. The city lies in the midst of the vast North Dakota lignite coal fields and southeast of the city is located one of the country's largest lignite coal-stripping plants. Minot is the home of one of the state teachers colleges. The town was incorporated in 1887. Government is administered by a council and city manager. Pop. (1940) 16,577; (1950) 22,032.

MINOTAUR, mĭn'ô-tôr, in Greek mythology a monster, half man, half bull, which was the offspring of Pasiphaë, wife of Minos, a king of Crete. During the period when Minos demanded that Athens send him an annual tribute of youths and maidens, it was the Minotaur, confined in the labyrinth built by Daedalus for Minos, which devoured them. Not until Theseus slew the monster was Athens released for this tribute. See also Labyrinth; Minos; Pasiphae.

MINOTS LEDGE or **COHASSET ROCKS,** in Massachusetts, a promontory and lighthouse in Boston Harbor.

MINSK, mĭnsk; Russ. myĕnsk, city, USSR, capital of Belorussian SSR, and of Minsk Oblast. It is in west-central European Russia, on the Svisloch River, a tributary of the Berezina. The city was founded in the 11th century, and has been under Russian rule since 1793. It is a junction for Moscow-Warsaw and Baltic-Ukraine railways and airways. Industries are varied, including automobile, tractor, machine building, woodworking, linen, synthetic leather, food, and motion picture factories. Minsk is the seat of a university and several colleges. Damage during World War II was exceedingly great, but the city is being rebuilt. Pop. (1946) 300,000.

MINSTER, mĭn'stẽr (Anglo-Saxon, *mynster,* from Lat. *monasterium*), anciently signified the church of a monastery or convent. In many instances the name has been retained and applied to the church after the monastery no longer exists. It is also often given to a cathedral or large church which was never monastic; for example, York Minster. The word is also found as part of the name of several places, such as Westminster and Minster-in-Thanet.

MINSTREL, mĭn'strĕl, a name introduced into England by the Normans, and designating singers and performers of instrumental music, together with jugglers, dancers, sleight-of-hand performers, and similar persons who entertained. See also Bard; Minnesinger; Negro Minstrels; Provençal Literature; Skald.

MINT, an aromatic plant of the genus *Mentha.* The species are characterized by square stems; opposite simple leaves; and small purple, white, or pink two-lipped, axillary flowers in whorls which often form terminal spikes. All mints are noted for the fragrance of their foliage due to the presence of essential oils, for the production of which half a dozen species are more or less cultivated. The following are the most important: spearmint (*M. spicate*); peppermint (*M. piperita*); pennyroyal (*M. pulegium*); bergamot mint (*M. citrata*); and Japanese mint (*M. arvensis* var. *piperascens*).

Besides these cultivated species, which are frequently found as escaped plants near gardens, there are several other species, of which the following are perhaps best known: round-leaved mint (*M. rotundifolia*), a native of Europe, naturalized rather interruptedly in the coast states from Maine to Texas; water mint (*M. aquatica*), with hairy stems, rather rare in wet places in New England and southward to Maryland; whorled mint (*M. sativa*) and its close relative, corn mint (*M. arvensis*), which are found in damp fields in New England; and wild mint (*M. canadensis*), which extends northward from the Northern states across the continent. All are recognizable by their resemblance to other members of the genus, especially by their odor. Several other related plants of other genera are called mint, among them being mountain mint (*Koellia*), also popularly known as basil. The numerous species are widely distributed throughout the United States and Canada, and have a mint-like flavor and odor. Catnip (*Nepeta cataria*) is often called cat mint, and several species of *Monarda,* especially *M. punctata,* are known as horsemint.

The half-dozen cultivated mints are managed alike. They will grow on any soil that will produce good crops of potatoes, but since they are considered exhausting crops, are included in the rotation only once in five or more years. Upon reclaimed swamps, however, which are considered best adapted to their cultivation, they are generally allowed to remain consecutively for five years or even more without

change of crop. The land having been plowed, harrowed and otherwise fitted, small pieces of the root-stock are dropped at intervals of a few inches in shallow furrows about 30 inches apart. All through the season the land is kept scrupulously free from weeds, especially of smartweed, fireweed, ragweed and horseweed, which seriously injure the product if included in the "hay" from which the oil is distilled. Hand-weeding is commonly practised after horse cultivation is stopped by the luxuriant vines. About midsummer, or when the earliest flowers appear, the tops are cut, either with scythes or sometimes with mowing machines, and cured like hay. They are then stored under cover for distilling. This process is usually conducted with steam, which enters the still below, passes upward through the mass of hay, carrying the essential oil with it, and condenses in coils of pipe chilled by running water. After condensation, the oil and water separate by gravity. After standing for a greater or less length of time, crystals of menthol (q.v.) appear in the oil of peppermint. The annual yield of oil per acre sometimes exceeds 50 pounds, and sometimes a second profitable cutting of the crop may be made in autumn. Having once been planted the crop takes care of itself from year to year. The most important producing centre is in southwestern Michigan and northwestern Indiana. Perhaps next is Wayne County, N. Y. Other important mint fields are at Mitcham, Surrey and Lincolnshire, England, and in Saxony, Germany.

MINT, derived from the Latin word *moneta,* a name of Juno, known as the Roman goddess of coin or money, Anglo-Saxon *mynet.* A government establishment for coining of lawful metallic money.

Metals were used for money in ancient Egypt as early as 2500 B.C. The Old Testament (Genesis 23:16) tells of merchants using gold and silver bullion for money. The first coiners of gold and silver known to history were the Lydians (about 550 B.C.). The Greeks learned coinage from Lydia and the art was taken to Rome from Greece. Metals other than gold and silver which have been minted include copper, nickel, zinc, tin, aluminum, manganese and iron.

In Great Britain during Anglo-Saxon times a large number of mints were established throughout the country under control of moneyers—officials responsible for the integrity of the coinage. Later it became the custom to establish a temporary mint wherever the sovereign happened to reside. The Royal Mint in London now supplies most of the coins of the British Empire except for Australia, Canada, India and South Africa which also operate mints. Some smaller governments which have no mints in their own countries contract for their distinctive coins from mints of larger countries.

The first mint of the United States was established at Philadelphia by Act of Congress dated April 2, 1792.

At the time of the adoption of the Constitution in 1789 the monetary system of the new republic was in confusion. The coins in principal use were those of various foreign nations. The Continental Congress had declared for a decimal monetary system. Thomas Jefferson who became secretary of state with the inauguration of President George Washington, and Alexander Hamilton, who became the first secretary of the treasury, were responsible for most of the suggestions which were incorporated in the act establishing a monetary system and the mint. Jefferson advised the adoption of the dollar as the unit of the new system. The dollar corresponded with a Spanish coin, variously known as the pillar dollar, milled dollar, or "piece of eight," with which the colonies had long been familiar. Jefferson also advised that the unit of value be attached to both gold and silver. Hamilton, in an official report to Congress, recommended that the mint ratio between gold and silver be 1 to 15, a proportion corresponding to the bullion values of the period, and the coinage of gold, silver and copper. He also proposed a schedule of coins to be minted.

The Act of April 2, 1792, provided for the coinage of the gold eagle ($10), half-eagle and quarter eagle; the silver dollar, half-dollar, quarter-dollar, dime (originally spelled "disme") and the half-disme or half-dime; the copper cent and half-cent. The Mint was first placed under the secretary of state, but was later transferred to the secretary of the treasury.

The first coins, one cent and one-half cent pieces, were struck in March, 1793. A hand-operated press was used to impress on the new money the design established by Congress. An old engraving conveying the artist's impression of the scene shows President and Mrs. Washington, Jefferson, Hamilton and Mrs. Hamilton, and other officials of the new republic, viewing the first coins. Another engraving of the same date shows the exterior of the Mint building which was protected by a guard and a watch dog. The guard made rounds of the premises at stated intervals, ringing a bell at the rear of the building to signify his presence. The first coins on the obverse showed a bust representing the Goddess of Liberty. This was in conformity with the Act of Congress requiring "an impression emblematic of liberty" with an inscription of the word "Liberty" and the date of coinage. On the reverse of the copper coins the denomination appeared enclosed in a circular chain of fifteen links. The Act required that the reverse of gold and silver coins should include "the figure or representation of an eagle with the inscription 'United States of America'" and this direction was followed as gold and silver coins were produced later.

Prior to the adoption of the Constitution, the Continental Congress in 1787 had arranged for the minting of copper one cent pieces under private contract. This coin is known by collectors as the "Franklin cent," though there is no evidence that Benjamin Franklin was concerned in the design. The design specified by Congress called for a circular chain of thirteen links enclosing the motto "We Are One" on one side of the coin. The other side of this coin showed a dial with hours marked upon it, the noonday sun above, the Latin word "Fugio" (I fly), or in connection with the symbol of the dial "Time Flies," and the phrase "Mind Your Business." The circular chain, used in the 1793 design, apparently was derived from this pre-Constitution coin. In later copper coinage of the same year, a wreath took the place of the chain.

The word "Liberty" has appeared generally upon the face of coins from the first minting. Two other mottoes were developed later to be incorporated in most subsequent designs. The words "E Pluribus Unum" (One out of many), taken from the Great Seal of the United States,

were first used on the half-eagle in 1795. The motto "In God We Trust" made its advent on coins in 1866, an outgrowth of the religious sentiment of the Civil War period.

In the early years of the republic domestic production and supply of precious metals were relatively small. Foreign coins continued to circulate with the domestic coins and were assigned legal value by acts of Congress. This condition continued until 1857 when all acts authorizing the currency of foreign coins were repealed.

The Bureau of the Mint in Washington, headed by the director of the mint, administers the activities of seven field institutions: coinage mints at Philadelphia, San Francisco and Denver; Assay Offices at New York and Seattle; gold bullion depository at Fort Knox and silver bullion depository at West Point.

The principal functions of the mint service today include the manufacture of domestic silver and minor coins; the acquisition of gold and silver bullion (payments for which are made on the basis of mint assays); the safeguarding of the government's holdings of the monetary metals, including coins in processing stages until finished and distributed to the treasurer of the United States or to Federal Reserve Banks. Other major activities include the refining of gold and silver, coinage for foreign governments, manufacture of gold, silver and bronze medals, and coinage dies and, in addition, special assays of bullion and ores.

The mints established in the United States are listed below:

PHILADELPHIA
Authorized by Act of April 2, 1792
Organized—1793

DENVER
Authorized by Act of April 21, 1862, but operated as an assay Office until passage of Act of Feb. 20, 1895, which provided for a coinage mint
Organized—February 1906

SAN FRANCISCO
Authorized by Act of July 3, 1852
Organized—1854

CHARLOTTE, N. C.—gold coinage only
Authorized by Act of March 3, 1835
Cornerstone laid January 8, 1836
Organized—1838
Coinage suspended May 20, 1861

DAHLONEGA, GA.—gold coinage only
Authorized by Act of March 3, 1835
Organized—1838
Coinage discontinued February 1861

CARSON CITY, NEVADA
Authorized by Act of March 3, 1863
Organized—1870
Coinage discontinued May 1893

NEW ORLEANS, LA.
Authorized by Act of March 3, 1835
Organized—1838
Coinage suspended from 1861 to 1879
Coinage discontinued April 1909
Office closed June 30, 1942

NELLIE TAYLOE ROSS,
Director of the Mint, Washington, D.C.

MINT GERANIUM. See COSTMARY.

MINTO. See ELLIOT, SIR GILBERT, 3D BARONET OF MINTO; ELLIOT-MURRAY-KYNYNMOND, SIR GILBERT, 1ST EARL OF MINTO; ELLIOT-MURRAY-KYNYNMOND, GILBERT JOHN, 4TH EARL OF MINTO.

MINTON, Thomas, English pottery manufacturer: b. Wyle Cop, Shrewsbury, 1765; d. 1836. While learning the art of engraving he acquired a knowledge of the process of printing on delft or chinaware. He settled at Stoke-on-Trent in 1791 and founded a pottery factory with the object of producing glazed pottery in the highest style, which should compete with the productions of foreign countries. He was completely successful and the range of his manufactures was increased by his son, Herbert Minton (1793–1858), who succeeded him in 1836, and manufactured the famous Parian porcelain and the encaustic tiles, with which the name Minton is now most commonly associated.

MINUCIUS FELIX, Marcus, probably the earliest Latin apologist of Christianity. Although he is mentioned by Lactantius and Saint Jerome, practically nothing is known of his life except what may be gathered from his one known work, *Octavius,* a popular defense of Christianity in dialogue form. Almost all modern critics agree in putting the date of its composition before that of Tertullian's *Apologeticum* (197) which bears a close resemblance to it, although the matter has been the source of great controversy. Waltzing, who has published the best and most recent edition (Leipzig 1912) and made many other valuable contributions to the literature of the subject, places it between 160 and 185. There is an English translation in the *Ante Nicene Fathers.* The dialogue, which is modeled chiefly on Cicero's *De natura deorum,* takes place between three lawyers: the author (who acted as judge), Caecilius Natalis (a pagan and native of Citra), and Octavius Januarius (like the author, a Christian convert and native of Africa). The three had left Rome during the autumn vacation for a sojourn at nearby Ostia, where on a walk along the strand the discussion was provoked by the saluting of a statue of Serapis by Caecilius. By agreement he begins, giving an arraignment of Christianity which alleges the impossibility of man arriving at truth, the inexpediency of disturbing long-established religious beliefs (especially those which have been the cause of Rome's greatness), the want of culture among the Christians, the indecency of their worship, and the inherent absurdity of their doctrines. Refuting these allegations point for point, Octavius, upon purely philosophical grounds and therefore without explicitly quoting the Holy Scriptures or mentioning the name of Christ or the mysteries of Christianity, treats of the creation, Providence, the unity of God, the absurdity of paganism, the resurrection, and the reward after death. Caecilius acknowledges himself vanquished, but wishes some further explanations to be made later. The dialogue, in spite of the inevitable traces of the general decadence of taste, attains a rare degree of elegance, grace, and limpidity. The introduction especially is a masterpiece because of the naïveté and naturalness with which the stage is set. Saint Jerome speaks of another work appearing under the name of Minucius Felix, *De fato vel contra mathematicos,* but believes that it is not genuine because of the difference in style. Minucius in his dialogue had promised a special work on fate and it may be that this inspired the publication under his name of a work that was not his.

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de l'Église; leur Vie et leurs Oeuvres (tome 3, Paris 1898); Salmon, George, *Minucius Felix, Marcus* in Smith and Wace's *A Dictionary of Christian Biography* (Vol. III, London 1882); Chevalier, Ulysse, *Bio-Bibliographie* (Paris 1905).

HERBERT F. WRIGHT.

MINUET, mĭn'ū-ĕt', a graceful and stately dance of French origin, the name of which, derived from *menu,* small, was suggested by the little steps. It developed from the *branle* of Poitou and was introduced into Paris in 1650. It was at first a gay and sprightly dance; but after appearing at court it became grave and very dignified. It is mentioned by Beauchamps, father of dancing-masters, who flourished in the reign of Louis XIV, and also by Blondy, his pupil; but it was Pécour who gave the minuet popularity. The first known minuet tunes of artistic value were written by Lully (composer of ballets and operas) in 1653. The minuet was a great favorite at the court of Louis XIV, and was equally popular in the contemporary court of Charles II in England, where it continued in vogue into the reign of George II. The minuet reached perfection in the reign of Louis XV. It was then a dance for two persons, in moderate triple time, and was generally followed by the gavotte (q.v.). Afterward the minuet was considerably developed, and, with the gavotte, became chiefly a stage dance and a means of display. The original court minuet was a grave and simple dance, although it did not retain its simplicity for long. It was elaborated and molded into a beautiful form—the perfect expression of an age in which deportment was carefully cultivated, manners were polished and bodily grace developed to the highest degree. The many slow graceful movements, the bows, the pauses to be filled with pretty compliments and the opportunity the dance gave for the display of beauty and bravery of costume made the minuet a factor in the polite world on both sides of the Atlantic. These court minuets were written in three-quarter time and consisted of two eight-bar phrases, each of which was repeated. Mozart's beautiful minuet in *Don Giovanni* shows the form exactly. The form was soon extended. As a complement to the first movement, a second minuet was added, similar in form but contrasted in feeling. This, being usually written in three-part harmony, received the name of Trio, a name retained to the present time, long after the restriction as to the number of parts has been abandoned. A further enlargement of the form of the minuet consists of the extension of the number of bars to 16. Bach and Handel introduced the minuet into their suites and Handel also used it frequently as a concluding movement for the overtures to his operas and oratorios. Bach's minuets are remarkable for their variety of form and character. The historic importance of the minuet arises from the fact that it still holds its place in the symphony, the descendant of the suite. The first composer to introduce the minuet into the symphony appears to have been Haydn. Examples are also found in Haydn's string-quartets. Haydn, however, while retaining the form, changed the spirit and introduced a light-hearted humor. The form of Mozart's minuets is identical with Haydn's, but Mozart again changed the spirit and in his hands tenderness and grace take the place of mere exuberance. It is in Mozart's concerted instrumental works that his minuets are chiefly to be studied. Beethoven continued the popularity of the minuet. The beautiful minuet in the last scene of Verdi's *Falstaff* is a most happy adaptation of the old form to modern music.

MINUIT, mē'nwē'; mĭn'ū-ĭt, or **MINNEWIT,** mĭn'ĕ-wĭt, **Peter,** director general of New Netherland and first governor of New Sweden; b. Wesel, duchy of Cleves, 1580; d. Saint Christopher, West Indies, 1638. He was probably of French or Walloon descent since he pronounced his name like the French word *minuit* and his coat of arms bore a bat, the emblem of midnight. In 1625 he was a member of the council of Willem Verhulst, the West India Company's director of New Netherland, but the same year returned to Holland. In January 1626 he sailed again for Manhattan arriving there on May 4. Verhulst continued as director of the colony until Sept. 23, 1626 when Minuit succeeded him and was the first of the company's governors to bear the title of director general. One of his first official acts was to legalize the occupation of Manhattan by obtaining a deed of purchase from the Indians for trinkets valued at 60 guilders ($24). When regular church services were inaugurated in Fort Amsterdam in 1628 by the Rev. Jonas Michaëlius, Minuit served as an elder. Recalled to Holland by the company's Amsterdam Chamber in 1631 in consequence of a bitter dispute with Johan van Remunde, secretary of the colony, he was dismissed from the company's service. However, some years later Samuel Blommaert, one of the company's directors, gave him a high recommendation to Axel Oxenstierna, the Swedish chancellor, who commissioned him to found a Swedish settlement in America. In the spring of 1638 he purchased from the Indians a tract on the right bank of the South (Delaware) River and built Fort Christina on the site of Wilmington, Del. Later that year he left Måns. Kling in charge of the colony of New Sweden and sailed for Saint Christopher where he exchanged his cargo for tobacco. While he was paying a visit to the captain of a Dutch merchantman in the harbor, a hurricane struck the island. The ship foundered and he was drowned. See the article by A. J. Barnouw in *The Dictionary of American Biography.*

MINUTE, a division of time and of angular measure; the 60th part of an hour, and the 60th part of a degree. In astronomical works minutes of time are denoted by the initial letter *m,* and minutes of a degree or of angular space by an acute accent (′). In architecture the 60th part of the diameter of a classic column, measured at the base.

MINUTE MEN, in the American Revolutionary War, the militia, who were prepared for service at a minute's notice. They were principally civilians, resident in Massachusetts, who were enrolled in accordance with an act of the provincial congress, passed Nov. 23, 1774. There were in Boston alone 16,000 minute men ready for service.

MINYAS, mĭn'ī-ạs, in Greek mythology, the son of Chryses, the hero of the *Minyae,* from

whom were descended most of the Argonauts. His three daughters, Alcĭthŏe, Leucippe, and Arsippe, were changed into bats for having made light of the mysteries of Dionysus.

MIOCENE, *in geology,* the fourth epoch of the Tertiary period, spanning about 10 million years and ending about 10 million years ago, follows the Oligocene and precedes the Pliocene epochs. The name was given in 1833 by Sir Charles Lyell on the basis of studies in France and Italy from the Greek in reference to the rocks having only a "minority of the recent" fossil mollusks. The Alps were severely deformed and raised during the Miocene epoch as were the Caucasus, the Himalayas, and the Andes. While areas of the Coast Range in California rose, Miocene marine sediments exceeding a mile in depth were laid in the area of the Great Valley. Similar marine rocks along the coast of Oregon and Washington adjoined plains of contemporaneous lava flows extending eastward to Yellowstone Park. In the Great Plains of Nebraska and the Dakotas and extending to the Gulf coast, gravels and clays were laid by streams arising in the present Rocky Mountain region. In Texas, a thin layer of surface terrestrial sedimentary rocks thickening to a layer more than a mile in depth of marine sedimentary rocks beneath the shore of the Gulf of Mexico was formed. Thinner marine rocks of this period crop out eastward to Florida and northward to New Jersey.

MIOHIPPUS, a genus of small horses of the Oligocene period in North America. See Horse—*Evolution.*

MIQUELON, mĭk′ĕ-lŏn, French mē-klôn′, an island, is located in the Atlantic Ocean near the southern coast of Newfoundland, at the entrance to Fortune Bay. With Saint Pierre (q.v.), it forms a French colony, the two islands being the only remnant of the once vast French empire in North America. The southern part of Miquelon, called Little Miquelon (*Petite Miquelon*) or Langlade, was once a separate island but since 1783 has been connected with it by a sand bar. Under the direction of the commandant of Saint Pierre, Miquelon is occupied only by a few families engaged in the fisheries. The area is 83 square miles. Pop. (1946) 550.

MIR, in czarist Russia, was the name of a rural commune, consisting of the inhabitants of one or more villages, who were, as a community, owners of the surrounding land and who were mutually liable for the taxes. From time to time the land was redistributed among the members. The mir was self-governing as a community, with elective officers, but was subject to higher control.

MIRA, mī′rȧ, in astronomy, "the wonderful star," Omicron Ceti, is a remarkable variable situated in the neck of the constellation Cetus, "the whale." It was discovered in 1596 by David Fabricius, and its variability was apparently first noticed in 1638. The period of this star, which is rather irregular, averages about 330 days. During the greater part of this time the star remains at about the 9th magnitude, but during about 100 days it rises to a maximum which may vary from the 2d to the 5th magnitude, remains for a week or 10 days there, and then sinks to its minimum again. When shining with a brightness of the 2d magnitude, it is giving out more than 600 times as much light as when at the 9th magnitude. Its greatest recorded variation occurred between the years 1779 and 1783, when, after attaining a brightness equal to that of the first magnitude star, Aldebaran, it sank so low that it was invisible, even in telescopes showing stars of the 10th magnitude. The period of its changes is also irregular, sometimes varying to the extent of two months. Thus, neither the times of greatest brightness nor the amount of the brightening can be accurately predicted.

As to what occurs in this and similar long period variables to occasion so great an outburst of light at the approximately constant interval of about 11 months, we are ignorant. As the time of greatest brightness of Mira approaches, the spectrum gives evidence of powerful disturbance, and the outburst is from the depths of the Sun, the outlying strata of vapors remaining comparatively cool. A periodical surging of the material of the ball of the Sun is thus suggested, and this surging is so widespread as to amount to a real bodily distortion rather than to a mere tide, but the cause of this disturbance we do not know.

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MIRABEAU, mē-rȧ-bō′, Anglicized mĭr′ȧ-bō, Comte de (Honoré Gabriel Victor Riqueti), French orator and revolutionary leader: b. Bignon, near Nemours, March 9, 1749; d. Paris, April 2, 1791. He entered the Berry cavalry regiment in 1767 and was soon promoted to second lieutenant, but because of misconduct he was later imprisoned on the island of Ré until March 1769. He then joined an expedition to Corsica, was commissioned captain of dragoons in 1771, and in 1772 was married. In 1774, owing to debts and quarrels with his wife and father, he was imprisoned in the Castle of If, and the next year was transferred to the Castle of Joux, near Pontarlier. Here he fell in love with the young wife of the Marquis de Monnier. Trouble ensued, and Mirabeau finally escaped to Switzerland, where he was joined by his mistress, Sophie, as he called her, and in October 1776 they settled in Amsterdam. In May 1777, however, they were arrested, brought to Paris, and Mirabeau was imprisoned again for three and one-half years. It was at this time that his erotic letters addressed to Sophie were written. Having secured the revocation of the death sentence imposed upon him for the seduction of Sophie and being legally separated from his wife (1783), he left France for a few months.

Upon Mirabeau's return he began his intimacy with Henrietta van Haren, known as Mme. de Nehra, whose influence was undoubtedly exerted to his great benefit. In August 1784 he was forced to flee to London to allow more trouble to blow over, and while there he wrote the *Considérations sur l'Ordre de Cincinnatus.* At about this same time he began to devote himself completely to politics and was entrusted by Calonne with a secret mission to Prussia in 1786. As a result of this and a subsequent mission to Prussia, he published *De la Monarchie Prussienne sous Frédéric le Grand* in 1788 and *Histoire Secrète de la Cour de Berlin* in 1789. His attacks on the government of Louis XVI eventually made him well enough known to the *tiers*

état to be elected by the town of Aix to be its representative in the States-General of 1789. Here he speedily eclipsed all the other orators of the Assembly, and became the centre round which gathered all the men of greatest mark and force of character in the third estate. He was the immediate cause of the French Revolution, by the resistance which he offered to the demand of the king after the royal sitting of 23 June 1789, that the third estate should vote separately from the other two orders. It was on this occasion that he gave the vigorous reply to the grand-master of ceremonies, who had communicated to the Assembly the royal will, concluding with the words, «Go and tell your master that we are here by the will of the people, and that no one shall drive us out except by the force of bayonets.» Both before and after this occasion he delivered many eloquent speeches, which obtained for him the title of the «French Demosthenes.» Among the most remarkable of these are his address to the king demanding the removal of the troops encamped at Versailles, speeches on the national bankruptcy, on the civil constitution of the clergy, on the royal sanction, on the right of peace and war, and his reply to the Abbé Maury on ecclesiastical property. After having shown himself a bold reformer, and the most dangerous adversary of the court, Mirabeau ended by offering his support to the throne; the court paid his debts and supplied him with funds, although he continued to make a show of opposition to royalty in order to uphold his popularity. This state of matters dates from May 1790. It appears to be true that in this change of position he acted from conviction, foreseeing the imminence of a great catastrophe, which he desired if possible to avert. Whatever may have been his motives, this conduct, when it became known, naturally raised up against him numerous enemies. But on 30 November he was elected president of the Jacobin Club, and on 29 Jan. 1791 of the National Assembly. His remains were buried with great pomp in Sainte-Geneviéve Church (the Pantheon), but three years later they were exhumed to make room for those of Marat. Mirabeau's aim was to make France a constitutional monarchy after the English pattern. Statesmanship and oratorical powers were marvelously combined in him. Mme. de Staël said of him that his speech was «like a powerful hammer, wielded by a skilful artist, and fashioning men to his will.» His speeches, however, were not his own altogether: a group of his friends united to supply him with the framings, and these he suffused and sublimated with his own genius.

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MIRABILITE. A mineral consisting of hydrous sodium sulphate or glauber salt, $Na_2So_4.10H_{20}O$, occurring in the United States in Arizona, California, Oregon, Wyoming. Used to some extent for manufacture of soda.

MIRACLE PLAYS. The earliest dramatic representations of religious themes grew up within the Church itself. At certain seasons of the year, tableaux of gospel scenes were shown to the people, a practice which still survives in the representations of the Nativity in modern Catholic churches. The introduction of action and music into these tableaux is easy to understand, particularly in view of the dramatic elements in the celebration of the Mass, and in the ritual for special occasions, like the consecration of a church. Tropes or simple texts set to music were added to the regular service, and gave a further opportunity for dramatic scenes. In time these tropes grew more elaborate, passages in the vernacular were introduced and popular elements not taken from the Bible were added. Meanwhile, the little plays, which in the beginning had been given in the choir, were transferred to the nave, and set up against the pillars. So popular did these representations become, and so great was the concourse of spectators, that a move outside the building into the churchyard had to be made. Secular elements crept in very rapidly, and the plays were finally transferred to open spaces in the cities and towns. The liturgical drama reached its height in the 13th century; by the beginning of the 14th century it had largely passed out of the hands of the clergy, although representations continued to be given in many churches.

The growth of the miracle play in England is due to the influence of the Normans. There are almost no evidences of dramatic impulse in England before the Conquest. The earliest play of which there is mention by name is a 'Play of Saint Katherine,' at the beginning of the 12th century, produced under the direction of a Frenchman who afterward became abbot of Saint Albans. To the same century belongs the work of Hilarius, a pupil of Abelard, and perhaps of English birth. He wrote Latin plays on subjects taken from the Scriptures, and diversified them with refrains in Old French. It seems probable that French plays may have been acted in England at this time, but none are extant.

The term «miracle play» is properly applied to the religious plays which developed in England out of liturgical beginnings. They have sometimes been called «mysteries,» but this term, which is more generally and rightly used of productions in France, does not antedate the 18th century in England, the mediæval name being *miraculum*, or *miracle*. A great impetus was given to the plays by the institution of Corpus Christi Day, with its elaborate processions and outdoor ceremonial, and many came to be presented at this season, when the conditions of weather were likely to be favorable. In time the procession served as a mere preliminary to the dramatic performances to follow. A desire for more elaborate stage effects and a greater

number of incidents within the plays was constantly increasing, until there developed out of the relatively simple early pieces long groups of plays of cyclic character, covering the principal events of the Scripture narrative, in both the Old and the New Testament. The series given at York in 1415 begins with the Creation, and ends with the glorification of Mary and Jesus in heaven, embracing 48 separate pieces in all. These cycles were often not all given on one day, but extended over two or more days, or they were divided, and presented in succeeding years.

After leaving the churches, the plays soon passed into the hands of the guilds, or associations of tradesmen. In the 13th century clerics were forbidden by papal edict to appear on the stage, but these prohibitions were frequently disregarded. The control of the plays by the guilds marks a period of great importance in the history of the English drama. Much care was devoted to the production and acting of the various pieces. The corporation of the city had general charge of the matter, deciding when the performances should be given, and dividing the various scenes among the several companies. An effort was made to have the play suit the character of the guild that gave it; the shipwrights showed the building of the Ark, the waterman the Flood, and so forth. The plays were given on movable stages called *pageants,* which consisted of "high scaffoldes with two rowmes," one beneath which was used as a dressing-room, and one above, open on all sides to give a better view, and occasionally provided with a canopy. These wagons moved from place to place, repeating the performance at different stations. The number of these stations varied with the size of the town; there were sometimes a dozen or more. The pageant wagons were gaily painted and decorated. They were generally rectangular, but special shapes were required for the Ark, or for Hell-Mouth, a huge painted head with open jaws belching fire and smoke. The scenery was of a rude sort. Palaces, temples and castles were sometimes represented by boxes or wickerwork covered with cloth. Occasionally the actors made use of the open space in front of the pageant; Herod's "raging" appears to have been partly done in the street. The costumes were often expensive, but frequently grotesque. Herod was attired like a Saracen, with red gloves. Pilate always wore a green cloak and wielded a huge club. God the Father was represented in person, and dressed all in white, with a gilt wig. The devils and the Evil One were made very realistic, and came to furnish a great deal of low comedy. Various accounts of sums paid for properties and costumes are still preserved.

Four cycles of miracle plays are still extant, the York, Chester, Coventry and Towneley or Woodkirk plays. The Towneley series, so called from the family who long owned the manuscript, much resembles the York cycle, and like it displays much vigor and humor. The Chester plays perhaps appeal most to modern taste. The religious passages are more reverent, the humor less coarse and the versification less harsh. The Coventry plays are full of didacticism, and this, with the introduction of personified abstractions, relates them more closely than the others to the Moralities. Fragments of other cycles have also survived. The Vulgate and the Apocrypha are the chief sources of the texts. In places some tragic elevation is reached, marred, however, by repetition and moralizing. Melodramatic and ranting scenes were popular. The comic scenes are often very spirited, and clearly based upon observation of the life of the people. Anachronisms are common, and the supernatural is treated with great naïveté.

The miracle plays were at their best in the time of Chaucer. In the 15th century the Moralities arose to compete with them for favor, but never equaled them in dramatic achievement. The miracle plays continued to be given until the beginning of the 16th century, but in the reign of Elizabeth they had ceased to be a vital force. Their influence in preparing the way for the Elizabethan drama was very great, however. They introduced elementary types of comedy and tragedy, farce and melodrama, and accustomed the people as a whole to dramatic conventions. They made a national drama possible in the time of Shakespeare, and kept the theatre from being a mere amusement for the nobility, or a diversion for a small group of literary people.

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MIRACLES, works which excite wonder, because they are beyond ordinary human experience and appear to contravene the known laws of nature.

The well-known argument of Hume against the credibility of a miracle has often been refuted. A miracle, he said, was contrary to experience, but false witnesses in history are not contrary to experience; it is less probable that the miracle is true than that the witness is false. There are two fallacies in this reasoning; it begs the question by the use of the words contrary to experience, for the point at issue is

whether miracles are contrary to experience or no. If they are contrary to Hume's experience, may it not be because his experience is limited? He has not lived at an age when a new religion was instituted and extraordinary guarantees demanded in order to accredit it with a hostile world. Even mankind's experience in nature is becoming widened every year, and many wonderful things take place at this moment which our ancestors of a century ago would have looked upon as magical or miraculous, such as wireless telegraphy, communication by telephone, the effects of the Roentgen rays, the power of radium, etc. For miracles are not to be looked upon as a violation of the laws of nature, but merely as the interposition of a higher law overruling a lower one. To those who believe in an intelligent creator and conserver of the world there can be no difficulty in apprehending the possibility of the miraculous; even those who like Herbert Spencer have a vague belief in what they style Force or Power underlying all the operations of nature should not hesitate in admitting that the force which keeps up the multitudinous activities of the universe may manifest itself at times in unprecedented fashions, even as the new discoveries and combinations of science are constantly revealing new powers in the domain of natural law.

Pascal has said that the certainty and genuineness of certain miracles is proved by the falsity of others, meaning presumably that the very fact that general human consent has been given to the idea of miracles proves that such idea has a counterpart in reality. There are of course certain concomitant circumstances which may be taken as affecting the credibility of a miracle. Most of the miracles of history may be put aside as inventions; such are many of the stories told by Livy and Herodotus, and the wild fables of Hindu history, as well as many miraculous incidents in the life of Mohammed. Christian apologists lay particular emphasis on the moral aspects of the miracle. To those who deny or doubt the existence of a supreme being, the moral ruler of the universe, a miracle is an impossibility. On the other hand, without miracles the revelation of God is impossible. Hence, a miracle with a moral object is most in accordance with the character of a Supreme Being governing the world with a moral end. All idle or superfluous miracles are to be rejected as at variance with the character of such a being. Equally to be rejected are miracles which are merely tentative, that is, sometimes successfully accomplished, sometimes ending in failure; as well as others which are doubtful in their nature and those which are merely exaggerations of natural events.

In the early Church those who defended Christianity against the attacks of those outside laid great stress on the evidence of miracles, and claimed that miraculous power still existed among Christians. Irenæus asserted that this power was universal among Christian churches. Saint Augustine asserts the reality of the miraculous on the testimony of his own experience. He makes the acute remark that a miracle is not contrary to nature but to what we know of nature. The schoolmen did not agree with Augustine on this point. Thomas Aquinas defines a miracle as «something out of the order of nature.» Albertus Magnus declares that God has implanted the possibility of miracles in the very nature of things, although denying that he can do anything contrary to nature. Luther puts the miracle of grace in the heart far above any physical miracle, while he assigned the Bible miracles their proper place in the development of the faith. The Roman Catholic Church has always claimed the existence of miraculous powers and continues to do so to this day. The Socinians and Arminians maintain that God has always revealed himself by means of supernatural works, and Grotius in his defense of Christianity makes miracles the foundation of his argument. There has always, however, been a school of rationalists or philosophers who have opposed or attacked the belief in miracles, although Leibnitz admitted this belief into his philosophical system. He defines a miracle as an event inexplicable by natural causes. The laws of nature, he says, are not necessary and eternal; God can for his own purpose suspend them; the miraculous is included in the divine plan and forms a part of «the pre-established harmony.» Spinoza made the statement that miracles are impossible. In his pantheistic philosophy nature and her laws are identical with the will, intelligence and nature of God, who cannot work contrary to the laws of material nature. Kant like the English Deists did not deny the possibility of miracles, for they might be wrought by powers and in accordance with laws of nature with which we are unacquainted, but believed that such laws were never exercised. Schleirmacher contests the apologetic value of miracles and endeavors to eliminate the miraculous from the Christian scheme, which he thinks is lowered by this supernatural element. The modern agnostic claims that the advance of science has made a belief in the miraculous impossible. Some have tried to explain the recorded miracles of Scripture by a reference to natural causes; others would treat them as allegories or legendary accretions or folktales, or attribute them to self-deception, or fraud, or the credulous exaggeration of bystanders and witnesses. Miracles are regarded by conservative theologians as an essential part of Christianity which cannot be explained away or eliminated without destroying its authority. The more advanced theologians claim the right to question the reality of miracles, even including the virgin birth of Christ and the resurrection, and they regard as the matter of supreme importance the fact that Christ spiritually still lives and is transfiguring the life of mankind. Certain it is that miracles no longer hold the place they once did as Christian evidences; conversion, the «expulsive power of a new affection» vivifying and transforming the soul, the divine response to prayer, communion with God and the supreme miracle of Christ himself as the spiritual regenerator of mankind — these have placed outward signs and evidences into a subordinate place.

Bibliography.— There is an inexhaustible list of works on the subject; but in addition to authorities named in the article consult Arnold, Matthew, 'Literature and Dogma' (new ed., London 1902); Balfour, A. J., 'Foundations of Belief' (1895); Bonney, T. G., 'The Present Relation of Science and Religion' (ib. 1913); Bruce, A. B., 'The Miraculous Element

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MIRAGE, mĭ-räzh′, an optical illusion produced in the atmosphere by an unusual refraction (q.v.) of light rays. The illusion may result in the appearance of a distant object floating in mid-air, or projected transparently against a ground or sea surface where the object does not physically exist. Often, complex inversions and distortions of the mirage image cause it to assume weird shapes (see FATA MORGANA).

The basic cause of a mirage is the bending of light rays from a distant object as they pass the boundary or interface between two layers of air having sensibly different densities. The difference in density is usually caused by an unequal distribution of temperature, as when the layer of the atmosphere closest to the ground is heated from below by intense reradiation of the sun's

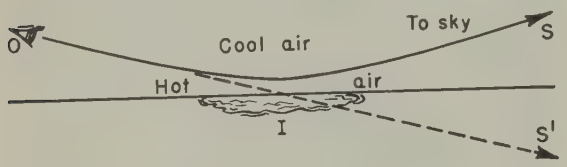

Fig. 1. Inferior mirage.

rays from the ground. For this reason, mirages are more frequently seen over deserts and wherever temperature inversions are found. Stratification of the atmosphere is necessary for a mirage to occur.

Since light rays are bent upward in entering obliquely into a stratum of air of lesser density, the image of an object seen under these conditions is in an inverted position below and apparently in front of the object. This is known as an *inferior* mirage. The appearance of a spurious lake on the desert, or an incongruous film of water over a portion of the highway ahead on a clear hot day, are typical examples of inferior mirages. These phenomena occur only under conditions where, in the lowest few feet of the atmosphere, the air is superheated and substantially

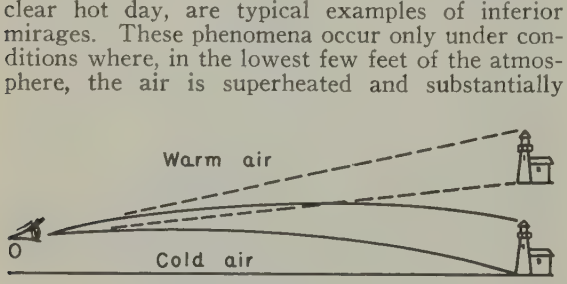

Fig. 2. Superior mirage.

less dense than the air above it. The apparent pool of water is but a refracted and shimmering image of the clear sky above (see Fig. 1). Light rays from a point *S* in the sky are curved upward by refraction so that an image of a patch of the sky is formed at a point directly beneath, and seems to originate in a point *S′* below the ground. The glistening, waterlike image of the sky thus appears as if reflected from the ground at a point *I*, where the line of sight from the observer *O* intersects the ground in front of the apparent source *S′*.

Conversely, if the light rays from a distant object are refracted downward on entering a cold air mass having greater density, the apparent position of the object is elevated above its actual position (see Fig. 2). If the density transition is marked, the image of an object on the ground may be projected upward against the sky in a phenomenon known as a *superior* mirage ("looming"). When a strong temperature inversion occurs some 30 feet above the surface, as is common over quiet bodies of water, a superior mirage is frequently formed. Because of this stratum of abnormally warm air overlying a stratum of cold air, many complex refractions resulting in both erect and inverted images, and fragments thereof, are possible, depending upon the height of the observer and his angle of vision with respect to the refracting layer.

As an optically real, though physically illusory phenomenon, a mirage can be photographed.

FERGUS J. WOOD.

MIRAMICHI, mĭr-ă-mĭ-shē′ (Indian "happy retreat"), river, New Brunswick, Canada, formed by several streams flowing east or northeast and joining to enter Miramichi Bay on the Gulf of St. Lawrence. The main stream, the Southwest Miramichi, is 135 miles long. Newcastle and Chatham are the chief towns on the lower river.

MIRAMON, mē-rä-môn′, **Miguel,** Mexican soldier and politician: b. Mexico City, Mexico, Sept. 29, 1832; d. Querétaro, June 19, 1867. Educated at a military school in Chapultepec, Miramón fought in the Mexican Army against the United States in 1847, and by 1855 had risen to the rank of colonel. The next year he took part in two unsuccessful revolts at Puebla against the moderate liberal provisional president, Ignacio Comonfort. When the War of the Reform began in 1858, he joined Gen. Félix Zuloaga as leader of the Conservative faction against the Liberals, led by Benito Juárez. Miramón was chosen by the Conservative junta to succeed Zuloaga as president in February 1859, but was defeated at Capulálpam (Dec. 22, 1860) by Jesús González Ortéga, Juárez' general, and fled to Cuba and then to Europe. There he became involved in Napoleon III's plans to invade Mexico, and returned to his native land with Maximilian in 1862 as a grand marshal. From 1864 to 1866 he served as minister to Berlin. When Maximilian's army was finally defeated by Juárez at Querétaro (May 14, 1867), Miramón was taken prisoner and later shot, along with the emperor.

MIRANDA, mē-rän′dä, **Francisco de,** Venezuelan precursor of South American independence: b. Caracas, Venezuela, March 28, 1750; d. Cádiz, Spain, July 14, 1816. As an officer in the Spanish Army he fought in North Africa and then volunteered for service in the Western Hemisphere, where he played a part in the American Revolution. Miranda received the surrender of the British at Pensacola, Fla.; cooperated in the capture of New Providence in the Bahamas; and after Admiral François de Grasse had captured Tobago (1781), helped him re-equip and provision his fleet for the voyage to Chesapeake Bay, thus contributing to the decisive Franco-American victory at Yorktown. Angered at the arrogant attitude of the Peninsular Spaniards toward colonials, Miranda sailed to the United States. It was in New York (1784) that, according to his own testimony, he formed "a project for the liberty of the entire Spanish-American Continent with the cooperation of England." By this time he had made the acquaintance of almost every important United States leader.

After 18 months in North America, the Venezuelan patriot sailed for England. During a six-month stay in London he made friends, heard debates in the House of Commons, and wrote articles about the prospects for freedom in South America. Then, to complete his "imperfect educaiton," he also traveled widely on the Continent. In Russia he became so much a favorite of Catherine II that, after his return to London, he was granted the protection of the Russian embassy there. At a conference with Prime Minister William Pitt, plans were discussed for liberation of the Spanish colonies in America. In 1792, however, Miranda became interested in the French Revolution and in September 1793, as a general of division, served under Charles François Dumouriez on the historic field of Valmy. Another victory, this time at Antwerp, was followed by a debacle of the Republic's armies at Neerwinden. Tried on charges of treachery for this defeat, the Venezuelan was acquitted triumphantly. When Napoleon won control of France, however, Miranda returned to London and, renewing his friendship with Pitt, maintained contact with numerous agents in the Americas. In 1806 his first expedition to Venezuela, organized in New York with the alleged connivance of American authorities, ended in complete failure.

Napoleon's invasion of the Iberian Peninsula (1810) set the stage for uprisings in Hispanic America. On April 19, the patriotic forces in Venezuela decided to disown the distant Madrid regency. This was the signal for Miranda to return to his own land. After eloquent speeches by Miranda and Simón Bolívar, the first republic in South Amercia was proclaimed in Caracas on July 5, 1811. When royalist armies threatened to destroy the young republic, Don Francisco was elected generalissimo and virtual dictator; but due to disunity and the fall of the fortress of Puerto Cabello, the Venezuelan leader was forced to capitulate, July 25, 1812. Trapped by the Spaniards in the port of La Guaira, Miranda was transported a prisoner to Cádiz where he died on the anniversary of the fall of the Bastille.

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Joseph F. Thorning,
Advisory Editor of "The Americas."

MIRANDOLA, mē-rän′dô-lä, commune, Italy, in Modena Province, Emilia-Romagna Region, 18 miles northeast of Modena. Its records go back to 1102, when the first fort was probably built. Until 1710 it was the seat of the Pico family, of which the humorist, Count Giovanni Pico della Mirandola, was the most famous member. It is a cathedral town and a rail terminus, and manufactures canned goods, macaroni, hemp products, shoes, and chassis trucks. Pop. (1951) 24,234.

MIRBEAU, mēr-bō′, **Octave (Henri Marie),** French novelist and playwright: b. Trévières, Calvados, France, Feb. 16, 1850; d. Paris, Feb. 16, 1917. Educated at a Jesuit school at Vannes, of which he later wrote bitterly in *Sébastien Roch* (1890), Mirbeau became dramatic critic on *L'ordre,* and a founder of the satirical paper *Les grimaces.* His political ideas were often unpopular, but he was influential in attracting favorable attention to contemporary painters and writers, and was an early defender of Capt. Alfred Dreyfus (q.v.). His stories of the peasants of Normandy, where he was born, were well received in 1886, and he published several novels. In 1897 his *Les mauvais bergers,* a five-act drama, was played by Sarah Bernhardt. His most successful play, *Les affaires sont les affaires* (1903), was produced in New York as *Business is Business* (1905).

MIRFIELD, mûr′fēld, urban district, England, in the West Riding of Yorkshire, on the Calder River and canal, 4 miles northeast of Huddersfield. It is a railroad junction, and an important cotton and woolen milling town, making carpets and blankets. Pop. (1951) 11,885.

MIRIAM, mĭr′ĭ-ăm, in Biblical history, the sister of Moses and Aaron, first mentioned (Exodus 2:4-10) as being stationed by her mother to watch her brother Moses' cradle among the rushes on the riverbank. In Exodus 15:20-21, Miriam is called "the prophetess," and leads the women in a song of rejoicing over the safe crossing of the Red Sea. Later (Numbers 12) she rebuked Moses for his marriage with an Ethiopian woman, and for this was stricken with leprosy, but the curse was removed. She died after the wandering in the desert, and was buried in Kadesh.

MIRKHOND, mēr-kŏnd′, (Pers. Mirkhvand; properly Muḥammad ibn-Khavand Shah ibn-Maḥmud) Persian historian: b. 1433; d. 1498. A direct descendant of Mohammed, he devoted his life to collecting all the available material on the lives of the important men of Persia. The work he produced, *Rauẓatuṣ-Safá* (*Garden of Purity*), is considered one of the world's masterpieces. In seven volumes, with a geographical appendix, it contains the biographies of prophets, kings, and caliphs from remote times to 1523. The final volume was probably written by Mirkhond's grandson, Khvandamir (1475–1534). The work was partially translated by E. Rehatsek in five volumes (1891–1894).

MIRO, mē-rō′, **Joán,** Spanish painter: b. Montroig, near Barcelona, Spain, April 20, 1893. After studying art in Barcelona, where he had his first exhibition, Miró went to Paris. His 1921 exhibition received favorable attention from contemporary artists, and in 1922 *The Farm* in cubistic style, was hailed as a masterpiece. The surrealists accepted his 1926 painting *Dog Barking at the Moon,* as an example of their art, but at an exhibition in New York in 1940, critics were divided in classifying his work. His style is one of fantasy, with recognizable forms, but not purely representational. The Museum of Modern Art in New York owns several of his works.

MIRO FERRER, Gabriel. See Spain—*11. Literature* (The 20th Century).

MIRROR, a smooth surface usually of glass, capable of regularly reflecting rays of light. A mirror may be (1) a polished surface of glass; (2) a surface of tin foil on the further side of a sheet of glass, as in the common looking glass; (3) the surface of a film of silver or platinum deposited on a polished glass surface, so that rays of light to and from the metallic reflecting surface do not pass through the glass; (4) a polished surface of silver, gold, platinum, or speculum metal.

The earliest mirrors were probably man's

own reflection in the still water of ponds and lakes. The use of mirrors of brass by the Hebrews is mentioned in the Pentateuch; and bronze mirrors were used by the Egyptians, Greeks and Romans. The use of silver in the manufacture of mirrors was taught by Praxiteles in the 4th century before Christ. Looking glasses were first made in Venice in A.D. 1300, and in 1673 were introduced into England. They were a great improvement on the more ancient speculum metal mirrors, whose reflecting surfaces were liable to oxidation from exposure to the air, but they have the disadvantage that there are two reflecting surfaces, one of glass, the other of metal. Polished metals reflect nearly all rays of light at all incidences; glass reflects very few rays at the normal incidence, but the amount of reflection becomes greater and greater as the incidence becomes more and more oblique. Mirrors are usually either «plane» or «spherical.» Spherical mirrors are small portions of the surface of a sphere. In a spherical mirror, concave or convex, the line through the centre of the spherical surface of which the mirror is a part and the middle point of the mirror is called «the axis.» From a concave mirror rays parallel to the axis converge after reflection to a point called the «principal focus,» which is half-way between the centre of the sphere and the mirror. (See LIGHT). Rays from a luminous object outside the spherical centre of a concave mirror form a small, real, inverted image of the object between the centre and the principal focus; when the object is between the centre and the principal focus the image is beyond the centre, and is large, real and inverted.

Prior to 1835 mirrors were almost universally made by applying a coat of tin-foil amalgamated with mercury to the surface of plate-glass. In 1835 Baron Liebig observed that on heating aldehyde with an ammoniacal solution of nitrate of silver in a glass vessel, a brilliant deposit of metallic silver was formed on the surface of the glass. To this observation the more recent process of silvering glass is really due. In 1849 Drayton made known a method in which he employed as a backing composition two ounces of nitrate of silver, one ounce of ammonia, three ounces of alcohol and three ounces of water. The defects of these two modern processes are that the deposit of silver on glass is not so adherent and unalterable under the influence of sunlight and sulphurous fumes as the old amalgam of tin and mercury; besides, the newer processes give the glass a slightly yellowish tinge. These disadvantages have been obviated by applying to the silver coating a weak solution of cyanide of mercury, which immediately forms a kind of amalgam and renders the deposit at once much whiter and more adherent. The silvering is protected from mechanical abrasion and the chemical action of gases and vapors by a coating of shellac or copal varnish, which when dry may receive a further covering of red-lead paint. A method of coating glass with platinum has been recently introduced. A solution of bichloride of platinum is spread over the surface of the glass with a fine brush, and the metal is precipitated with oil of lavender. As this summary process produces a somewhat gray lustre it is used only for cheap mirrors, the lids of ornamental boxes, toys and the like.

MIRROR CARP. See CARP.

MIRROR OF KNIGHTHOOD, The, Spanish romance of chivalry. It was one of the books in Don Quixote's library and of it the priest said to the barber: «In this same 'Mirror of Knighthood' we met with Rinaldo de Montalban and his companions, with the Twelve Peers of France and Turpin the historian. These gentlemen we will condemn only to perpetual exile, as they contain something of the famous Bojardo's invention, whence the Christian poet Ariosto borrowed the groundwork of his ingenious compositions; to whom I should pay little regard if he had not written in his own language (Italian).» 'The Mirror of Knighthood' is identified with the 'Cavallero del Febo' (Knight of the Sun), a romance belonging to the Amadis de Gaul Cycle. It seems to have been the work of several hands and was unfinished. An English translation was printed in 1578.

MIRROR FOR MAGISTRATES, The. This once popular work, the first part of which was published in 1555, and the last in 1620, was the result of the labors of at least 16 persons, the youngest of whom was not born when the oldest died. It probably owed its inception to George Ferrers, master of the king's revels at the close of the reign of Henry VIII; and he associated with himself William Baldwin. Richard Niccols is responsible for the book in its final state; and in the interim, it was contributed to by Thomas Newton, John Higgins, Thomas Blennerhasset, Thomas Chaloner, Thomas Sackville (who wrote the poetical preface called the Induction and the life of Buckingham), Master Cavyll, Thomas Phaer, John Skelton, John Dolman, Francis Segar, Francis Wingley, Thomas Churchyard and Michael Drayton. It is a «true Chronicle Historie of the untimely falles of such unfortunate princes and men of note, as have happened since the first entrance of Brute into this Iland, until this our latter age.» It was patterned after Lydgate's 'Fall of Princes,' a version of Boccaccio's poems on the calamities of illustrious men, which had been very popular in England. The stories are told in rhyme, each author taking upon himself the character of the «miserable person» represented, and speaking in the first person. The first one told by Ferrers is that of Robert Tresilian, chief justice of England.

MIRROR OF PERFECTION, The, is a most intimate and exceedingly illuminating account of the son of Peter Bernardone, cloth merchant of Assisi. Christened John he was nicknamed by his father «Francisco» and is known to the world by no other name than that of Saint Francis of Assisi.

The volume, small enough to be attractive—there are only about 50,000 words to it—was written by Leo of Assisi who is often spoken of as the «beloved disciple» of Saint Francis. «Brother Leo, was not merely a fellow-townsman, 'companion,' disciple, and dear friend of Francis of Assisi. He was also his sick-nurse, secretary and confessor during the last six years of his life. None knew Francis so intimately, or remembered him so well. None could be more scrupulously conscientious in recording what he believed to be the exact truth about the not yet canonized Saint.» The character and fashion of the record tempts one

to speak of him as St. Francis's Boswell. It is the "oldest life of the Beloved Francis," being "done," so a note at the end of the volume informs us, "in the most holy place of S. Mary of the Little Portion, and completed this fifth of the Ides of May in the year of Our Lord 1228." St. Francis died Oct. 3, 1226.

The significance of the title is disclosed in these words of the author: "Here endeth the Mirror of Perfection of a brother Minor; to wit, of the Blessed Francis, wherein we may most sufficiently behold as in a glass the perfection of his calling and profession." Without a doubt a less scrupulous writer would have said also the perfection of the life of the Blessed Francis. He refrained from saying this most likely because he knew that St. Francis would most flatly resent being spoken of as perfect.

The style in which the book is written is singularly in keeping with the spirit and character of the subject, and of the type of life he represented—simple, direct, homely, shorn of all scholarly vanities and conceits as the life of the subject was shorn of all worldly comforts. There is an indescribable charm and power of revelation to this narrative that is simple and homely even almost to the point of bluntness. Narrative is hardly the correct word. Perhaps it is better described as "a chaplet of immortelles set upon the head of the Saint on the morrow of his death to typify the crown of glory achieved by this beatified Spirit."

It is hardly a disinterested picture or biography. Some of it has been written with a distinct purpose, the intent being to show not merely what kind of a man St. Francis was and the kind of life he lived but what principles and "Rules" he laid down as the foundation of the famous order which takes its name from him, and it is plainly also the purpose to show what obedience to these principles is the true path of the perfect Christian. Sometimes Brother Leo becomes controversial, taking vigorous issue with those, and they were many, who "desired to ignore certain of the wishes and to modify certain of the injunctions of Francis in what they believed to be the interests of the Order." All this, however, does not lessen the value of the book as a carefully drawn and wholly reliable picture of the founder of the order of Franciscans. By his scheme of minutely, yet briefly, telling what St. Francis did on those occasions when it seemed best that by example he should make clear to those concerned what doctrines he believed should govern their conduct, and of repeating what reply was made to those who came to St. Francis seeking information or to question his ideals, the author gives the reader a very impressive picture of this noted religious character. With the devotion of one who is wholly of the same mind and spirit as the subject of his writing, Brother Leo with painstaking accuracy repeats in "what wise the Blessed Francis declared the will and intention which he had from the beginning to the end as regards the observance of poverty" and of "maintaining poverty in books, and beds, buildings and appliances," and "how he did induce and teach his brethren to go forth for alms," thus disclosing what manner of man he was. He recounts instances showing with what unswerving zeal St. Francis carried out to the very limit of perfect example his ideals of absolute poverty in all things, of humility, charity, compassion and condescension. There may be much more to the life of the Blessed Francis than is here given, but the author has without doubt in these pages pictured Francis in the fashion in which he most desired to appear before his fellow-men. It is a book one must read if he would know the real St. Francis and appreciate the ideas and ideals which moved him to fashion his life after the manner of the rules he made for the order that grew up about him.

MIRYACHIT, mēr-yä′chĭt, a peculiar nervous disease prevalent in Siberia and some other countries, the chief characteristic of which is mimicry by the patient of everything said or done by another person.

MIRZA, mēr-zä′, a title of honor in Persia.

MIRZA HUSAYN ALI (Bahaullah), Persian religious reformer: b. Mazadran, Persia, Nov. 12, 1817; d. Acre, May 29, 1892. He was of noble family, joined the Bahai movement in 1850 and was imprisoned during the fierce political and religious persecutions which the sect suffered shortly after the death of Mirza Ali Mohammed. (See Bahai Faith.) His property was confiscated and he himself, with his family, was banished from Persia to Baghdad (Turkey) in 1852. Many Bahais followed him, most of them fleeing from the fierce persecution at home. Mirza Ali organized these into a compact, well-governed and self-sustaining community which soon became wonderfully prosperous, growing steadily in wealth and numbers. He was early looked upon as the great leader foretold by the founder of the faith; and new adherents came from all over Asia to study under him or to join the colony in Baghdad. This prosperity of the colony and the popularity of Mirza Ali, the "Bab" (gate or door), excited the jealousy of the Persian government and church, and the prophet and the whole colony were extradited and brought back to Constantinople. During the exodus, Mirza Ali proclaimed himself the expected prophet and took the name of Bahaullah (Splendor of God), by which designation he has ever since been known among his followers (1864). As the Bahai movement continued to grow with great rapidity in Constantinople, Mirza Ali was banished to Adrianople. Thousands of the faithful followed him there and he was removed to Acre (Palestine), a Turkish penal settlement, with 70 of his most active disciples (1868). They were all subject to the most rigorous imprisonment and treated with great harshness for seven years. At the expiration of this time the Bahais were allowed to form settlements in the town of Acre. To these settlements came people of all sects and creeds, and the penal colony became the center of an intense religious movement which proclaimed the brotherhood of man, the unity of the race and the identity of all true spiritual aims and thought. There Mirza Ali remained from 1868 to 1892, writing his doctrinal books, working out plans for the government of the society and studying moral, social, political and economical questions and applying the lessons thus learned to the illustration of the gospel of the unity of mankind, of religion, of society and of government. He boldly attacked the problems of the day and attempted to solve them through the application of his own religious views. Among

the works of Mirza Ali are *The Hidden Words; The Most Holy Book; The Book of Certainty* and *The Seven Valleys.*

MIRZAPUR, mĭr'zä-po͝or, city, India, in the Benares division of the United Provinces. Mirapur, signifying the Prince's Town, is on the right bank of the Ganges, 45 miles east-southeast of Allahabad. It presents an imposing appearance from the river, with fine ghats leading down to it, and numerous mosques, temples and handsome European houses occupying some of the most conspicuous sites, but the interior is disappointing. It has a large mart for grain, cotton and other raw produce, but with the railway era and the rise of Cawnpore to commercial importance, much of its trade has migrated elsewhere. Shellac, brassware and carpets are manufactured. There are imports of grain, sugar, cloth, metals, fruit, spices, tobacco, lac, salt, and cotton; and exports of the same articles. Pop. (1941) 70,944.

MISAMIS, mē-sä'mēs, former province along the coast of Mindanao, Philippine Islands. In 1939 it was divided into Misamis Occidental and Misamis Oriental (qq.v.). Before 1818, when it was made a separate province, it was a part of Cebu Province.

MISAMIS OCCIDENTAL, ôk-sē-thăn-täl', province, Philippine Islands, on Mindanao. It is west of Iligan Bay, and northeast of Zamboanga Province, and it is separated from Lanao Province in the northwest by Panguil Bay. The terrain of the province is mountainous, the highest peak being Mt. Malindang (7,956 feet). Corn and coconuts are produced. The chief towns are Oroquieta (the capital), Tangus, Jimenez, Ozamiz, and Plaridel. Misamis Occidental was originally a part of Misamis (q.v.), but was made a separate province in 1939. The area is 802 square miles; pop. (1948) 207,575.

MISAMIS ORIENTAL, ō-ryän-täl', province, Philippine Islands, on Mindanao. It is a long coastal strip east of Iligan Bay. It includes Camiguin Island, in the Mindanao Sea. Augusan Province is on the east and Lanao Province on the southwest. On Camiguin Island is the volcanic cone, Hibokhibok (5,620 feet). The soil of the province is fertile, and the chief products are hemp, fish, and coconuts. There are chromite deposits in the vicinity. The chief towns are Cagayan (the capital), Balingasag, Mambajao, and Initao. The province was formed in 1939 from a portion of Misamis (q.v.). The area is 1,512 square miles; pop. (1948) 369,671.

MISANTHROPE, Le, lĕ mē-zäñ-trōp', a comedy of Molière in five acts in verse, presented for the first time in the Theatre of the Palais-Royal, June 4, 1666, when the author was 44 years old, Molière played the title role and his wife the part of Célimène. This play, which is Molière's nearest approach to tragedy, concerns one Alceste, who rails at the insincerity of mankind and yet is in love with a coquette, Célimène — a stroke which art is incapable of without genius. Alceste excites at once our admiration, pity and laughter. An upright and sincere man even to an unreasonable degree, he is made miserable by a letter of Célimène which seems to justify his righteous indignation. Notwithstanding that these fears seem to be well founded, Alceste remains in love with Célimène, but wishes her to withdraw with him from human society — which she, of course, refuses to do. The splendid emptiness of the life in a Parisian salon of the 17th century is placed vividly before us. There is no place for a natural and honest character in such society. Everything is artificial, deceptive and shallow. Molière's own experience had been so painful that the accent of truth pervades his treatment of the character which so nearly resembled his own. His life, saddened by hostile criticism, ill-health and an unhappy marriage, had become embittered, and some have attempted to prove therefrom that Molière himself is the real Alceste. It is true that he revealed more of his real self in this play than in any of his other plays, but he was too much of an artist to depict merely his own character. His unhappy domestic life probably did influence him to some extent, but the germ of the play is to be found in his earlier but unsuccessful play, *Dom Garcie de Navarre* (Feb. 4, 1661), from which he borrowed freely both scenes and verses. The duke de Montausier, the character of Mégabate in Mlle. de Scudéri's *Le Grand Cyrus* and Boileau may also have been, as has been claimed, in Molière's mind in his delineation of Alceste. As a foil for the rigorous Alceste, the author presents us with the indulgent Philinte, who bears with men's faults from the necessity of living among them. So likewise with the coquette is contrasted the virtuous Éliante. The prude Arsinoë, and the marquis, typical of the large class of nobility whom Molière suspected of using their influence at court against him, constitute the other principal characters. Sheridan has imitated a scene of *Le Misanthrope* in his *School for Scandal* and Wycherley has imitated the entire play in his *Plain Dealer,* but in a comparison between the imitation and the original the difference is seen between genius and brutality. The idea behind *Le Misanthrope* may perhaps be best rendered in the words of Philinte: "All these human defects give us opportunity in life of exercising our philosophy. 'Tis the most amiable employment virtue finds; and if every place were full of honesty and all hearts were frank, just and docile, the greatest part of our virtues would be useless to us, since the use of them is placed in this, in the power of bearing the injustice of another in respect to our property, without being ruffled." From this it is evident that Molière in his characterization does not discredit virtue, as such critics as Rousseau and Fénelon claimed, but merely the austerity of virtue not tolerant enough of human weakness. The public of the time was not prepared for such a fine distinction and did not appreciate the humor which reigns throughout. Consequently, in spite of its purity and elegance of style, the play was coldly received. It is said that at the first presentation, after the reading of Oronte's sonnet, the pit applauded, but Alceste afterward in the same scene contended that the sonnet was mere trash, whereupon the audience, through embarrassment at having approved it, became prejudiced against the entire play. Subsequently, it has become to be almost universally acknowledged as the most perfect piece of French comedy and the masterpiece of

Molière. There is an extremely clever translation of 'Le Misanthrope,' with the French text *en regard,* in the fourth volume of the works of Molière published by John Watts (London 1748).

HERBERT F. WRIGHT.

MISCARRIAGE, literally a failure, a going astray. I. A miscarriage of justice is a failure of the law to attain its ends; or a breach of legal duty. Such is the significance of the term as employed in the fourth section of the English Statute of Frauds and in similar statutory provisions in the United States. II. Miscarriage in medical jurisprudence is employed in the sense of abortion (q.v.).

MISCEGENATION, from the Latin *miscere,* to mix, and *genus,* race, a mixture of races. The word is usually applied to the amalgamation of the white and negro races in America, and came into general use toward the middle of the 19th century, when certain publicists advocated absorption of the blacks by intermarriage with whites. Consult Davenport, 'Heredity of Skin Color in Negro-White Crosses' (Washington 1913); Estabrooke & McDougle, 'Mongrel Virginians' (Baltimore 1926). See MIXED RACES.

MISCHIANZA, mĭs-kẹ-ăn'tsą, **The,** in American history, an entertainment given in Philadelphia, 18 May 1778, during the war of the Revolution, by officers of the British army, in honor of Sir William Howe, about to return to England after his supersession. The entertainment was given at the country home of Thomas Wharton and comprised a dinner, dancing, a regatta, mock tournaments and various games. Major André was prominent in planning the entertainment. Consult Sargeant's 'Life of Major André' (New York 1902).

MISDEMEANOR, *in law,* any offense below felony; the least offense by English common law: In the United States, the different States vary widely in defining misdemeanor, so that what is misdemeanor in one State may be indictable felony in another. Among the offenses commonly classed under this heading are malicious mischief, assault and battery, etc.; criminal proceeding on such charges may be dropped, in many States, if the injured party acknowledge satisfaction, which suggests a distinction between felony. The historic line between the two classes of offenses was based on the outcome of conviction; in the case of felony the convicted person forfeited his property, real and personal, if the felony was capital, personal only if the felony was not capital. But no forfeiture of property ensued upon conviction for misdemeanor.

MISE OF AMIENS, mēz, ov ą'mē'ăn', (*mise,* Anglo-French term meaning judgment, from the French *mettre,* to place), is the name given to the decision of Louis IX of France in the controversy between Henry III of England and his barons (23 Jan. 1264). Henry went in person to Amiens to attend the arbitration; but an accident prevented Simon de Montfort from doing the same. Louis had his idea of the dignity of royalty and was too scrupulous not to credit another king with a desire of doing his duty. He, therefore, decided all points in favor of Henry and annulled the Provisions of Oxford and all engagements founded upon them, leaving Henry a free hand to appoint his ministers and to enjoy his royal power as fully as he had done before the enactment of the Provisions of Oxford. See MONTFORT, SIMON DE; HENRY III; BARONS' WAR.

MISE OF LEWES, lū'ĭs, a treaty made by Henry III after the battle of Lewes (14 May 1264), where he was defeated and captured by the Barons under Simon de Montfort. The Mise of Lewes contained seven articles. By the first and second, after a reconformation of the Provisions, a new body of arbitrators was named — the archbishop of Rouen, the bishop of London, Peter, the chamberlain of France, and the new legate the cardinal bishop of Sabina, with the Duke of Burgundy or Count of Anjou as umpire when necessary; the third directs that the arbitrators shall swear to choose only English counsellors; by the fourth the king is bound to act on the advice of his counsellor in administrating justice and choosing ministers, to observe the charters and to live at moderate expense; by the fifth Edward and his cousin Henry are given as hostages; by the sixth is provided the indemnity of the earls of Leicester and Gloucester, and the seventh fixes the next Easter as the time for the completion of the compromise. Peace was declared on 25 May and published at London on the 11th of June. See HENRY III; MONTFORT, SIMON DE; BARONS' WAR.

MISENO, mē-sā'nō, **Cape,** Italy, a promontory forming the west side of the Bay of Pozzuoli (ancient Cumæ), 10 miles southwest of Naples. On it are the ruins of the ancient city of Misenum, destroyed by the Saracens, 890 A.D., which Augustus made one of the principal naval stations of the Romans.

MISERABLES, Les, lā mē'zą'rą'bl, by Victor Hugo, is by universal consent one of the great novels of the world. Heralded since 1854 as designed to be a sort of social gospel, written almost wholly in exile by one whose political intransigence had attracted general regard, the work, extending to 10 volumes, appeared simultaneously in as many languages (3 April to 30 June 1862) and has since been in constant and wide circulation in many lands. It was Hugo's first novel since 'Notre-Dame,' 31 years before. That had been an evocation of the past. Here his eyes were on the present, his heart in the future. To profound compassion for the sufferings of the unfortunate he joined a sturdy faith in the possibilities of moral regeneration and social reform through a realizing sense of human brotherhood. «So long,» he says, in a preface, «as there shall exist, through the fault of our laws and customs, a social condemnation that creates artificial hells in the midst of our civilization and complicates a divine destiny by human fatalism; so long as the three problems of the century,— the degradation of man by the proletariat, the fall of woman by hunger, the arrested development of the child by ignorance,— are not solved; so long as social asphyxia is possible in any place — in other words and in a wider aspect, so long as there shall be on earth ignorance and misery, books like this cannot be useless.» The first of the three problems is here impersonated in Jean Valjean.

the second in Fantine, the third in her unfathered daughter, Cosette.

In structure *Les Misérables* is loose-jointed, discursive, straying too readily into by-paths of antiquarian lore, political reminiscence, philological speculation, scientific conjecture, sociological visions. Hugo is apt to proclaim some commonplace with oratorical emphasis, as though it were a revelation of social salvation. He is apt to overcharge his characters until they become hardly human embodiments of some abstract quality, it may be mercy and forgiveness as in Bishop Myriel, untempered social justice as in Javert, political intransigence as in Enjolras, unmitigated cunning and cruel greed as in Thérnadier. But through all there is a sincere and intense if vague emotion, a deep pulsing sympathy, a splendid indignation at the ignoble and base degradations of outworn institutions and conventions, an unfailing force of moral conviction, a glowing eloquence, that make it easy to pass by, if not to forget, the occasional cyclopean lack of humor and the passages of puerile insipidity that are in strange contrast to others of impassioned and beautiful lyric appeal.

Hugo is a social optimist, often grand, never petty, though sometimes grandiose. Its foibles apart, *Les Misérables* is a noble plea for more practical recognition of the brotherhood of man, for more charity in judging the tempted, the wretched and the fallen. Jean Valjean, whose struggle for social reintegration is the connecting thread of the 10 volumes, is a discharged convict contending against social and legal proscriptions that must have driven him back to the galleys whence he came, had not Bishop Myriel redeemed him with the gift of the silver which he had stolen. He makes himself respected and beloved. But a petty theft remains unexpiated, and rather than see another suffer on account of it he surrenders himself again to prison. But first he lightens the last hours of Fantine, once a symbol of joy, "innocence floating on error," now the dying mother of Cosette, whom she has in desperation consigned to the mercies of Thérnadier and now commits to the heart of Valjean. Here ends *Fantine*, the first of the novel's five parts, to be remembered especially for Bishop Myriel, said to be essentially Monsignor de Miollis, a former bishop of Digne. The second part, *Cosette*, opens with a justly famed picture of Waterloo, whence the scoundrel camp-follower Thérnadier, a plunderer of corpses, had saved for his own base ends Colonel Pontmercy, father of Marius, the romantically predestined husband of Cosette, and apparently reminiscent of Hugo's own. Then it tells of Valjean's life in the galleys and of his escape, how he was pursued by justice incarnate in Javert, how he rescued Cosette from Thérnadier and himself found refuge as a convent gardener, with reminiscences of Hugo's own childhood at Les Feuillantines. *Marius*, the third part, is concerned mainly with the restless political agitation among those dissatisfied with the results of the revolution of 1830. Marius is what Hugo thought he himself might have been. The charm of this part is in the very genial account of the Parisian *gamin*, Gavroche. Part 4, *Saint Denis*, has a brilliant account of the great barricade and riot of June 5, 1832, with the touching death of Gavroche and the first buddings of the love of Marius and Cosette. *Jean Valjean*, the fifth part, is especially notable for its account of the rescue of the wounded Marius by Valjean and their passage through the sewers, of the despairing suicide of the baffled Javert, of Thérnadier's unintentional enlightenment of Marius as to his real debt to Valjean and for the very beautiful picture of the redeemed convict's august end.

Les Misérables has been abridged by O. B. Super (Boston 1903), and well translated by C. E. Wilbour, (*Everyman's Library*, 1909) and others.

MISERERE, mĭz-ĕ-rē′rē; -rā′, (Latin, "have mercy"), the name (taken from its first word) by which the 50th Psalm in the Vulgate (or Latin version) is known, corresponding to the 51st of the authorized version. It is the fourth of the seven Penitential Psalms. The *Miserere* forms part of certain liturgies, and various great composers have taken it as a subject. The *Miserere* of Gregorio Allegri is particularly famous.

The name Miserere is also given to a projection on the underside of the seats of the stalls of mediaeval churches and chapels. They are usually ornamented with carved work, and are so shaped that when the seats proper are folded up they afford a small seat at a higher level sufficient to afford some support to a person resting upon it, and were thus used by priests suffering from bodily infirmity.

MISERICORD, mĭz-ĕr-ĭ-kôrd′, a narrow-bladed Italian dagger used in giving the *coup de grâce* or finishing stroke to a wounded foe. Also the name of a society in Florence, founded in the 13th century, who tend the poor sick, carry victims of accidents or disease to the hospitals, and the dead to their burial.

MISFEASANCE, mĭs-fē′zăns, from the French *méfaire*, to do wrong signifies the doing of a lawful act in a negligent, or improper, manner. Misfeasance is, in some cases, punishable by law. It should be contrasted with malfeasance, the doing of a wrongful act, and non-feasance, the failure to perform a promised act.

MISFORTUNES OF ELPHIN, The, a humorous novel by Thomas Love Peacock (q.v.) published in 1829. A parody of the Arthurian legends, it tells how King Elphin of Caredigion in Wales loses most of his realm, flooded by the sea, how he is imprisoned by a neighbor and rescued by Taliesin, a young bard who enlists King Arthur's help by restoring to him Queen Guinevere, abducted by King Melvas.

MISHAWAKA, mĭsh-ä-wô′kä, city, Ind., in St. Joseph County, altitude 720 feet, 4 miles east of South Bend, and 104 miles east of Chicago, by rail; at the head of navigation on the St. Joseph River; on the Grand Trunk and the New York Central railroad lines; has an airport. In the surrounding country corn, wheat, oats, and rye are grown. Water power generated by means of dams in the river above the city has been used in the local industries, products of which are rubber footwear, raincoats, upholstery, furniture, trunks, aluminum articles, beer, steel and wooden pulleys, drop forgings, and brass castings. Mishawaka has a public library; 12 elementary public schools, one high school, and three parochial schools; six parks and three playgrounds. There was a settlement on this site as early as

1828. Early in the 1930's St. Joseph Iron Works was established on the south side of the river, and a year or two later Indiana City was laid out on the other side. In 1839 the two villages were combined and incorporated as the town of Mishawaka. Incorporation as a city was effected in 1899. The name comes from an Indian village that occupied the site before the white men settled there. Government is administered by mayor and council. Water supply, light, and power systems are municipally owned. Pop. (1940) 28,298; (1950) 32,913.

MISHNA, mĭsh'nà, the first part or text of the Talmud, the second part or Gamara (supplement) consisting of a commentary on or elucidation of the Mishna, which consists of oral traditions and glosses on the Pentateuch, made in Galilee by the Rabbi Jehudah or Judah Hakkodesh, who completed the work 220 A.D. A commentary was rendered necessary by the extreme terseness and conciseness of style with which the Mishna is composed. It is written in Hebrew, but it contains a number of Greek, Latin and Aramaic words, which had become naturalized in the Hebrew, and bears traces also of Aramaic idiom. The traditions set down in the Mishna were held by the Pharisees to be of equal authority with the written law of Moses, and were supposed to constitute an oral law delivered to Moses by God and by Moses delivered to Joshua, by Joshua to the elders, by the elders to the prophets and by the prophets to the men of the Great Synagogue. Such is the statement of the Mishna itself, which the Pharisees accepted. The Sadducees, however, rejected this doctrine, although in many cases they followed in practice "the traditions of the elders" with much fidelity. See also JEWISH HISTORY AND SOCIETY—*The World of the Talmud.*

MISIONES, mē-syō'nās, national territory, Argentina, between the Uruguay River on the southeast and the Paraná on the west, and the Iguassú on the north; area 11,506 square miles. Three low mountain chains radiate from the center, and the greater portion of the surface is covered with forest, producing building and dyewoods, oranges, medicinal herbs and the *yerba maté* or Paraguay tea. The country is well watered and fertile, and there are valuable granite quarries. The Iguassú Falls, 196 to 200 feet in height on the Brazilian line attract many tourists. Maize is largely grown and sugar cane to some extent, and several sugar mills are in operation.

There are interesting and other ecclesiastical remains of the early Jesuit missions. Posadas, the capital, on the Paraná, was founded in 1865. Pop. (1947) 246,396.

MISKOLC, mĭsh'kôlts, city, Hungary, 84 miles northeast of Budapest, on the Sajo River, at the foot of the Bükk Mountains. It has excellent rail and air service. Second in industrial importance to Budapest, it carries on a large trade in wine, tobacco, cereals, and flour. Other manufactures are varied. They include textiles, food products, furniture, shoes, paper, flour, lumber, soap, and bricks. Extensive lignite mining is carried on in the vicinity.

The city has several beautiful Gothic churches, a law school, and a conservatory of music. On Mt. Avar, nearby, are the state-owned vineyards. There are warm springs and baths at Tapolcza about 4 miles southwest of the city. Pop. (1941) 77,362.

MISNOMER mĭs-nō'mĕr, (from the French *ménomer,* misnaming) an error in naming a person in a pleading, deed or other written instrument.

MISPICKEL. See ARSENOPYRITE.

MISPRISION, mĭs-prĭzh'ŭn, (1) the concealment of a crime, as felony or treason; called also *negative misprision.* (2) High misdemeanor or contempt, as maladministration by a public official or inducing a witness to refuse to testify; called also *positive misprision.* Misprision of felony is still punishable in the English law, but is practically obsolete elsewhere. Misprision of treason was formerly punished in England by forfeiture of goods and imprisonment for life, but today the maximum penalty is penal servitude for life. In the United States it is a federal offense, punishable by imprisonment.

MISREPRESENTATION, *in law,* any act, whether verbal or tacit, tending to create or creating a false impression on another, such that by acting upon this impression he is injured. Misrepresentation falls under two heads, deliberate and unwitting. Deliberate misrepresentation is either deceit or fraud. Unwitting misrepresentation is legal mistake, and its treatment by the law depends largely on circumstances, but is unfortunately too much influenced by the principle that "ignorance does not excuse," which should strictly be confined to the application suggested by its original form, "ignorance of the law."

MISRULE, Lord of, a whimsical title given to the leader of the Christmas revels in the Middle Ages. He is a descendant of the king of the ancient Roman Saturnalia who impersonated Saturn. His duties were to lead the multifarious revels of the season; or, in other words, to act as master of ceremonies. John Stow, English historian, in his *A Survay of London* . . . (1598–1603) gives the following account of him: "In the feast of Christmas there was in the kings' house, wheresoever he lodged a Lord of Misrule or Master of Merry Disports, and the like had ye in the house of every nobleman of honor or good worship. The mayor of London and the sheriffs had their several Lords of Misrule ever contending without quarrel or offence, who should make the rarest pastime to delight the beholders. These lords beginning their rule at Allhallows Eve continued the same till the morrow after Candlemas Day, in which space there were fine and subtle disguisings, masks and mummeries, with playing at cards for counters in every house, more for pastimes than for gain."

In the University of Cambridge the functions of the Lord of Misrule were performed by one of the masters of arts who was regularly elected to superintend the annual reproduction of Latin plays by the students besides taking a general charge of their games and diversions during the Christmas season, and was styled the Imperator, or Praefectus Ludorum. A similar Master of Revels was chosen at Oxford. It seems to have been in the Inns of Court in London that the Lord of Misrule reigned with the greatest splendor, being surrounded with all the parade and cere-

mony of royalty, having his lord-keeper and treasurer, his guard of honor, and even his two chaplains, who preached before him on Sunday in the Temple church. On Twelfth Day he abdicated his sovereignty. In the year 1635 this mock representative of royalty expended in the exercise of his office about £2,000 from his own purse; and, at the end of his reign, he was knighted by Charles I at Whitehall. The office was regarded among the Templars as most honorable and was generally conferred on young gentlemen of good family. The Lord of Misrule was always costumed extravagantly and carried a fool's bauble as badge of office. A favorite form for his lordship to enter upon his duties was to absolve the company of all their wisdom, leaving them «just wise enough to make fools of themselves.» Fealty was sworn to the merry monarch and the reign of fun and folly began.

In Scotland this character was called the Abbot of Unreason; in France, he was the Abbé de Liesse and Abbas Stultorum — the Abbot, or Pope of Fools. Scott gives a description of one of these mock-ecclesiastics in 'The Abbot.'

MISSAL (Latin *missale,* from *missa,* mass), the book which contains the prayers, rubrics, antiphons, etc., of the mass. It was formed by comprising in one volume the separate books formerly used in different parts of the service, namely the Oratorium, Lectionarium, Evangeliarium, Antiphonarium, the Canon, etc., for the convenience of the priest. Variations and corruptions in the course of time crept into the text of the Missal, and the Council of Trent suggested a revision of it. This was accordingly accomplished by order of Pius V (1570), who required the new Missal to be used by the whole Church, with the exception of those societies which for more than two centuries had followed another ritual. Subsequent revisions made under Pope Clement VIII (1604), Urban VIII (1634) and Leo XIII (1884, 1898) extended little beyond alterations of single expressions, and the addition of new masses, both obligatory and permissive, universal and local. In the ancient and mediæval Church there were missals in use, varying according to the various rites. Thus, in England, there were missals of the Sarum use, Hereford use, Lincoln use, Bangor use, etc. There are also missals of the Greek Church, the Church of the Maronites and other Christian bodies. The earliest printed missal is the 'Missale per totius Anni Circulum More Ambrosiano compositum' (Milan 1475, folio), which was followed by the 'Missale secundum Consuetudinem Romanæ Curiæ' (Rome 1475).

MISSI (Latin, meaning those sent), name given to officials sent on special errands by the Frankish kings. Their institution dates from Charles Martel and Pepin le bref; but Charlemagne made them a regular part of his administration. Under Charlemagne the *missi dominici* were most important. Into each district of the great empire were sent each year two *missi:* one a lay nobleman and the other an officer of the Church. It was their business to hold court, hear complaints, redress grievances and report all this to the emperor. By this means Charlemagne controlled the courts and centralized the government. The missi dominici disappeared from France and Germany in the 9th century and from Italy in the 10th century. Consult Thompson, J. W., 'Decline of the Missi Dominici in Frankish Gaul' (Chicago 1903).

MISSING LINK, a term used to designate the gap in the scheme of evolution between the ape and man. See Ape; Evolution; Darwin; Pithecanthropus Erectus.

MISSION INDIANS, a general name given the Indians of southern California who in the 18th century were Christianized by the Spanish Franciscan missionaries. The Mission Indians were originally of many tribal families and dialects, but chief among them were the Yumas and the Shoshones. Father Junipero Serra (q.v.) and the other friars who followed him succeeded in gathering the Indians into communities, mission houses and chapels were built and vineyards planted. The work began about 1776 and continued successfully until 1831. In this latter year they numbered 19,000, but with the overthrow of the Spanish power by the Mexicans a period of confiscation and destruction began, which continued to 1840. The friars were banished, the mission abandoned and the Indians driven back to the deserts and the mountains. Under the American rule in California, both Indians and missions were neglected until after the Civil War, when, principally at the instigation of Helen Hunt Jackson (q.v.), the government took steps to care for the unfortunate natives. They now occupy about 30 small reservations, which in the aggregate contain 180,000 acres. The remaining Indians number about 2,600. They are partly civilized and fairly industrious. Within recent years an organization in Los Angeles has endeavored to rebuild the ruined missions and preserve them in remembrance of the historic past. (See Pious Fund). Consult Englehart, Z., 'Missions and Missionaries of California' (San Francisco 1908); Wetmore, C. A., 'Mission Indians of Southern California' (Washington 1895).

MISSION SOCIETY, American Baptist. See Missions, Protestant Foreign.

MISSIONARY RIDGE. See Chattanooga, Battle of.

MISSIONARY SOCIETY, Methodist. See Methodist Churches of the World.

MISSIONS, Protestant Foreign. Foreign missions were not seriously undertaken by Protestants until more than 200 years after the Reformation. This curious fact is sufficiently explained by the circumstances that the reformers were involved at the outset in a struggle not only for liberty but for life itself; that Christendom did not yet control the whole of Europe; an aggressive Mohammedan power with its foot in Hungary and its fleets in the Mediterranean being still active in its purpose of conquest; and that the state alone commanded resources sufficient for enterprises of any kind in remote regions like the Indies, Africa or America. These circumstances of life in Europe in the 16th century materially lessen the importance of the question whether Luther and his followers did or did not see that a Christian Church must die which is not actively missionary in principle.

The first Protestant missions, perhaps naturally, were state enterprises, unless we reckon as a mission the single effort of Heiling (1634) in Abyssinia, which ended with his murder 20 years later. In 1556 the Council of Geneva sent missionaries to Brazil with Coligny's colony, who perished with the colonists. In 1635 the Duke of Gotha sent a mission to Persia, and in 1663 again a mission to Abyssinia; both unpractical embassies were quickly forgotten. The Dutch government, after gaining possession of the East Indian Archipelago in 1602, made a serious effort to Christianize the Malays, and the people of Ceylon and of Formosa, producing permanent results in Java and the adjacent islands of the East Indian Archipelago only. The Dutch government published in 1685 the New Testament in Malay (the second of modern translations of Scripture into heathen languages; Eliot's translation into Mohican in 1663 having been the first), and the whole Bible in 1701. It has also maintained a Malay Protestant Church in Java, the Moluccas and Celebes, which now has about 400 ministers and 250,000 adherents, of whom probably one-half are descendants of the 17th century converts. A similar state missionary enterprise undertaken by a Protestant government of Europe was the Danish mission to South India, founded by King Frederick IV of Denmark in 1706. The king sent out as the first missionaries to Tranquebar, Ziegenbalg and Plutschau, Germans from Francke's school at Halle. Other Germans from the same surroundings followed, notably Schultze and his later associate, Schwartz, making this Danish mission the first serious Protestant mission in India. Ziegenbalg translated the New Testament into Tamil (the third of modern translations of Scripture into heathen language), and before the end of the century from 30,000 to 50,000 Tamils had become Christians.

Another mission maintained by Frederick IV of Denmark was that commenced by Hans Egede in Greenland in 1721, and later transferred to the care of the Danish Missionary Society. This mission Christianized the whole Eskimo population in the vicinity of the Danish trading stations.

The British government showed a similar sense of responsibility for missionary work in its colonies, and the duty of preaching to the North American Indians was laid down in the charters of Virginia (1584) and Massachusetts (1628). Parliament even went so far as to consider in 1648 the endowment of a state foreign missionary enterprise. It voted a grant in aid of the "Society for the Propagation of the Gospel in New England," formed in 1649 and still existing under the name of the New England Company, which educates Indians in Canada with the revenues of the ancient government grant. John Eliot of Roxbury, Thomas Mayhew of Martha's Vineyard, and others through this government solicitude received state support in their missionary work for Indians. The British East India Company, moreover, was required by its charter in 1698 to maintain chaplains at its stations, and to instruct its Hindu servants in Christian doctrine.

All of these state enterprises in the line of foreign Protestant missions were uncertain in method and precarious in stability. They served, at least, to show the possibility of prosecuting missions in the colonies, but were sufficiently barren to suggest the formation of those voluntary societies for missionary effort which proved to be the effective form in which the missionary idea among Protestants was to express itself.

Unsatisfactory religious conditions in the East India Company's trading posts led in 1698 to the organization of the "Society for the Promotion of Christian Knowledge," with the purpose of providing books and schools for neglected English communities, and in 1701 to the appearance of the "Society for the Propagation of the Gospel in Foreign Parts," intended to provide for the religious culture of Englishmen residing in foreign lands. Both of these societies were directed by the Church of England, although voluntary in form and in the sources of their revenues. Neither of them were foreign missionary societies. But the first now publishes books in Oriental languages, and it saved the Danish Mission in South India from dying with its royal founder, and supported it during a century, until it was taken over by the Society for the Propagation of the Gospel. This latter society, too, has gradually taken up the work of evangelizing pagans until it has over 1,000 missionaries in India, China, Japan, Korea, Malaysia, Africa and the West Indies, with nearly 3,500 native clergy and laymen in the various departments of its work. These two societies then, founded about the beginning of the 18th century, may be considered as the pioneers of the voluntary foreign missionary societies of Protestant Christendom.

It was not until the 19th century was about to dawn, however, that a general movement toward missionary enterprises began among Protestants in Europe and America. This movement grew out of that revival of personal religion in the 18th century which was fostered by the writings of Spencer and Francke, the Pietists of Halle, and by the devoted lives of men like David Brainard of Connecticut, and Zinzendorf, the patron and leader of the Moravians, and was stimulated by the exhortations of Whitefield, the Wesleys and Jonathan Edwards, and by the example of the "Unity of Brethren" *(Unitas Fratrum* or *Brüder Unität)* as the Moravians call themselves. The Moravians, not as a church that begs men to volunteer, but as a community in which every member has equal interest in evangelism, were the first decided champions of Protestant missions. They held it the duty of all Christians to tell men what benefits they had received from Jesus Christ. They established missions between 1732 and 1770 in the West Indies, in Greenland, in the Indian settlements of North America, among the Hottentots of South Africa, and in Labrador. They now support 306 congregations with 36,242 communicants and teachers in their various mission fields which include, besides those already named, Alaska, Australia and the border lands of Tibet. The English Wesleyans should also be reckoned with the Moravians as having taken up missions in advance of the general movement of the Protestant churches. They did not formally organize the Wesleyan Methodist Missionary Society until 1814. But in 1779 they employed missionaries among the North American Indians, and in 1786 they began an important work among the slaves of the West Indies. The Society has over 835 missionaries, and

thousands of native workers and teachers in India, Ceylon, South Africa, China, Polynesia and the West Indies.

Before this extension of Wesleyan missions took place a surprising outburst of zeal for the missionary idea appeared almost simultaneously in England, in the United States and on the Continent of Europe. It was a revolution, since formalism had made the Protestant churches almost forget that to be a Christian means to be always in some sense a missionary. The characteristic feature of the movement was its origin in the conscientious convictions of isolated individuals, from whom the church did not expect initiative and whom it sometimes regarded as unsteady enthusiasts. William Carey, a cobbler and a Baptist minister in England, made the first move in 1786 and was frowned down by his elders. But in 1792 his earnest conviction carried the day; 12 men united to form the Baptist Missionary Society (England), and Carey and Thomas went to India as its first missionaries. There is no space here to describe the marvelous activities of Carey and his associates Marshman, Ward and others, at the Danish trading post of Serampur near Calcutta, where they were given asylum when the East India Company refused to tolerate their presence in its territories. The great school buildings which these missionaries erected at Serampur stands today, and their press added to the then slender stock of Bible translations passably good versions of Scripture in 34 Oriental languages and dialects. The Baptist Missionary Society has 480 missionaries and about 2,000 native preachers and teachers in India, Ceylon, China, Africa and the West Indies.

This example was contagious. In 1795 The Missionary Society was formed in London by the union of notable men of four different denominations. Its name was afterward changed to The London Missionary Society. It is now substantially composed of Independents (Congregationalists) alone, and has 480 missionaries and 7,000 native preachers and teachers, in Polynesia, New Guinea, Madagascar, Africa, India and China. In 1796 two similar societies were formed in Scotland which at first aided the London society, but later took up independent work in the West Indies and in South Africa, and finally (1824) became merged in the Church of Scotland Foreign Missionary Committee, of which a later (1843) offshoot was what has now become the Foreign Missionary Society of the United Free Church of Scotland. The Church of Scotland Foreign Missionary Committee now has 120 missionaries and 1,200 native workers, and the United Free Church has 541 missionaries and 5,093 native preachers and teachers in India, China, Africa, Arabia, and New Hebrides, Manchuria and the West Indies. The same impulse led in 1797 to the formation in Holland of the Netherlands Missionary Society. This was first an auxiliary of the London Missionary Society but soon undertook independent work. At present it has over 60 missionaries and 154 native workers in the Dutch East Indies.

The same conviction of responsibility together with realization of the extent and condition of the heathen world led in 1797 to the organization in London of 26 men belonging to the Church of England as the Society for Missions to Africa and the East. This name later gave place to the familiar one of the Church Missionary Society. Among its founders were William Wilberforce, Henry Venn and Charles Simeon; but the Church of England gave the society no encouragement until the successes of nearly 50 years compelled recognition. Hence the first missionaries of this society were commonly Germans; for the most part men of the highest ability and attainments. The fields of the Church Missionary Society are India, Ceylon, China, Japan, Africa, Mauritius, New Zealand, Persia, Palestine, Egypt, the Sudan and the Arctic regions of British North America. It has about 1,500 missionaries and over 11,000 native preachers and teachers.

Missionary enterprises next began to spring up in Germany and in America. The marked characteristic of the movement in every case was the same profound conviction of individuals, commonly not officials of the churches to which they belonged. Five students of Williams College in Massachusetts furnished the initiative that resulted in the organization of the American Board of Commissioners for Foreign Missions in 1810. This was at first an interdenominational society. Its first missionaries, Newell, Judson, Hall, Rice and Nott, were sent to India and were ordered out of the country by the East India Company the moment they landed. Judson and Rice took refuge with the English Baptists at Serampur, while the others succeeded in effecting a lodgment at Bombay and in Ceylon. The fields of this society include India, China, Japan, Ceylon, Africa, the Balkan States, Turkey, Austria, Spain, Mexico, the Philippines and Micronesia. Its missionaries number over 650 and its native laborers 5,000. After 40 years of existence as an interdenominational society, it handed over its missions in Persia, Syria and the Gabun region of West Africa to the Presbyterians, and part of its field in South India to the American Reformed (Dutch) Church, and has become substantially a Congregationalist body. Judson and Rice of the earliest missionaries of this society decided on arriving in India that they would prefer to serve under a Baptist organization and this decision led to the formation in 1814 of what is now the American Baptist Foreign Mission Society of Boston. Burma was the field selected for its first efforts and the heroic work of Adoniram Judson in that land made his name great among modern Protestant missionaries. The society has about 700 missionaries and 8,600 native laborers in Burma, Siam, Assam, India, China, Japan, the Philippines and Africa.

Meantime, in Germany, Jannicke of Berlin, whose brother was a missionary of the Danish Halle band in South India, opened a Missionary Training School at Berlin in 1800. This school during the next 25 years furnished about 80 missionaries to the service of the English and Dutch societies, and served to arouse interest in missions among the Germans. Its influence led in 1815 to the establishment of a Missionary Training Institute at Basel in German Switzerland. The latter institute furnished many admirable men to the service of other societies and in 1822 began to send out missionaries of its own. The fields of the Basel Missionary Society are in India, China and Africa,

and graduates of its institute are pastors of Protestant churches in Turkey. At present it has in the field about 475 missionaries and 624 native workers.

In 1824 10 strong men in the Lutheran Church, among whom were Neander and Tholuck, formed the Berlin Missionary Society; beginning operations, according to the wise continental practice, by opening a training school for missionaries. It began to send out missionaries in 1834 and now carries on missions in Africa and China. It has in the field about 150 missionaries (wives of missionaries not counted) and 1,000 native preachers and teachers. Other missionary societies sprang up in Germany during the first quarter of the 19th century. Of these the Rhenish Missionary Society is perhaps the largest. Its fields were in South Africa, China, Sumatra, Borneo and New Guinea. It has 382 missionaries and 1,340 native laborers. There are a score, at least, of other German missionary societies of which the chief are the Gossner Society, the Hermannsburg, the Leipzig, the North German and the Breklum societies, working in the Dutch East Indies, Africa, India, China, Australia and Turkey.

The same period saw the formation in France of the Paris Evangelical Missionary Society (1824), designed at first merely to aid existing enterprises, but quickly beginning to send out missionaries of its own. At present it has 170 missionaries, men and women, and 1,274 native workers, in Madagascar, Senegambia and the Barotse and Basuto regions of Africa. With the development of French colonial expansion it has also taken the place of the London Missionary Society's missionaries in Tahiti and in parts of Madagascar, and of American missionaries in the French Kongo region. Protestant missionary societies in Holland, Denmark, Sweden, Norway and Finland sprang later from the same causes and are doing good work with 831 missionaries and about 4,000 native workers in Africa, India, China, Chinese Turkestan and Madagascar.

The same spiritual awakening of widespread effects gave rise also to the British and Foreign Bible Society (1804), the American Bible Society (1816), the Netherlands Bible Society, and Religious Tract Society of London (1799) and the American Tract Society of New York (1820). The Bible societies do true foreign missionary work in publishing the Scriptures as soon as missionaries have translated them into the languages of non-Christian peoples and in disseminating the Scriptures in these languages. Some 500 modern translations have been published. The British and Foreign Bible Society employs about 2,000 colporteurs and Bible women and its total issues of Bibles, New Testaments and lesser parts of Scripture amounted to over 11,000,000 copies. The American Bible Society has about 3,582 workers in foreign mission fields and issued in 1925 9,214,423 copies. The Scottish National Bible Society issued in the same year over 2,000,000 copies, besides joining with the first named societies in providing finances for translating and publishing the Bible in various languages.

The tract societies aid missions in a similar manner; providing funds for the publication of undenominational Christian literature in the languages of non-Christian peoples. The Religious Tract Society of London at its centennial anniversary was able to report that it had given for this purpose to English and American foreign missions aid equivalent to $100 per day during the whole period of its existence.

In the second quarter of the 19th century the American Methodist Episcopal Church and the American Presbyterian Church began their missionary work in foreign lands. The two great branches of the Methodist Episcopal Church now have 1,027 missionaries and 8,561 native laborers. The Presbyterians North and South have 1,579 missionaries and 6,866 native laborers. Almost all denominations in the United States and in Great Britain now have foreign missionary organizations of their own. Interdenominational and international missionary societies, like the China Inland Mission, the North Africa Mission, the Christian and Missionary Alliance and other bodies of greater or less importance have been formed to carry on missionary enterprises by methods more free from machinery than the older societies sometimes seem to require. The total number of Protestant missionary societies now existing probably exceeds 500. The World War interfered with collection of statistics, but it is safe to assert these societies have 24,000 missionaries, men and women, and about 110,000 native workers.

Four points are noteworthy, in the history of the development of these missionary societies, as each marking an epoch of expansion of their scope. These are: (1) The adoption of education as a missionary agency; (2) the general adoption by women of mission work for womankind; (3) the establishment of medical missions; (4) the opening of industrial departments in many missions.

1. Education.—The aim of foreign missions is to tell of Jesus Christ to those who do not know Him. The aim is to lead them to surrender self-will to the control of Jesus Christ so completely that converts shall be true Christians, who, if the missionary leaves to-morrow, will stand immovable in their devotion and their impulse to teach others the truth that has benefited themselves. At the outset the task seemed simple enough. To preach and preach again was all that was necessary. As a result of the first half century of experience, the discovery was made that common schools are essential in all missions which urge the reading of the Bible. Rev. Dr. Alexander Duff, a missionary from Scotland who left ineffaceable marks upon India, was a leader in championing the thesis that education in all grades is also an essential department of missionary effort. This principle is now established with all that it means of general enlightenment for backward races, and at present there are in the Protestant missions throughout the world 35,000 educational establishments of all grades from kindergarten to university, attended by about 1,670,000 young people of every form of religious belief.

2. Woman's Work.—As early as 1825 missionaries undertook the education of girls in India, Africa, Turkey and elsewhere. In 1835 a Woman's Missionary Society was formed at Berlin, Germany, for the instruction of women in the East; and later schools for girls were opened in several non-Christian lands by different missionary societies. It was not until 1860 that the women of Christian lands began

to take the matter into their own hands. Beginning with the Woman's Union Missionary Society of New York (1860), mission boards of women were organized in almost all the Protestant denominations of Great Britain, Canada and the United States. These missionary societies of women are for the most part closely allied to the general missionary boards of the denominations to which they belong, but they send out women as missionaries and have produced vast extension of the scope of the missionary enterprise. The impossibility of carrying on successful missions without women missionaries to win and instruct their own sex is now fully recognized. There are thousands of unmarried women working as missionaries in all parts of the non-Christian world. No mission field is so dangerous or so repellent in its barbarism as to be denied the ministering service of devoted women of Christendom.

3. Medical Missions.—At the outset physicians were sent to the missions with the primary duty of caring for the health of missionaries. They could not, however, fail to use their knowledge for the relief of suffering in lands where surgery was unknown and the science of medicine parodied. It was not until about 1885 that the Medical Mission was fairly established as a recognized channel of missionary influence. Since that time the number of missionary physicians, both men and women, and of missionary hospitals and dispensaries has increased every year. At present there are over 800 men and women physicians and surgeons, with 1,638 hospitals and dispensaries in connection with foreign mission fields.

4. Results of Foreign Missions.—It used to be common for critics of missions to picture bewilderment among pagan hearers as a necessary result of denominational differences among missionary preachers. But the gospel preached to pagans by Protestant missionaries of different denominations is one in essence, and the problems of missionary effort in all fields are much alike. Sixty years ago missionaries of different denominations at work in India conferred together on the more efficient prosecution of the common work. The advantage of such conferences was so clear that the solidarity of the different missions may be set down as one result of the missionary enterprise. Conferences between the different missions are now held regularly in many foreign lands. Moreover general conferences of the societies of different nations have been held with notable advantage to the cause of missions. Such was the Conference of London in 1888, the Ecumenical Conference on Foreign Missions held in New York in 1900 and the World Foreign Missions Conference of Edinburgh in 1910. The Latin America Mission Conference of 1916 was a gathering of the same nature which brought together at Panama almost 500 missionaries and friends of missions from 21 nations. An annual assembly of the same class is the Foreign Missions Conference of the United States and Canada which brings together representatives of more than 40 missionary societies. Similar annual conferences are held in Great Britain and in Germany. Fruits of such gatherings are increase of sympathy and comity and diminution of possible causes of friction between different denominations and a steady advance in efficiency and economy on the foreign field. At home this unification of missionary interest has produced such interdenominational enterprises for the support of foreign missions as the Missionary Education Movement, the Student Volunteer Movement and the Laymen's Missionary Movement.

At present the stations of foreign missionaries number about 12,000 besides about 38,000 other places more or less regularly visited. The organized congregations are about 15,400. In connection with these congregations the number of persons in full church membership is nearly 3,000,000. Figures are proverbially uncertain agents for setting forth facts and their meaning. In any general statement such as is here attempted it should be remembered that before statistics can be gathered from the wide areas concerned many of the details will not be up to date. One thing that should be clear to the reader of this article, however, is the widening of the scope of foreign missions since the first fruition of the missionary idea in the modern Christian Church. This expansion of the scope of missions is not due to any modification of their fundamental purpose. It is due to experience of the needs of non-Christian peoples and especially of their need of a future nurture similar to that enjoyed by Christians at home. Let no one forget that no miraculous short cut exists by which a pagan savage can be transformed into a Christian gentleman of culture. The planting of the aspiration is a miracle, but a majority of converts remain children in development. Some may use this fact to belittle the moral change seen in multitudes. The number of converts who do become leaders in the mission churches is not thus to be set aside. Men from the lowest classes have risen through devotion to Jesus Christ to the highest ability, like the slave-boy Crowther of Yorubaland and Constantian of Turkey who became eminent among Bible translators; or like Abdul Masih and Imaduddin of India, whose work among their own people as Christian ministers was that of masters of apologetics; or like Dr. Saleeby of the Philippine Islands, once a village boy in Mount Lebanon, whose fitness for good service was grounded on the instruction received in American mission schools in Syria. The clean and kindly lives of converts in the mission fields, their sincerity and stability influence their people. Of the 150,000 persons received into Church membership in foreign missions annually, it is not rash to estimate one-half as having been won to a serious study of Christianity by the subtle influence of the lives of Christian acquaintances. Furthermore, the high qualities discovered in Christians often produce a gradual moral uplift among those who have not accepted the religious message of the missionary. It is a significant fact that the missionary societies have reported as income from the mission field in a given year $7,902,256. This money came in part, from church collections, but also for non-Christian patrons of mission schools, and patients in mission hospitals. The Bible is widely circulated in mission fields. Some of the people decline to admit its authority as containing the principles of life on which must depend the stability of the universe; but they do regard it as a repository of experiences of men, wise and unwise, through many ages of time. These records sharply touch their own problems of life and

character. In 1915 a Chinese official, not a Christian, bought in Peking several thousand copies of the New Testament in Chinese which he gave to friends and subordinates as containing the noblest scheme of moral conduct which the world has ever known.

Add to such by-products of foreign missions the direct fruits of missionary effort in endowing illiterate languages with alphabet and writings, in purifying literary thought and expression in languages which already have literature, in enlightening womankind, hitherto guarded against culture, in training children and youth, in teaching an industrial efficiency which touches the world's commercial interests, and one gains fuller comprehension of the results of foreign missions. This vast enterprise so reaches the source of social development among those masses with whom is the reserve vitality of every nation that it must be reckoned among the great agencies by which Europe and America are shaping the destinies of backward races throughout the world.

The outbreak of the World War in 1914 created a reaction against Christianity throughout the mission fields of the world which prevailed until the East understood that the British Empire, and later the United States, were both fighting for justice and righteousness and for the rights of unprotected humanity. German foreign missions naturally suffered during the defeat of the nation which had violated a fundamental principle of Christianity, "Peace on Earth—Good will to men," and the interdenominational, international missionary organizations which reached their culmination at the Edinburgh Missionary Conference in 1910 were, for the time, disorganized. The continuation committee there launched had been remarkably successful in binding under one organization the Protestant missionary forces of the world.

By the stand of the British Empire and America, North and South, a reaction occurred which increased the endeavors of Protestant foreign mission work as shown in the statistics presented at the Foreign Mission Conference of North America at Garden City, N. Y., in 1918. Gratifying increase was shown along all lines of foreign missionary endeavor and was best exemplified by the grand total of the incomes of the affiliated societies, representing as far as it was possible to be ascertained the amount given in Canada and the United States for carrying on foreign Protestant missionary enterprise. Of the total amount, $18,500,000 were given by living donors, a balance of nearly $2,000,000 representing the incomes from legacies, endowments and other sources. Exclusive of the income of the societies derived from the mission fields themselves, the total income amounted to $20,400,000 as compared to $16,939,741 in 1915 and $11,946,218 in 1910. Officially advanced by the National Missionary Society of Sweden in a communication to Secretary James L. Barton, chairman of the American National Committee, representing the mission societies of North America, the suggestion is to be acted upon, although many difficulties appear in the way of the achievement: "Whether plans should not be inaugurated by the Protestant missionary bodies of the world to put all foreign work upon a supernational basis so that in case of any future war, no matter what countries were involved, their institutions and their work should remain absolutely undisturbed?"

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MISSIONS, Protestant Home. Home missionary effort in the United States is older than its organized form. Before the War of the Revolution individual churches in New England and New York were sending their pastors, for weeks or months at a time, into the new settlements, to preach the Gospel and administer the ordinances of religion. Connecticut pastors received for this service $4 a week, and $4 more were allowed for the supply of their pulpits, the money being raised by voluntary subscriptions among the home churches. These

desultory efforts continued more or less intermittently for 25 years; they were warmly welcomed by the struggling settlements and were influential in preparing the way for better organized endeavors.

Organized American home missions began with the establishment of the "Missionary Society of Connecticut," 21 June 1798, by the Congregational churches of that State. Massachusetts Congregationalists followed one year later, 1799, with the "Massachusetts Missionary Society." Both of these Societies, bearing the names of the States where they originated, and supported by the States whose names they bear, were not primarily for the benefit of Connecticut and Massachusetts. The object of the Connecticut Society, as stated in its charter, was "to Christianize the heathen (Indians) of North America and to support and promote Christian Knowledge in the New Settlements of the United States." The charter of the Massachusetts Society describes its object as being "to diffuse the Gospel among the heathen (Indians) as well as other peoples in the remote parts of our country." Both Societies, therefore, while local in their origin and support, were truly national in spirit and aim. Other New England States followed the lead of Connecticut and Massachusetts in organizing similar societies; New Hampshire in 1801; Rhode Island in 1803; Maine and Vermont in 1807, all of them under Congregational auspices. They all continue to the present time with but slight changes in name, and with increasing devotion to home missions, State and national. The first organized movement on the part of the Baptist churches was made in 1802, when the "Massachusetts Domestic Missionary Society" was established at Boston, with the same broad object as its Congregational predecessors, namely, "to furnish occasional preaching and to promote the knowledge of evangelistic truth in the new settlements of these United States, or further, if circumstances should render it proper." To the same year 1802 belongs the first systematic effort of the Presbyterians of New York, Pennsylvania and New Jersey, acting under the same broad charter with those of the Congregationalists and Baptists of New England; "to send forth missionaries well qualified to be employed in mission work on the frontiers, for the purpose of organizing churches, administering ordinances, ordaining elders, collecting information concerning the state of religion in those parts, and preparing the best means of establishing a Gospel ministry among the people." Meanwhile the Reformed Church of America had not been idle. Sporadic missionary work began with it as early as 1786, culminating in 1822 in the organization of the "Missionary Society of the Reformed Dutch Church," differing nothing in spirit from its forerunners, but with a wider scope, as it included home and foreign missions under a single organization. Methodist and Episcopal missions, as well as the Lutheran and those of the Disciples of Christ, belong necessarily to a later period.

It is important, historically, to remember that all these early missionary bodies were called into being by one motive and for one object. Barbarism in the new settlements was the common dread of the East, and to prevent such a disaster by pre-empting those rapidly gathering communities with religious institutions was the motive of all early home missionary organizations. At the opening of the 19th century, what was known as the new settlements were found mainly in northern New England, eastern and central New York and northern and southern Ohio, and these were the first points of home missionary attack. The opening of the Northwest Territory and the passage of the Ordinance of 1787 attracted a stream of emigration from the East, mingling with which was a considerable element from Great Britain, Holland, Scandinavia, Germany and Moravia, Belgium and Switzerland. The earlier settlers in New York, Ohio, Indiana and Illinois were generally Protestant in their sympathies, but unable at once, with a new country to subdue and new homes to be built, to provide themselves with the institutions of worship. To the help of these hopeful but destitute settlers came the missionary organizations of the East. Their missionaries were hurried forward to every needy point, not only in the wilds of New York and Ohio, but to the remoter settlements of Indiana, Illinois, Kentucky and Tennessee. They even found their way down the Mississippi to New Orleans and crossed the northern borders to Canada. A specially promising field of effort was a section of Ohio, bordering on Lake Erie, settled chiefly by emigrants from Connecticut and for this reason commonly known as "New Connecticut." At the beginning of the century the tract contained about 1,400 inhabitants. In 1804, it had 400 families; one year later the 400 had become 1,100, one-half of them from New England. In less than 30 years from the beginning of organized home missions 90 churches had been planted, all of them by home missionaries sent out and supported by Connecticut and Massachusetts. To sum up in a sentence the work of the Missionary Society of Connecticut at the end of 30 years, 200 missionaries had been employed whose joint labors were equivalent to 500 years of ordinary service by one man, and 400 churches had been established in the new settlements of the land. With what wear and tear of body, with what sacrifice of comforts in the wilderness, with what patience of hope and courage of faith and labors of love, no words can fitly portray. Not a mile of railroad had been built. The river and the canal, the stage coach, the emigrant wagon and the saddle, were the only conveniences of travel, and to these the missionary added footsore and weary tramps from settlement to settlement. During the same period 125 Puritan churches had been gathered in the growing settlements of New York State, supported in whole or in part by home missionary funds.

All these earlier efforts were marked by a commendable absence of the sectarian spirit. A common danger threatened the nation. The problem presented to the churches of the East was how to overtake the new and rapidly multiplying settlements with the means of Christian civilization. No rivalry entered into the struggle but only a strong sense of the need of prompt, united action. In their love of humanity and of country every thought of denominational supremacy was buried under the all-absorbing issue whether the New America should be heathen or Christian. This spirit was particularly active between Presbyterians and Congregationalists which were then the strongest church bodies in the land; for 50 years, be-

tween 1801 and 1851, they carried on their missionary work in the new settlements under a "Plan of Union," mutually agreed to, by which the churches of either order, wherever formed, might worship in the same house, listen to the same pastor and profess the same creed, while at the same time they were left free to govern themselves by the polity they loved and preferred.

In 1826 Congregational, Presbyterian, Reformed and Associated Reformed churches united at New York City in organizing a National Society. Such change of policy had become necessary. Hitherto, State societies had been doing national work, each in its own way. But several missionary organizations working independently had resulted in an unequal distribution of men and money. Some sections had been over-supplied and others were left destitute. Moreover, the laborers themselves came into conflict with each other. The time had arrived for federation and co-ordination of effort, and to this end the American Home Missionary Society was organized, as above stated, with headquarters in New York City, the various State societies making themselves auxiliaries to the national organization. Perhaps nothing more potential in the progress of American Home Missions belongs to its history than this act. For years the churches making alliance labored together in fraternal unity, contributing to a common treasury and governed by a single board of direction. Receipts rapidly increased, the missionary force doubled and trebled, and instead of being an itinerant preacher, the home missionary became a settled pastor, dwelling among his people. It was only when these allied church bodies had grown strong that they withdrew one by one to organize separate societies, leaving the Congregationalists to inherit the name and traditions of this honored organization. Indeed, it was not until many years later that "American" was dropped from its charter name and the designation of "Congregational" was substituted. Meanwhile the Methodists had organized their "Missionary Society" (national) in 1819, including home and foreign work; the Episcopal Church, its "Domestic and Foreign Missionary Society," in 1821; the Baptists, their "American Baptist Home Mission Society" in 1832, also national; the Lutherans, their "Home Missionary Society of the General Synod" in 1845, and the Disciples, their "American Christian Missionary Society," in 1849. The Southern Presbyterians, Southern Baptists and Southern Methodists have also their home missionary organizations which are doing a great religious work in the Southern States. Thus, by natural evolution, all the leading Church bodies of America have gradually become organized for home evangelization and a movement, which began in 1798 for the Christian enlightenment of the new settlements, has developed into a system as broad as the national domain, by which the stronger churches of the land are sharing the burdens of their weaker brethren and strengthening those forces of Christian civilization upon which the safety of the nation depends.

The purchase of Louisiana (q.v.) in 1803 imparted a mighty impulse to the missionary movement. That expansion gave us the mouth of the Mississippi and undisturbed possession of its entire course. It carried our western boundary from Lake Superior to the Rocky Mountains, doubling the national area by a stroke of the pen. Fourteen States and Territories have been carved out of the Louisiana Purchase. They include the great corn and wheat belts of America, and their underground treasures are among the richest of the world. Emigration from the East and Middle West began at once and has reached enormous proportions. It is rivaled in volume only by the millions of foreign birth that have poured and are still pouring into this new and mighty West By these movements a great missionary problem was presented which the organized home missionary army welcomed with zeal and have never wearied in their efforts to solve. The order of missionary progress through the Louisiana Purchase was strictly along lines of immigration. There is not a State in that vast tract which the home missionary did not enter while it was yet a Territory, and always in the first and feeblest stages of settlement. From Missouri to Iowa, from Iowa to Minnesota, Kansas and Nebraska, thence to the Dakotas, and on from these points to Wyoming, Colorado and Montana, and last of all, when the door was opened to Oklahoma, until every State in this imperial purchase has been leavened with Christian institutions. Something of the volume of this work may be gathered from the fact that in 1916 over 30,000 Protestant churches were enumerated within the Louisiana Purchase, holding property to the value of $80,000,000 and having 2,700,000 communicants, and, with rare exceptions, this church growth is the fruit of home missionary culture, begun, maintained and supported until the need ceased, by the missionary revenues of these Eastern societies. The same process was repeated when about midway in the century the Oregon Treaty made sure our possession of the Northwest and the discovery of gold opened the Californias to the world. Home missionaries ordained in the East promptly started for the Pacific Coast reaching their fields by the way of Cape Horn and the Sandwich Islands. The strategic positioin of the far West and Northwest as related to the work of foreign missions in China and Japan was keenly appreciated by the churches and their missionary boards at the East. Money was contributed freely and many of the ablest preachers of the East went forth cheerfully to lay the foundations of Christian society on the sunset shores of the republic. "The Mexican Cession," including Texas, New Mexico, Arizona and Utah, was another belt of peculiar missionary need, which in spite of ancient superstitions and modern delusions has proved a rich field of rewarding home missionary effort.

The close of the Civil War introduced, at the South, a home missionary problem that was absolutely new, and which continues to absorb the interest of Northern churches to an extraordinary degree. Four million slaves were suddenly set free. Government opened its bureaus of relief, and the churches of the North through their missionary boards, hurried forward preachers and teachers. The greatness of the opportunity quickened the home missionary spirit of the whole country. Several of the boards opened freedmen's departments and the churches magnified the privilege of responding to their appeals. To the missionary, himself,

there was in this call an element of peril which, so far from deterring him, only stimulated his zeal. The Yankee preacher and teacher were not well received at first by the white South. Social ostracism was not the only penalty they had to face for their devotion. Violence to their persons and destruction of their property were not infrequent in the early years of this missionary endeavor. An ugly spirit of caste included the negro teacher with the negro and young women delicately reared in the best homes of the North suffered from neglect or open indignity. These conditions have mostly passed away; respect and even gratitude, on the part of the South, have been won, as the fruits of this vast home missionary effort have become more apparent. These fruits appear not only in organized churches for the negro race, but in a long array of universities, colleges, academies, normal, common and industrial schools, planted exclusively for the benefit of the blacks, all of them specifically Christian, and all of them originally supported by the free-will offerings of Northen churches. Howard, Hampton and Fiske, Atlanta and Tugaloo, Talladega and Straight, Shaw and Richmond, Wayland and Leland, Nashville and Bishop, and a host besides, are names as familiar to the educational world as Harvard, Yale or Princeton. They are all the fruit of negro emancipation and all of them are the creation of home missionary interest and enterprise.

It was in 1840 that foreign immigration began to attract the attention of the friends of home missions. Up to that time its entire volume from all sources had not exceeded 500,000. Then began the flood. During the next 30 years the country received about 6,000,000 foreigners. Driven by famines and oppressions at home and drawn by the opportunities of labor in a new country and by our generous homestead laws, they were arriving, for continuous years, at the rate of 500 to 1,000 per day. Between 1865 and 1885 more than 7,000,000 were added to our foreign population, which means that in these 20 years foreign immigration exceeded that of the entire previous record of the country. It is needless to say that, as this vast problem began to be measured and sanely comprehended by the churches, the appeal of home missions was almost revolutionized. Hitherto that appeal came from our own people and often from our own kin. To follow close after them on the westward trail and to stand with them in planting the church and the school had been for years the whole of home missions. While this feature has never lost its claim and probably never will, another claim has entered to divide the attention and concern of the churches. To the peril of domestic heathenism has been joined the larger fear of imported barbarism, and thus for many years foreign missions at home has come to be a distinct interest of American home missions. All branches of the church have taken part, through their organized societies, in this effort to Christianize the alien. No nationality has been overlooked; Germans and Scandinavians, Bohemians, Poles and Russians, Hollanders and Hebrews, Spanish, French, Italians, Armenians, Chinese, every sort and condition of foreigners, however forbidding or hopeless, has been made the object of home missionary culture, with results that have astonished the most sanguine believer and rebuked the most despairing doubter and which have all but silenced the prophets of evil who predicted the direst consequences from the infusion of so much foreign blood into the moral, social and political life of the nation. Many times over it has been demonstrated that every grade of foreign immigrant is susceptible to religious development and is entirely capable of being both civilized and Christianized, and is in fact being rapidly assimilated, through the agencies of education and religion, into the best types of American life. Great migrations are not feared to-day as they were in 1840. Fears have been quieted and the native American stock have come to view with less and less alarm what 50 years ago almost crazed them with apprehension.

To attempt any adequate summary of the results of home missions at the end of 150 years would require a survey of the development of 50 States and Territories so vitally have the home missionary and his work entered into the beginnings and the early history of all our Commonwealths. A few salient facts must suffice. The vitality of the home missionary idea has shown itself, first of all, in the growth of organizations. Beginning in 1798 with the Connecticut Missionary Society it has multiplied itself into more than 30 home missionary bodies, all Protestant, all evangelical and all national. These organizations have collected and disbursed $150,000,000. Their chief agent has been the Church, with its ordained preacher and its divinely appointed ordinances, and for the Church, these millions have been given. This total, however, takes no account of co-operating agencies, which have been called into being to serve the missionary work of the churches. Add these: Sunday school planting; Bible and tract printing; church building and Christian education; which by careful inquiries are found to have expended $150,000,000 more, and the grand total for home missions, root and branch, in organized form, is $320,000 000. Not a dollar of this immense fund has been *paid* in any commercial sense for value received. All of it has been *given,* a free-will offering of Christian people to mark their intense conviction of the peril of a nation without the Gospel and their supreme faith in its leavening power. What have these millions accomplished and what of visible fruits remain to justify their cost? It is a fact not generally known, and when known not sufficiently appreciated, that the great evangelical bodies of the United States trace most of their church organizations directly to home missions. Congregationalists admit that four-fifths of their churches are of home missionary origin. The proportion would be larger but for the fact that hundreds of their churches were born before home missions began. Presbyterians confess that nine-tenths of their churches are of home missionary planting. Baptist, Methodist and Episcopal estimates range from five-sixths to nine-tenths. Such ratios can mean but one thing: that these far-spreading ecclesiastical bodies have become strong in church power, not by their own help, but by home missionary aid, the few, strong, bearing the burdens of the many, weak, and they answer the inquiry which suggests itself at once to a thinking mind: where and what would these ecclesi-

astical establishments be to-day but for the helpful agency of organized home missions? To the credit of home missions, therefore, should stand the undoubted truth, that an overwhelming majority of the evangelical churches of America owe their being to its nurture and care. What does such a fact mean in the religious development of the country? In the year 1800 the United States had one evangelical communicant in 14.50 of the population. In 1850 that ratio had grown to one in 6.57; in 1870, to one in 5.78; in 1880, to one in 5; in 1890, to one in 4.53, and in 1900, to one in 4.25. In other words, evangelical church membership increased three and one-half times faster than the population in less than 100 years. Between 1800 and 1890 population increased 11.8 fold; in the same period evangelical church membership increased 38 fold. To these figures Dr. Daniel Dorchester, their compiler, adds the comment: "This exhibit of religious progress cannot be paralleled in the history of God's kingdom in any land or any age." It is only 140 years since Voltaire in Geneva declared: "Before the beginning of the 19th century Christianity will have disappeared from the earth," and it is less than 100 years ago that American infidels were prophesying that the Church would not survive two generations in this country. In defiance of these dismal auguries the average yearly increase of evangelical communicants has fulfilled the prophecy of a larger average than ever for the 20th century. It is no vain boast, therefore, but the obvious truth, that by far the larger part of this remarkable growth is due to the direct agency of American home missions, since in its own carefully planted gardens most of this growth has taken place.

Consult Leonard, D. L., *A Hundred Years of Missions,* 3d ed. (New York 1913); Latourette, K. S., *A History of the Expansion of Christianity,* 7 vols. (New York 1937–1945).

MISSIONS, Roman Catholic. Missions and missionaries are words derived from the Latin verb meaning "to send," apostolate and apostle being derivatives of the corresponding Greek verb. In the Catholic Church all works contributing to the external growth of the Church are accomplished by a commissioned personnel (that is, by persons sent), and are rightly called missionary. The establishment of the church and the fostering of its growth among non-Christians is the principal work of foreign missions; the promotion of the expansion of the church among non-Catholic Christians, that of home missions. The Code of Canon Law (Canon 1350) places direct responsibility for foreign missions on the pope; for home missions, on the bishops and parish priests in their respective territories.

Foreign Missions.—Jesus Christ, Himself an apostle (Hebrews 3:1) and the divine prototype of all missionaries, established the foreign missions when He laid on the church the task of giving to men, for all of whom He shed His blood, the opportunity to become the sons of God, and He promised His church that He would be with her as she carried out this order (Matthew 28:18-20; Mark, 16:16-20). The church ever makes her own St. Paul's words, "Woe to me if I do not preach the gospel!" (I Corinthians 9:16).

Mission history began on the first Pentecost. The first missions were undertaken by, or under, the apostles, and in these missions Paul, the Apostle of the Gentiles, won undying fame. Even in its earliest years the church did not restrict its mission to the Roman Empire, but the history of the missions outside the empire is obscure and they led to no great and lasting results. The empire was prepared by God to be Christianity's first home, and the Catholic Church was Roman from the outset. Christianity grew as a religion of cities which quickly adapted itself to the imperial framework. The Roman Church derives its primacy from the residence and death of the prince of the apostles in Rome, but it was Rome's position as the imperial capital that, under divine guidance, attracted St. Peter and made the church in the capital the center and headquarters of the new religion.

By the time of the Edict of Milan (313) there were perhaps 4 million Christians in the empire, and Armenia had become the first officially Christian state about 300. By 400, Christians numbered about 10 million in the empire, and there were scattered groups of Christians on its Asiatic and African fringes. Up to 313, Christian missions had had to meet popular and official opposition and often severe and prolonged persecution; after that date they received some aid from the Christian emperors. We have no precise information about the activities of the early Roman bishops in the work of converting pagans, but it is probable that they played a large part in the direction of this work in proconsular Africa and parts of Gaul and the Balkans, as well as in peninsular Italy. There were professional missionaries throughout this era, but most converts were made by the local clergy and Christians, Christian expansion being largely due to personal contact with pagans who were brought to the church by the example of their Christian friends and neighbors. The conversion of Ireland (432–461) by St. Patrick was a mission conquest outside the empire, noteworthy in itself and for the mission history of the future. The Irish mission was neither initiated nor inspired by Rome, but St. Patrick had authority from Rome to organize the church in Ireland. He showed great tolerance for native customs, especially in his adaptation of monasticism to Irish life. Irish monks are found in the following centuries as missionaries in all parts of the West, generally on their own initiative and without a special mission from Rome, which had only to record their victories.

The Roman Empire of the West, long in precarious condition, fell in 476. The church was then ready to play its part as educator and mother in Christ to the barbarian peoples, some of them already Arian Christians. The baptism of Clovis, king of the Franks, in 496, may be said to mark the beginning of the medieval missions. It was also a symbol of new methods for new times in which the baptism of kings and princes would often result in the incorporation of whole nations and tribes in the church. The medieval missions won the young peoples of Europe to the church, the missionaries being usually monks, Celtic or, more often, Anglo-Saxon and Frankish. England was the first nation to be converted by missionaries sent by a pope (Gregory the Great, 590–604), and following a papal plan. Rome also directed the work of later Benedictine missionaries, notably that of the greatest of them, St. Boniface. They often owed their missionary opportunities to the

military conquests of Frankish monarchs, a means of enlarging her borders which the church merely tolerated, knowing that, if baptism could be imposed by force, no compulsion could produce faith. Thus, even after mass baptisms, the mission work of instruction had to go on. The medieval European missions, completed in the 13th century, were characterized by great organizing genius and wise consideration of national customs.

The West had been cut off from the Far East by the rise of Islam in the 7th century and by the later schism of the Oriental churches. And Islam, not content to bar the way to the East, to destroy Christianity or gradually to reduce Christians to impotent minorities in Asia Minor, North Africa, and Syria, had threatened the European church itself with extinction. The counterattack of Christian Europe, the Crusades, did much to rouse the missionary spirit in Europe by making the Middle Ages aware of vast and populous regions untouched by the gospel. The great new orders, the Franciscans and Dominicans, proved most sensitive to the new opportunities. The medieval popes zealously fostered mission work in Asia. Intrepid missionaries like the great Franciscans, John of Montecorvino (1246–1328) and Odoric of Pordenone (1286–1331) reached China by the land route, and the archbishopric of Peking, erected in 1307, at one time counted about 100,000 Christians. These heroic missionaries penetrated to hitherto inaccessible regions such as Ethiopia, Persia, Tartary, and China; and though they failed, through no fault of their own, to establish the church permanently in these regions, in them we can detect the beginnings of modern Catholic missions, in their awareness of the need of study and preparation and of discovering points of contact with the peoples to be evangelized. Unfortunately, Christian Europe in the 14th and 15th centuries was torn by schism, heresy, and war, and the foreign missions suffered, as they always suffer, from the decadence and low spiritual vitality of the home church. The missions of China were ruined by the triumph of the Ming dynasty over the Mongols in 1368, and those of Persia by the Mongol invasion under Tamerlane (Timur) whose conquests closed the land route to the East.

Events soon made this unimportant. In 1415, the Portuguese capture of Ceuta bottled up the Barbary corsairs in the Mediterranean and made the Atlantic a Christian ocean. Christian naval exploration, partly of mission inspiration, culminated in the Spanish discovery of America in 1492 and the Portuguese discovery of the sea route to India in 1498. Vast new fields were thereby opened to Catholic missions over which, by papal concession, Spain and Portugal exercised a kind of monopoly in their respective domains. In America the missionaries, at first mainly Franciscans and Dominicans, received great assistance from Spanish authorities and colonists, although the ruthless cruelty of the latter in their dealings with natives often brought them into conflict with the missionaries, especially the great Dominican Bartolomé de las Casas (q.v.). The work of evangelization, often quite superficial in the early period, was achieved in an astonishingly brief period. The Holy See took an active interest in these missions and repeatedly, though without great success, intervened to protect the rights of the natives and to insist on the formation of a native clergy and the thorough instruction of the new Christians.

In the Far East, Christianity met almost everywhere with opposition from pagan rulers, and the church was founded and maintained only at the cost of much blood. Here again the earliest missioners were Franciscans and Dominicans. But the Jesuits, who were also engaged in heroic mission enterprises in North and South America and in Africa, especially distinguished themselves for far-flung and carefully planned missions. St. Francis Xavier (q.v.), whose brief decade (1542–1552) as a missionary in the East immortalized him, became to Catholic missionaries a model and a patron. Jesuit missionaries of all nations succeeded, by their scientific preparation and prudent zeal, in opening up China, Japan, Annam, and the lands of the Great Mogul to the gospel. The Philippines were almost completely evangelized during this period. The missions in Japan made wonderful progress until they were checked by the fierce persecutions which almost put an end to Japanese Christianity. The missionaries of this period, Jesuits and others, in the Far East, Africa, and the Americas, were ambitious and bold planners who showed incredible courage in trying to realize their plans.

By 1750 it was obvious that the missions were in a decline. This began much earlier with conflicts among the missionaries themselves, caused partly by the rivalries of European nations and partly by disagreement regarding certain methods of evangelization and of adaptation to native customs. Many other causes contributed to this decline: the lowered prestige of the Catholic nations, the loss of their sea power, the anti-religious spirit which then pervaded Europe and made deep inroads in the church, affecting the missionary societies, and leading to the suppression of the Society of Jesus in 1773, to the French Revolution, and to the long European turmoil that followed it. By 1800 about 1,000 aging missionaries were desperately trying to keep a little life in their dying works.

Twenty years later, although the number of missionaries was possibly less, the tide had turned. A new missionary era had begun, an era of ever-improving communications, of the revival and foundation of missionary orders and societies, of the re-establishment of the Society of Jesus. France took over the first place in Catholic missions from Spain and Portugal. Italy, Germany, Belgium, Holland, Ireland, and other countries supplied increasing numbers of missionaries, although in 1940 one fourth of the total personnel of Catholic missions was still furnished by France. In the 20th century, the church in the United States began to play a part in the missions of the Catholic Church. Many American religious communities undertook foreign missionary work, European missionary societies started American branches, and the Catholic Foreign Mission Society of America was founded at Maryknoll, N. Y. American Catholic missionaries, a mere handful before 1918, were about 3,000 in 1943, three times the total number of Catholic missionaries in 1800. To realize what was accomplished in this era, it is enough to contrast the 80,000 missionaries (priests, brothers, and sisters) of 1940 with the 1,000 of 1800, or to realize that the growth of the church in China alone between

1900 and 1940 was greater than its growth in the Roman Empire in the first 300 years of its history. And in 1940, despite the temporarily crippling effects of World War II, there was good reason to be optimistic about the future of the missions.

The territories of Catholic missions are under the supreme authority of the pope who, since 1622, administers them through the Congregation of Propaganda, a department or ministry for the missions headed by a cardinal prefect who is assisted by other cardinals and by numerous officials. This congregation determines territorial divisions (about 650 in 1940), appoints their personnel, supervises the activities of the missionaries, advises them on missionary problems, and acts as a clearing house for all problems from the mission world which it has not the authority to settle. But Propaganda territory is not exactly coterminous with mission lands. Some countries under Propaganda are not really missionary, and some regions, ecclesiastically under the Consistorial or Oriental Congregations or that of Extraordinary Ecclesiastical Affairs, are in reality missionary. Mission territories are usually ruled by vicars and prefects apostolic, the former being almost always bishops. In most larger territories the pope is represented by an apostolic delegate. Most missionaries belong to religious orders or societies. In 1940 there were engaged in the foreign missions about 70 such communities of priests, 30 of brothers, and over 450 of sisters, as well as an army of catechists and other native lay assistants.

The great progress of Catholic missions since 1800 owes much to the personal interest of the popes. Gregory XVI (1831–1846), a former cardinal prefect of Propaganda, began a tradition of papal attachment to the cause of the missions which did not decline under his successors, Pius IX, Leo XIII, and Pius X. It was more intense, or at least more manifest, during the reigns of Benedict XV (1914–1922) and Pius XI (1922–1939). Both of them wrote important missionary encyclicals, to rouse Catholic interest and support in the missions, to revise certain aspects of mission work, to recall the great missionary traditions and principles of the church concerning solid instruction of converts and the importance of early and vigorous efforts to form a native priesthood and episcopate, to recommend sympathetic appreciation of national traditions and customs, and accommodation to them in all lawful ways. Pius XI, in the secret consistory of May 23, 1923, declared the work of the missions the greatest and holiest of all Catholic works, and sponsored a great Mission Exposition at Rome. In 1923 he nominated two natives of India as bishops; in 1928 he personally consecrated six Chinese bishops in St. Peter's; in 1929 he consecrated a Japanese; in 1933, three more Chinese, one Annamite, and one Indian. Pius XII continued this policy: in 1939 he consecrated native bishops for China, India, Uganda, and Madagascar and in 1946, in his first consistory he elevated a Chinese, Bishop Thomas Tien of Tsingtao, to the cardinalate.

A notable feature of Catholic missions in the modern period is the scientific study of the missions. The first scientific Catholic mission periodical, the *Zeitschrift für Missionswissenschaft* (1911–1937), was edited by Dr. Joseph Schmidlin (1876–1943), professor of church history and missiology at the University of Münster. As director of the International Institute for Scientific Mission Research in the same university, he aided the publication of the monumental bibliographical work, the *Bibliotheca Missionum* (13 volumes in 1945), by the Oblate Fathers, Robert Streit and Dindinger, as well as the two collections, the *Missionswissenschaftliche Abhandlungen und Texte* (14 volumes) and the *Missionswissenschaftlichen Studien* (7 volumes). The review was carried on under another title and with a somewhat different purpose from 1938 to 1941. Dr. Schmidlin died under Nazi torture in the concentration camp at Schirmeck. In France, Georges Goyau (1869–1939), perpetual secretary of the French Academy, was a pioneer and moving spirit in this field. From 1924 to his death he was one of the editors and principal contributors of the *Revue d'Histoire des Missions,* and from 1926 he held the chair of mission history in the Catholic Institute of Paris. In 1933 two Roman universities, the Gregorian and the Propaganda, opened missiology faculties. In 1944 the University of Fribourg, Switzerland, opened an Institute of Mission Studies, and in 1945, in close connection with this institute, a new review, the *Neue Zeitschrift für Missionswissenschaft,* was started. Other Catholic universities have chairs of missiology, the most important of these being perhaps that of Louvain, Belgium, held by the Jesuit, Father Pierre Charles. Under his direction also are held the annual Louvain Missiology Weeks which have deservedly won fame for their scientific and fearless discussion of mission methods.

All Catholic missions under Propaganda receive some support from the Society for the Propagation of the Faith, founded in 1822 at Lyon, France, as an international association to assist Catholic missionaries by prayers and alms, and since organized in most Catholic dioceses. Since 1922 the general headquarters of the society is in Rome, the secretary of the Congregation of Propaganda being president of the superior council. Other international organizations which seek to arouse Catholic interest in missions, or in some special aspect of them, are the Missionary Union of the Clergy, the Society of the Holy Childhood, and the Society of St. Peter. The proportion of Catholics actively interested in mission work cannot be accurately estimated, but it increased sufficiently in the 20th century to bode well for the spiritual life of the church at home. For the missions not only reflect the vitality of Catholicism in the lands that send missioners, but the sending church is always enriched and uplifted by its own interest in the foreign missions. Any association with mission work is an incentive to zeal and the spirit of sacrifice, and a healthy reminder of the true nature of the church and of the duty of her children to assist the non-Christian three fifths of mankind to know Christ and His salvation. Catholics cannot but benefit by coming to know the story of Catholic missionaries who have written some of the most glorious chapters in the annals of the church and of humanity.

Home Missions.—Responsibility for the expansion of the church in non-missionary regions lies, as noted above, with the bishops and parish priests. Here it must suffice to describe the

missionary work within the United States. The need of an organized effort to present Catholicism to American non-Catholics in its true light led to the foundation of the society known as the Paulist Fathers (q.v.) in New York in 1858. The Paulist method of apostolate was given its definitive form by the Reverend Walter Elliott in 1893 when he began in public halls and churches in Michigan a series of missions to explain the doctrines of the Catholic Church. These missions, while they made a point of eschewing controversy, invited inquiry by providing at the door a Question Box for the questions of those whose interest was aroused. This mission technique, later used by many others besides the Paulists, achieved great success, not so much in winning converts to the church, as in creating in non-Catholic America a more sympathetic, because more enlightened, attitude toward the Catholic Church, in eliminating absurd but sincerely held misconceptions about its nature and aims, and in lessening friction between the church and other Christian groups. In 1917, David Goldstein, a layman who was a convert from Judaism, began on his own initiative to travel from coast to coast by automobile giving street-corner talks on the Catholic Church. The Catholic Evidence Guild, originally founded in England, and later organized in many American cities, provides trained speakers, mostly laymen, to present Catholic doctrine to outdoor audiences on street corners and in public parks. Outstanding American Catholic orators such as Msgr. Fulton J. Sheen and Father James M. Gillis, have regularly presented Catholic teaching to large radio audiences. These sermons, though they are entirely unpolemical, have brought many to a better understanding of the church and led some to join it.

These forms of home missionary effort are especially, though by no means exclusively, concerned with reaching the non-Catholic populations of cities and towns. But it is in rural America, especially in the South and West, that the Catholic Church is least known and least understood, as may be judged from the fact that in 1938 out of 3,070 counties in the United States 1,000 had no resident priest. A pioneer in the rural apostolate was Father Frederick Price of North Carolina, later cofounder of Maryknoll, who labored from 1886 to 1911 among the rural non-Catholic population of his native state with a zealous enthusiasm which inspired many later missionaries in the same field. In 1905, Father (later Bishop) Francis C. Kelley founded the Catholic Church Extension Society to aid in building churches and chapels in poor missionary parishes. This society built and operated a railroad chapel car from which missions were given to non-Catholic audiences in many small towns and villages. It was the model of the later motor "church on wheels," equipped with an altar, public address system, moving picture projector, and accommodations for missionaries. This motor chapel has been widely used, especially for summer campaigns conducted by various groups of priests and seminarians in many sections of rural America, further instruction of interested non-Catholics often being carried on by correspondence.

Through these seasonal campaigns a number of converts have found their way into the Catholic Church, but their success consists mainly in dispelling ingrained prejudices and thereby creating an atmosphere in which Catholic claims may hope to receive impartial, if not sympathetic, consideration. For more lasting and greater results, the actual establishment of the church with resident priests in the rural districts seems indispensable. This conviction led the Reverend Howard Bishop, a priest of the archdiocese of Baltimore, to found in 1939, under the patronage of the archbishop of Cincinnati, the Home Missioners of America. By 1944 this numbered 10 priests, 14 students, and 3 brothers, and with it was associated the Women's Missionary Society, a group of 6 young women. As the first field of their apostolate, the Home Missioners took rural areas in southern Kentucky and southern Ohio, and in these they began to apply, with adaptations called for by the conditions, the methods commonly used in Catholic foreign mission work. Besides this new society, exclusively devoted to the home missions, there are many other missionaries, members of religious communities of men and women and diocesan priests, permanently engaged in the work of the apostolate in rural America.

NEGRO MISSIONS

A special field of great importance for the home missions is represented by the Negro inhabitants of the United States. Negro Catholics in 1944 numbered 313,000 (103,000 in the North) out of a total of 13,000,000, of whom 7,000,000 were without church affiliation. In the same year there were engaged in Catholic activities for the Negroes 558 priests (18 Negro), 3,000 sisters (471 Negro), and 24 brothers (8 Negro). One community of priests, the Josephites (Society of St. Joseph of the Sacred Heart) is exclusively devoted to the apostolate for the Negro; there are four communities of Negro sisters, and one seminary for Negro students for the priesthood, the latter conducted by the Society of the Divine Word.

The American Board of Catholic Missions, the president of which is the archbishop of Chicago, distributes financial assistance to all forms of home missions. The Indian and Negro missions have received valuable financial aid from Mother Katharine Drexel, foundress of the Sisters of the Blessed Sacrament for Indians and colored people, who has devoted her life and her fortune to missions to these two races.

The phenomenal growth of American Catholicism, due, of course, in great part to immigration and the natural increase of the Catholic population, nevertheless owes much to the various forms of home missionary work. *The Official Catholic Directory* for 1945 gave the number of converts to the Church in the previous year as 84,908. There are no statistics to show how many conversions can be traced to the various missionary works of the church, and the things that awaken the first interest of future converts are manifold and often quite unrelated to any organized attempt to arouse it. But the results of home missionary work are gratifying, especially in view of the difficulties of the work and the relatively small number of workers.

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CATHOLIC INDIAN MISSIONS OF THE UNITED STATES

Colonial Period.—Catholic priests accompanied the Spanish and French explorers of what is now the United States and set up missions in connection with the earliest military and commercial posts. Mission foundations which were to have a certain permanency were organized in Spanish Florida in 1549; in New Mexico in 1598; in Texas in 1659; in southern Arizona in 1700; and in California in 1769. Numerous missionary establishments grew up from these beginnings and extended from Georgia and Florida to the West Coast. At its highest estate, Spanish Florida had 20 missions to which 40 missionaries and 26,000 Christian Indians were attached; Texas had at one time 14 mission centers and 15,000 Indian converts; New Mexico had 25 churches in 1630 among the Pueblos and Hopis, and 25,000 of these Indians were under the influence of the missionaries; the 21 California missions were homes and centers of adult education for 30,000 Indian converts by the year 1828; the early Pima missions in Arizona consisted of only four resident missions but exercised a large and lasting influence. The Florida missions came to an end with the British conquest of this area, and the Christian Indians were either exterminated or dispersed. The Texas and California missions were secularized by the Spanish and Mexican governments in the early 19th century and almost all of their civilized converts rapidly disappeared before the advance of American settlement in these states. The mission work has been uninterrupted in only New Mexico and Arizona. The Spanish missionaries, represented chiefly by Franciscan friars, diligently instructed the savage in the rudiments of civilized life; they induced the nomadic Indians to settle in villages, introduced livestock and European cultivated plants, taught the natives to develop gardens, farms and ranches, and set up workshops in which the handicrafts were taught.

The earliest French mission among the Abnakis of Maine was established in 1604; this group of small migratory tribes became and remained staunch Christians. The Iroquois missions in New York were begun by St. Isaac Jogues in 1642 and continued intermittently among these tribes until 1687; a later mission among the Mohawks, established in 1756, still exists. Successful missionary work among the Indians of the Great Lakes area was initiated in 1660; among the Illinois tribes in 1674, and among the Indians in Indiana in 1711. Several missions were established along the lower Mississippi River during the 18th century but never flourished. Missions which proved to be short-lived were attempted in Virginia (1570), in Maryland (1633), in Vermont (1743), and in Minnesota (1743). The areas under French control or influence were occupied by small seminomadic tribes with whom it was generally difficult to maintain prolonged and fruitful contacts. Moreover, the number of missionaries, chiefly members of the Society of Jesus, was too small and their resources too meager to achieve large results. While their careers were heroic, they succeeded in building up few permanent Christian communities.

National Period.—The heritage of the church of the new United States consisted of a few small missions in Maine, Michigan, Illinois and Indiana. Scarcity of clergy rendered impossible, at first, the extension of missionary work. The first Catholic Indian school was established in the second decade of the 19th century near Detroit by Reverend Gabriel Richard, S.S. From 1830 to 1868, Father (later Bishop) Frederic Baraga (q.v.) and his co-workers developed successful missions and schools among the Ottawas, Chippewas, Menominees, and Potawatomies of Michigan, Wisconsin, Indiana, and Minnesota. The Jesuits undertook work among the Kickapoos (1836), Potawatomies (1836), and Osages (1846) in the present State of Kansas. Fathers François Blanchet and Modeste Demers, later bishops, inaugurated missions in the Columbia River valley in 1837, and were soon followed by Father Pierre Jean De Smet and his Jesuit colaborers, who evangelized the Indians of Montana, northern Idaho, and western Washington. The remnants of the Spanish missions in California, New Mexico, and Arizona were adopted by American bishops and priests after the acquisition of the Southwest at the termination of the Mexican War.

A sequel of President Grant's peace policy was the establishment in 1874 of the Bureau of Catholic Indian Missions at Washington, D.C., to represent Catholic Indian interests at the seat of government, and to speed the development of religious and educational work among the Indians. Under this impulse, missions and schools were successfully undertaken among the Papagos, Sioux, Arapahoes, Crows, Gros Ventres, and smaller neighboring tribes. Later the work was extended among new tribes in Oklahoma, Arizona, New Mexico, California, and in the Territory of Alaska.

Present Status.—Indian tribes under 53 agencies, out of a total of 64, were provided with Catholic missions (1947). Religious and educational activities are carried on in Arizona, California, Colorado, Idaho, Kansas, Louisiana, Maine, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, New York, North Dakota, Oklahoma, Oregon, South Dakota, Washington, Wisconsin, Wyoming, and the Territory of Alaska. Out of a total Indian population of 273,650 resident on reservations, 94,085 are reported to be Catholics. More than 200 priests, both diocesan and religious, aided by catechists (Indian and white), are engaged in religious and missionary work. Churches and chapels for Indians number 402. Sixty-five mission schools, of which 39 are day schools and 26 boarding schools, have an attendance of more than 7,000 Indian pupils. The personnel of these schools comprises 625 teaching sisters, lay brothers, scholastics, and lay teachers. Two hospitals for Indians and several medical dispensaries are maintained.

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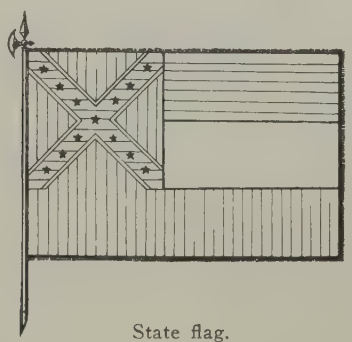
MISSISAUGA or **MISSISSAGA INDIANS**, mĭs-ĭ-sô'gȧ, an American tribe of the Algonquian family and a subtribe of the Chippewa, were first encountered by the French in 1634. They were living at the mouth of the Mississagi River in Ontario, Canada, and on the adjoining Manitoulin Island in Lake Huron. In the early part of the 18th century they began to drift southward for trading purposes, settling around Lake St. Clair and Lake Ontario. They were living in five villages near Detroit when they were admitted as the seventh tribe of the Iroquois league in 1746. This alliance lasted only until the outbreak of the French and Indian Wars (1755–1763). In 1778 their number was estimated at 1,250. There are about 600 of the Missisaugas remaining. They inhabit small reservations in Ontario and are progressive, industrious, self-supporting citizens.

MISSISSINEWA, Battle of, occurred on Dec. 18, 1812, at a site on the Mississinewa River near Jalapa, in Grant County, Indiana. It became evident to Gen. William Henry Harrison (Tippecanoe) that the Miami Indians, a tribe of the Algonquian family, were being incited to hostilities against the white settlers by the British. He sent Col. John B. Campbell to attack and destroy their villages. After destroying several villages, the army moved up the Mississinewa to Jalapa, planning to continue their destruction until they reached its junction with the Wabash. However, before daylight their camp was surrounded and attacked by 300 Miami braves. About 30 Indians were killed and Col. Campbell lost 8 of his force, with 48 wounded. As a result, he decided it best to return to Ohio. His campaign, however, had accomplished its purpose. He had struck terror in the hearts of the Indians, and they took no further active part in the War of 1812.

MISSISSIPPI, mĭs-ĭ-sĭp'ĭ, the seventh state admitted to the original Union, is bounded on the north by Tennessee, on the east by Alabama, on the south by Louisiana and the Gulf of Mexico, and on the west by the Mississippi River, dividing it from Louisiana and Arkansas.



State flag.

Along the Gulf coast the state claims all islands "within six leagues of the shore." The greatest length north and south is 330 miles; the greatest breadth east and west, 180 miles. The name, taken from the river which forms its western boundary, has been interpreted as Choctaw, meaning "beyond age," or Illinoian, meaning "great water" or "father of waters."

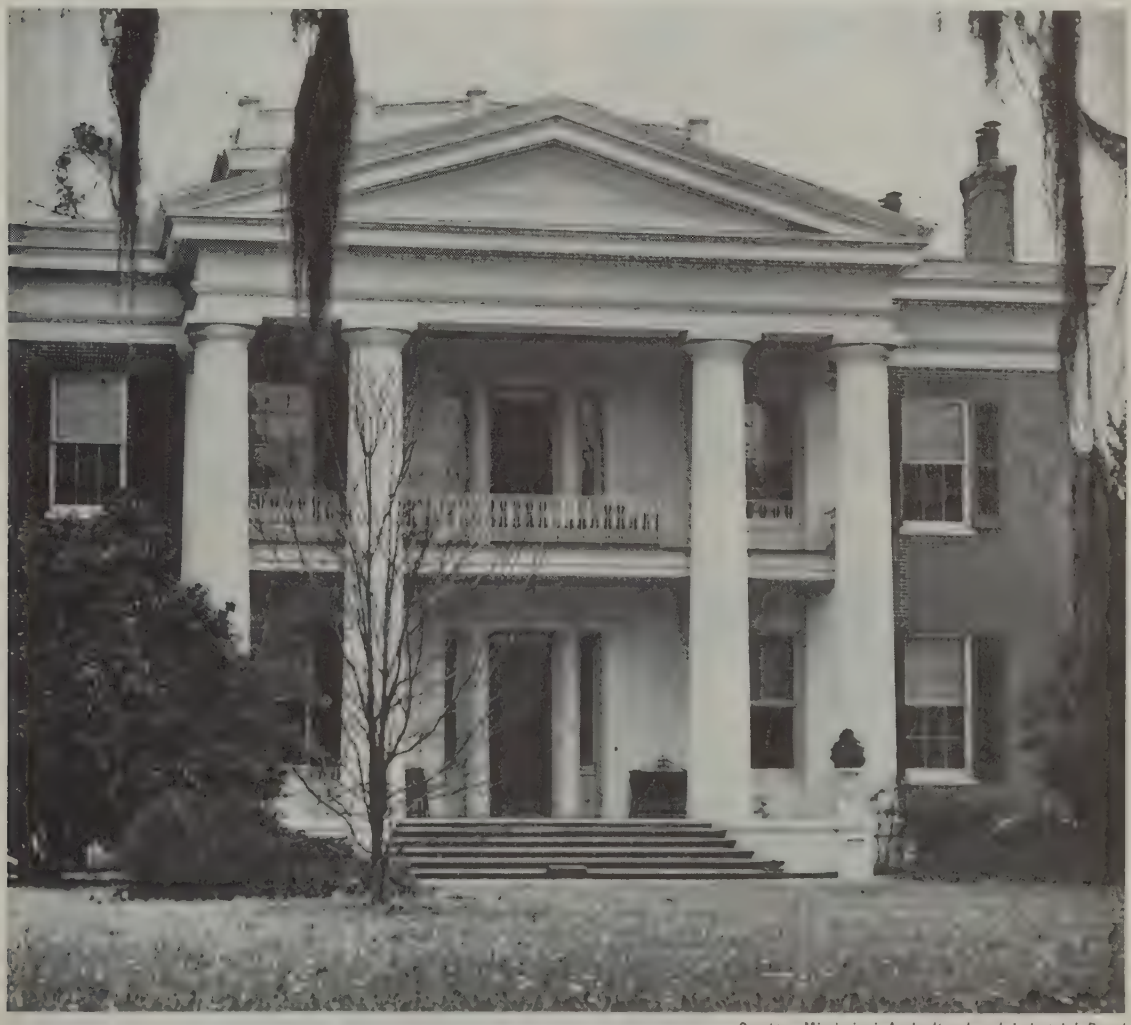
Land area	47,248 square miles
Water area	468 square miles
Total area	47,716 square miles
Latitude	30° 13′—35° N.
Longitude	88° 7′—91° 41′ W.
Altitude	sea level to 780 feet
Population (1950)	2,178,914
Capital city—Jackson; Pop. (1950)	98,271
Admitted as a state	Dec. 10, 1817
Bird (unofficial)	Mockingbird
Flower	Magnolia
Motto	*Virtute et Armis* (By valor and arms)
Nicknames	Magnolia State; Bayou State
Song (unofficial)	*Mississippi*
Tree	*Magnolia grandiflora*

State seal.

Physical Characteristics.—*Topography.*—There are 10 physiographic areas which conform generally to the geological structure. (1) The low, fertile, productive delta lies between the Yazoo and Mississippi rivers. (2) The loess bluffs, beginning at Memphis, stretch around the eastern border of the delta to Natchez. These rugged hills quickly erode and become impossible of cultivation. (3) Along the Gulf of Mexico lie the coastal terraces, a narrow strip of low, level, sandy soil unsuited for agriculture. (4) Immediately above these plains and reaching northward almost to Jackson and Meridian lie the Piney Woods. This portion was of slow development until the commercial value of the longleaf pine forests was realized. (5) A narrow prairie belt stretches from Vicksburg to the Alabama line. This gently rolling area yields some of the great agricultural profits of the state. (6) The most rugged and highest section is the fall line hills near the Tennessee River in the extreme northeastern part of the state. The red, sandy hills are exceedingly unsuitable for cultivation. (7) Around the western border of these hills lies the Black Prairie belt. Its rolling surface is a fertile farming area which has become a center for livestock. (8) The long, narrow, wedge-shaped district known as the Pontotoc Ridge of hills enters the state from the northeast and moves south along the western rim of the Black Prairie. The soil erodes easily, but originally grew a diversity of crops. (9) Then comes a strip of low-lying land, the flatwoods, which skirts the western and southern edge of the Pontotoc Ridge and Black Prairie belt. This area is important only as a source of forest products. (10) The remaining section, lying between the flatwoods and the loess bluffs, is called the North Central Highlands. The soil is a yellowish-brown loam adaptable to raising a number of crops.

Courtesy Mississippi Agricultural and Industrial Board

The Mississippi state capitol at Jackson.



Courtesy Mississippi Agricultural and Industrial Board

Melrose, a pre-Civil War home at Natchez.

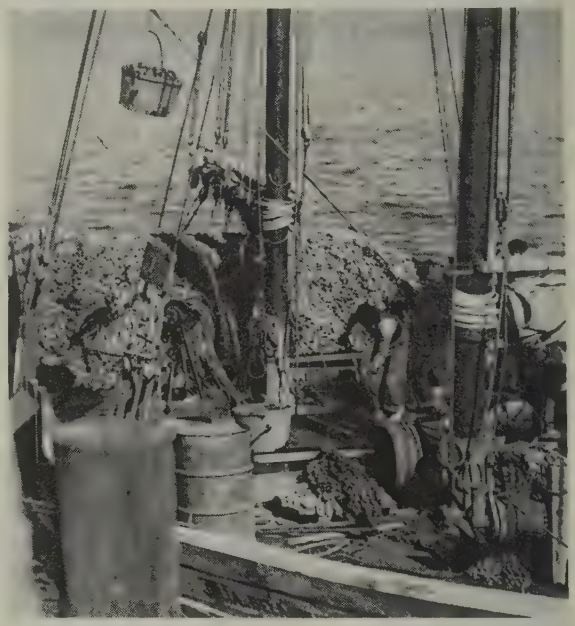
MISSISSIPPI

Courtesy Mississippi Agricultural and Industrial Board

Tung trees in blossom. From the nuts of these trees is obtained the tung oil used in paints and varnishes.

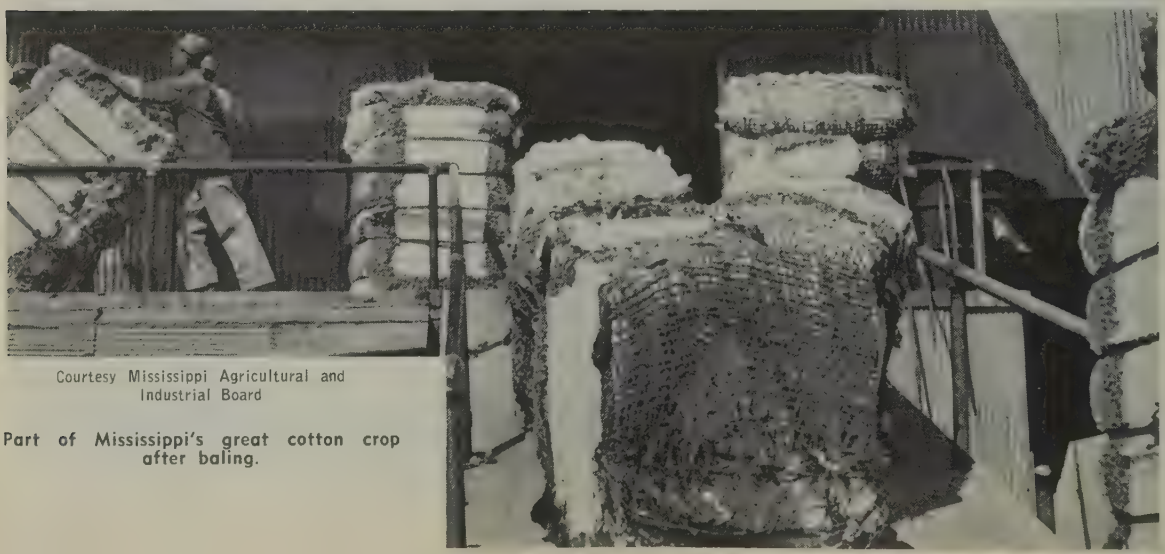
Photograph by A. V. Ragusin

Lighthouse at Biloxi, with the flags the city has flown.



Photograph by A. V. Ragusin

An oyster schooner unloading at Biloxi on the Gulf Coast.



Courtesy Mississippi Agricultural and Industrial Board

Part of Mississippi's great cotton crop after baling.

Climate.—The climate is semitropical, the average annual mean temperature over a period of 60 years being 65.5°F.; for winter 48° and for summer 81°. The extended period of warm weather allows for long growing seasons and pasturage. The average rainfall is 54 inches, more occurring along the coast than in the northern section.

Rivers.—A number of rivers drain the state. In the southwest the Big Black and Homochitto flow into the Mississippi. The west and northwest are drained by the Yazoo and its tributaries which flow into the Mississippi near Vicksburg. In the northeast are the Tombigbee, flowing through Alabama into Mobile Bay, and the Tennessee, which turns northward and empties into the Ohio. In the southeast the Leaf and Chickasawhay come together to form the Pascagoula, which ultimately passes into the Gulf of Mexico. The longest river of Mississippi is the Pearl, which drains the central portion of the state and flows into the gulf.

The only area where drainage is a serious problem is the delta. There a system of canals and levees has been constructed to protect the land against inundation. There is also a large earthen dam across the Tallahatchie near Sardis to help control flood waters.

Political Divisions.—*Cities.*—A complete list of the cities and towns of the state, with their 1950 populations, is on the back of the state map which is part of this article. The following cities, with 1950 populations, are of special importance.

In the central section: Jackson, population 98,271, altitude 294 feet; Meridian (pop. 41,893, alt. 341); Hattiesburg (pop. 29,474, alt. 143); and Laurel (pop. 25,038, alt. 243). The first is the state capital, the second a leading industrial town, the third the place near which the famous Camp Shelby of World Wars I and II was located, and the fourth, one of the earliest and most important locations of the lumber industry and its allied manufactures.

The outstanding delta communities are: Greenville (pop. 29,936, alt. 125); Greenwood (pop. 18,061, alt. 143); and Clarksdale (pop. 16,539, alt. 173). All are centers of the cotton growing and trading region.

The Gulf coast is represented by Biloxi (pop. 37,425, alt. 22), and Gulfport (pop. 22,659, alt. 19). The former is near the site of the oldest white settlement in Mississippi, Fort Maurepas. The latter is a major recreational center with an artificial harbor for shipping.

The Old South still lives at Vicksburg (pop. 27,948, alt. 206), and Natchez (pop. 22,740, alt. 202), on the Mississippi, and at Columbus (pop. 17,172, alt. 250), on the Tombigbee. A beautifully kept military park commemorates the campaign and siege of Vicksburg. The historic charm and culture of Natchez defy description. In the rich prairie section, Columbus is the site of Mississippi State College for Women, the first state supported college for women in the United States.

The New South is the spirit of Tupelo (pop. 11,527, alt. 289). Tupelo entered the first contract for the purchase of electric power from the Tennessee Valley Authority. A few towns (such as Canton, Columbia, Yazoo City), near the new oilfields are so-called "boom towns."

Counties.—Mississippi has 82 counties, which, with their county seats, are as follows:

County	County Seat
Adams	Natchez
Alcorn	Corinth
Amite	Liberty
Attala	Kosciusko
Benton	Ashland
Bolivar	Cleveland, Rosedale
Calhoun	Pittsboro
Carroll	Carrollton, Vaiden
Chickasaw	Houston, Okolona
Choctaw	Ackerman
Claiborne	Port Gibson
Clarke	Quitman
Clay	West Point
Coahoma	Clarksdale
Copiah	Hazlehurst
Covington	Collins
De Soto	Hernando
Forrest	Hattiesburg
Franklin	Meadville
George	Lucedale
Greene	Leakesville
Grenada	Grenada
Hancock	Bay St. Louis
Harrison	Gulfport
Hinds	Jackson, Raymond
Holmes	Lexington
Humphreys	Belzoni
Issaquena	Mayersville
Itawamba	Fulton
Jackson	Pascagoula
Jasper	Bay Springs, Paulding
Jefferson	Fayette
Jefferson Davis	Prentiss
Jones	Ellisville, Laurel
Kemper	De Kalb
Lafayette	Oxford
Lamar	Purvis
Lauderdale	Meridian
Lawrence	Monticello
Leake	Carthage
Lee	Tupelo
Leflore	Greenwood
Lincoln	Brookhaven
Lowndes	Columbus
Madison	Canton
Marion	Columbia
Marshall	Holly Springs
Monroe	Aberdeen
Montgomery	Winona
Neshoba	Philadelphia
Newton	Decatur
Noxubee	Macon
Oktibbeha	Starkville
Panola	Batesville, Sardis
Pearl River	Poplarville
Perry	New Augusta
Pike	Magnolia
Pontotoc	Pontotoc
Prentiss	Booneville
Quitman	Marks
Rankin	Brandon
Scott	Forest
Sharkey	Rolling Fork
Simpson	Mendenhall
Smith	Raleigh
Stone	Wiggins
Sunflower	Indianola
Tallahatchie	Charleston, Sumner
Tate	Senatobia
Tippah	Ripley
Tishomingo	Iuka
Tunica	Tunica
Union	New Albany
Walthall	Tylertown
Warren	Vicksburg
Washington	Greenville
Wayne	Waynesboro
Webster	Walthall
Wilkinson	Woodville
Winston	Louisville
Yalobusha	Coffeeville, Water Valley
Yazoo	Yazoo City

The People.—*Origins.*—The population of Mississippi is overwhelmingly native-born. According to the census of 1940, only 6,472 are foreign-born, being .03 per cent of the total population. The greatest number of original settlers were Scotch-Irish from the Atlantic seaboard states, although the leaders generally came from New England and New York and were of English origin. In the late 19th century there was an infiltration of Germanic, Slavic, and Latin peoples from New Orleans following the Illinois Central Railroad, but they were quickly absorbed. In the Delta there are small settlements of Chinese. The law forbidding miscegenation discriminates against these Orientals as well as against the Negroes. Indians to the number of 2,134 (1940) still live in Mississippi.

Until 1940, Mississippi showed a numerical preponderance of Negroes. For the first time since 1840 the census showed a slight majority of whites. The count has been questioned, since Selective Service indicated a number of Negro men who did not appear in the census. In any case the latest estimates show that now (1947) the Negroes are in a slight minority. They are largely concentrated in the Delta counties, in many of which they constitute two thirds to three fourths of the population.

The state's population declined 0.2 per cent between 1940 and 1950 to a total of 2,178,914. This reduction was partially accounted for by the movement into the armed forces and war industries, particularly during World War II, and also by the continued northward migration of Negroes after the war, seeking better economic opportunities in such large cities as St. Louis, Chicago, and Detroit.

Mississippi is predominantly rural. The 1950 census showed the rural population as 1,571,752 (72.1 per cent) as against an urban population of 607,162 (27.9 per cent). According to the 1945 Census of Agriculture, the farm population was 1,050,444. Generally, the income level of the people of Mississippi is low, their average per capita income being about $698 in 1950, although in the towns and cities, income was higher.

Famous Mississippians.—Nationally recognized work in painting has been done by John McCrady who found in the Negro his best material. One of his greatest pieces of work, *Swing Low, Sweet Chariot,* depicts the Negro's idea of death and the ascent to Heaven. Another artist of note is Karl Wolfe, portrait painter and art teacher. In literature, such writers as Irwin Russell, Stark Young, William Faulkner, and William A. Percy have done work of high quality both in prose and poetry. Another group of writers who have depicted Mississippi life include David Cohn, James Street, and Eudora Welty.

Natural Resources.—*Fauna.*—Few of the larger wild animals formerly abundant now remain. The chief game are cottontail, squirrel, raccoon, and opossum, although occasionally one may find a deer or fox. In the Bayou Pierre swamp and elsewhere there are still some alligators. One can catch almost any kind of freshwater fish, bass, cat, bream, or perch. The greatest number of birds is found on the coast where many kinds are plentiful. The mockingbird is common to all sections.

Flora.—Deserving special mention among the flowers are the azalea, camellia japonica, and poinse tia, all growing without protection in the south. More than a 100 species of trees are found, including numerous varieties of oak. One section, called the Piney Woods, is noted for its longleaf pines. Particularly colorful are the live oaks laden with Spanish moss in the south, the "heaven tree" in the north, and the holly and yaupon which are distributed fairly evenly but occur more frequently in the central portion.

Minerals.—Except for oil the mineral resources are not spectacular in nature. Common brick clay and crude sandstone, suitable for brick, tiles, crucibles, and spark plugs, overlay nearly all the geologic structures of the state. A small quantity of iron ore adaptable for paint pigments has been located. There is a largely untapped supply of high grade bauxite and low grade ore. Such rare clays as bentonite and fuller's earth are found and lignite exists in some abundance. Oil, however, is the most profitable mineral. From 1939 to 1945 fourteen fields located in 11 counties produced 90,050,795 barrels, making Mississippi the eleventh ranking oil producing state in the United States. In 1945 the oil severance tax brought $1,956,953 into the state treasury. Natural gas was discovered in 1926 at Amory and in 1930 at Jackson. The supply at Amory was limited, but the Jackson field has produced 114,985,557 cubic feet since discovery. By 1945, however, gas reserves were nearing exhaustion.

Forests.—Some type of forests comprise 54 per cent of the total land area, approximately 1,700,000 acres being publicly owned and 14,800,000 privately owned. These acres are almost evenly divided between pines and hardwoods. These resources were seriously depleted before they were placed under the state forestry commission and the United States Department of Agriculture. Of particular interest is the successful culture of tung trees. Approximately three fourths of the United States total grow in Mississippi, the most extensive orchards being in Pearl River County.

Soil.—The importance of the soil and its resources is indicated by the fact that for every person employed in industry there are 17 engaged in agriculture and related occupations. The soil, however, was never unusually rich and is poor in organic material. The top soil is thin, in places only a foot deep, and erosion works constantly against this layer. A large share of the public administration of natural resources is therefore concerned with conservation and utilization of the land. In 1934 only 34 per cent of the total land area showed negligible erosion, but impressive accomplishments have been achieved. By 1945, the United States Soil Conservation Service estimated that 80 per cent of the land area was slightly or moderately eroded, while only 20 per cent was severely eroded. Despite difficulties, more than 85 per cent of the total land area is organized for soil conservation purposes.

Water and Flood Control.—There is a supply of ground water pure enough and available in sufficient quantity for domestic uses, although no statutes are in force to prevent needless waste. Water pollution has taken on new importance with the increase of industries, but thus far the control is mainly negative in character. Water problems are primarily concerned with the control and disposition of rivers and streams. The efforts of federal and local agencies are sometimes taxed in meeting the problems of flood control, reclamation of land, and stream alignment. This has been largely accomplished by the construction of levees, reservoirs controlling the headwaters of tributaries of the Mississippi, and the maintenance of the present channels.

Parks, Reservations, Sanctuaries, and National Forests.—The program of the National Park Service has been confined to the administration of the Vicksburg National Military Park and Cemetery, the Brice's Crossroads and Tupelo battlefields of the War Between the States, and the Ackia battlefield where the Chickasaws defeated the French in 1736. It also participates with the states of Mississippi, Alabama, and Tennessee in the restoration of the Natchez Trace. On the military sites the work has been marking battle lines, constructing museums, erosion control, and measures emphasizing the historic values. The Vicksburg park receives the major attention. The work on the Natchez Trace was interrupted by World War II. The objective of this program is to preserve the scenic beauty and historic buildings and sites along the parkway.

In 1934, Mississippi had no state parks. From 1935 to 1941 ten were opened, three each in the northeastern, southern, and central sections, and one on the coast, representing a capital investment of $2,000,000. Amounting to 10,227 acres, they are administered by the Mississippi State Board of Park Supervisors. Although easily accessible, these parks have never served more than 39 per cent of the white people.

Reservations.—The Indian Agency, Philadelphia, was established in 1918. The Indians are the descendants of those Choctaws who chose to remain after the Treaty of Dancing Rabbit

Creek (1830). A small staff supervises the settlement and aids in the planning, raising, and marketing of products. A hospital and seven elementary schools are operated in the area. The work costs the federal government approximately $100,000 per year.

Sanctuaries.—There are two small bird sanctuaries, one in Livingston Park, Jackson, where it and the zoo are the outgrowth of a collection begun by the municipal fire department; the other, on the grounds of Mississippi Southern College, Hattiesburg.

National Forests.—Mississippi has set aside 2,785,010 acres for national forests. The first to be established, the Homochitto National Forest, lies in the southwestern corner of the state. The De Soto National Forest, a dense growth of pine, is located in the southeastern part, just north of the Gulf of Mexico. There are also the Chickasawhay National Forest, Bienville National Forest, Delta National Forest, and, in the extreme north, the Holly Springs National Forest.

Production and Manufactures.—The leading crop is cotton, in the production of which Mississippi is outranked only by Texas. It holds first rank in the yield per acre of lint cotton. The Delta, with its fertile soil and long summers, is particularly suited for the growth of cotton. Other crops in the order of their importance are corn, sweet potatoes, Irish potatoes, pecans, peanuts, soybeans, strawberries, peaches, pears, and grapes. Crystal Springs has established a national reputation in the production of tomatoes and cabbage, and Water Valley as a shipping center for watermelons.

The livestock business has developed greatly both as to beef types as well as milk cows, but dairying was developed first. In 1940 the annual production of butter was 7,000,000 pounds, cheese 12,000,000 pounds, ice cream 1,500,000 gallons. The receipts from all sale of livestock and livestock products in 1944 amounted to $76,979,000. The value of all farm products sold and used by farm households was $360,945,000. The legislature in 1944 authorized the establishment of facilities for processing, storage, and marketing to be operated under cooperatives with a donation from the state not to exceed $10,000 for any one unit. The Mississippi Agricultural and Industrial Board has approved (1947) a plan for a large central market to be built and controlled by the state and operated by individuals or cooperatives on an equal basis.

Timber is Mississippi's second major crop. Ruthless cutting, waste, and poor fire protection have been ruinous, but in 1932 the state awoke to the danger, and the timber volume has been slowly increased. The taxable sales value of finished forestry products has increased from $83,713,252, in the fiscal year 1940–1941, to the average annual value of $124,328,427 for the three fiscal years following. In 1943, Mississippi ranked first in the nation in hardwood lumber production, with 604,030,000 board feet, and seventh in softwoods, with 1,029,974,000 board feet. Forestry is the greatest industrial labor source in the state, with 43 per cent (in 1947) of all industrial labor in the woods and plants which manufacture forest products. Some 14 per cent of the revenue of the state comes from its forests.

The most spectacular and newest development in mineral extraction has been in oil. The search for commercial production began as early as 1903. New impetus was given by the discovery of the Jackson gas field in 1930. On Sept. 5, 1939, the first well was brought in at Tinsley field in Yazoo County. This now has 310 producing wells. This was followed in rapid succession by other locations. The total cumulated production of oil as of May 1945 was 90,050,795 barrels.

In 1932–1933 came the nationwide economic depression and its New Deal remedies. Business began to look toward decentralization. New sources of fuel and power (gas and TVA electricity) were opening up in Mississippi. Its large supply of cheap labor, moderate climate, and lower standard of living began to be eyed by northern and eastern industrialists. In 1936 the legislature passed an act to "balance agriculture with industry" as a special inducement to out-of-state capital. Communities were empowered to offer land, buildings, and five-year tax exemption. The state advertised this highly and successfully.

Under this plan twelve industrial plants were erected, among them the Ingalls Shipbuilding Corporation, Pascagoula, and the Armstrong Tire and Rubber Company, Natchez, four hosiery mills, three shirt factories, a chenille concern, a woolen goods mill, and a plywood plant. Even before this, however, a few companies developing timber products had been established. Because of World War II this program was abolished.

As the war drew to a close, the plan was revived. In 1944 the legislature created the agricultural and industrial board to industrialize the state. The movement is gaining momentum and bids fair to succeed.

Transportation and Communications.—The Delta and the Chicago and Southern lines are the main instruments of air travel in Mississippi. The former operates between Charleston and Dallas; the latter between New Orleans and Chicago. Both stop regularly at Jackson. In 1944 there were 32 airports in the state, some equipped for night flying.

Mississippi has finally developed an elaborate system of good roads and highways, but it has taken a long time in the accomplishment. They were placed under the state highway commission in 1916. The first planned program of road building was approved by the legislature as late as 1936. At that time the state issued notes amounting to $23,000,000 for the purpose. This was met by an allocation of the federal government in the amount of $19,500,000. Approximately 4,500 miles of hard-surfaced roads have been the result. In 1945 the total road mileage was 63,287 miles. The cost of maintenance is borne by the gasoline tax and the license tax on motor vehicles.

Railroad building began on a small scale in 1831, but during the War Between the States the railways were destroyed. The new period of construction came from 1880 onward. Facing the competition of automotive transportation, the railroads began about 1940 to introduce streamliners with rapid and attractive accommodations. In 1944 the railroad mileage was approximately 4,000 miles. The major lines are the Illinois Central; Gulf, Mobile, and Ohio; Southern; and St. Louis and San Francisco. A number of smaller systems are being gradually absorbed by the larger.

Water transportation in Mississippi is less important than it was before the War Between the States, when it was one of the chief modes of travel and transport. The Mississippi River was of particular consequence, but the Tombigbee, Pearl, and other streams were also used. There are still in some use ports along the Mississippi and on the coast.

Telephones and telegraphs are accessible to nearly all communities in the state, the former being part of the Southern Bell system, the latter chiefly Western Union.

Economic and Financial Factors.—On March 20, 1945, there were 23 national and 179 state banks, holding total assets of $665,287,856.54. State revenue comes from taxation, 34.89 per cent of the total being from the sales tax of 2 per cent. Other important taxes are income, tobacco, and general property tax, constituting respectively 15.49 per cent, 11.84 per cent, and 10.21 per cent of the revenue. Minor taxes account for 18 per cent and the remainder comes from refunding bonds, penitentiary sales, land redemptions, and other sources. Mississippi has a poll tax.

From 1890 to 1932 the financial program of the state was unsuccessful. In 1932 the sales tax was adopted and a program of rigorous economy was instituted. On June 30, 1946, the total state indebtedness amounted to $62,829,000 ($17,610,000 direct obligation; $45,219,000 highway bonds). The treasury reported as follows for the fiscal year 1945–1946:

Balance in treasury, beginning of fiscal year 1945–46	$ 26,539,990.68
Receipts, 1945–46	76,840,964.04
Total	$103,380,954.72
Disbursements, 1945–46	71,867,368.17
Balance, beginning of fiscal year 1946–47	$ 31,513,586.55

Government.—*Executive.*—The basic law of Mississippi is the constitution of 1890, with subsequent additions and amendments. The governor is elected quadrennially and may not succeed himself.

GOVERNORS OF MISSISSIPPI

TERRITORIAL

Winthrop Sargent		May 7, 1798–May 25, 1801
William C. C. Claiborne		May 25, 1801–Mar. 1, 1805
Robert Williams		Mar. 1, 1805–Mar. 7, 1809
David Holmes		Mar. 7, 1809–Oct. 7, 1817

STATE

David Holmes	Democratic-Republican	Oct. 7, 1817–Jan. 5, 1820
George Poindexter	Democrat	Jan. 5, 1820–Jan. 7, 1822
Walter Leake[1]	"	Jan. 7, 1822–Nov. 17, 1825
Gerard C. Brandon[2]	"	Nov. 17, 1825–Jan. 7, 1826
David Holmes[3]	"	Jan. 7, 1826–July 25, 1826
Gerard C. Brandon[2]	"	July 25, 1826–Jan. 9, 1832
Abram M. Scott[1]	"	Jan. 9, 1832–June 12, 1833
Charles Lynch[4]	"	June 12, 1833–Nov. 20, 1833
Hiram G. Runnels[3]	"	Nov. 20, 1833–Nov. 20, 1835
John A. Quitman[4]	Whig	Dec. 3, 1835–Jan. 7, 1836
Charles Lynch	Democrat	Jan. 7, 1836–Jan. 8, 1838
Alexander G. McNutt	"	Jan. 8, 1838–Jan. 10, 1842
Tilghman M. Tucker	"	Jan. 10, 1842–Jan. 10, 1844
Albert G. Brown	"	Jan. 10, 1844–Jan. 10, 1848
Joseph W. Matthews	"	Jan. 10, 1848–Jan. 10, 1850
John A. Quitman[3]	"	Jan. 10, 1850–Feb. 3, 1851
John I. Guion[4]	Democrat	Feb. 3, 1851–Nov. 4, 1851
James Whitfield[4]	"	Nov. 24, 1851–Jan. 10, 1852
Henry S. Foote[3]	Union Democrat	Jan. 10, 1852–Jan. 5, 1854
John J. Pettus[4]	Democrat	Jan. 5, 1854–Jan. 10, 1854
John J. McRae.	"	Jan. 10, 1854–Nov. 16, 1857
William McWillie	"	Nov. 16, 1857–Nov. 21, 1859
John J. Pettus.	"	Nov. 21, 1859–Nov. 16, 1863
Charles Clark[5]	"	Nov. 16, 1863–May 22, 1865
William L. Sharkey	Provisional	June 13, 1865–Oct. 16, 1865
Benjamin G. Humphreys[5]	Democrat	Oct. 16, 1865–June 15, 1868
Adelbert Ames.	Provisional (Military)	June 15, 1868–Mar. 10, 1870
James L. Alcorn[3]	Republican	Mar. 10, 1870–Nov. 30, 1871
Ridgley C. Powers[2]	"	Nov. 30, 1871–Jan. 4, 1874
Adelbert Ames[3]	"	Jan. 4, 1874–Mar. 20, 1876
John M. Stone[4]	Democrat	Mar. 20, 1876–Jan. 9, 1882
Robert Lowry.	"	Jan. 9, 1882–Jan. 13, 1890
John M. Stone.	"	Jan. 13, 1890–Jan. 20, 1896
Anselm J. McLaurin	"	Jan. 20, 1896–Jan. 16, 1900
Andrew H. Longino	"	Jan. 16, 1900–Jan. 19, 1904
James K. Vardaman	"	Jan. 19, 1904–Jan. 21, 1908
Edmond F. Noel	"	Jan. 21, 1908–Jan. 16, 1912
Earl L. Brewer.	"	Jan. 16, 1912–Jan. 18, 1916
Theodore G. Bilbo	"	Jan. 18, 1916–Jan. 18, 1920
Lee M. Russell.	"	Jan. 18, 1920–Jan. 18, 1924
Henry L. Whitfield[1]	"	Jan. 18, 1924–Mar. 18, 1927
Dennis Murphree[2]	"	Mar. 18, 1927–Jan. 16, 1928
Theodore G. Bilbo	"	Jan. 16, 1928–Jan. 19, 1932
M. Sennett Conner	"	Jan. 19, 1932–Jan. 21, 1936
Hugh L. White.	"	Jan. 21, 1936–Jan. 16, 1940
Paul B. Johnson[1]	"	Jan. 16, 1940–Dec. 26, 1943
Dennis Murphree[2]	"	Dec. 26, 1943–Jan. 18, 1944
Thomas L. Bailey[1]	"	Jan. 18, 1944–Nov. 2, 1946
Fielding Wright[2]	"	Nov. 2, 1946–Jan. 22, 1952
Hugh L. White.	"	Jan. 22, 1952–Jan. 17, 1956
J. P. Coleman	"	Jan. 17, 1956–

[1] Died in office. [2] Lieutenant governor. [3] Resigned. [4] President of Senate. [5] Removed from office.

Legislative and Judiciary.—The bicameral legislature, composed of 49 senators and 140 representatives, meets every two years on the Tuesday after the first Monday in January. The sessions meeting in leap years are unrestricted in scope and duration, but others may deal only with revenue, appropriations, and such matters as the governor shall submit for consideration. The state is entitled to 2 senators and 6 representatives in the United States Congress. The Supreme Court is made up of 6 judges elected for a period of 8 years. Other courts are the 17 circuit and 11 chancery courts with judges elected for 4-year terms.

Suffrage.—Voting is by secret ballot. Voters must have had legal residence in the state two years and in the election district one year, and must not have been convicted of certain crimes. Poll tax for the previous two years must have been paid and the voter must have registered. The voter may be asked to read, understand, or interpret a section of the state constitution. Officials are nominated by party primaries, the expenses of which are borne by the party. Normally, nomination in a Democratic primary is tantamount to election.

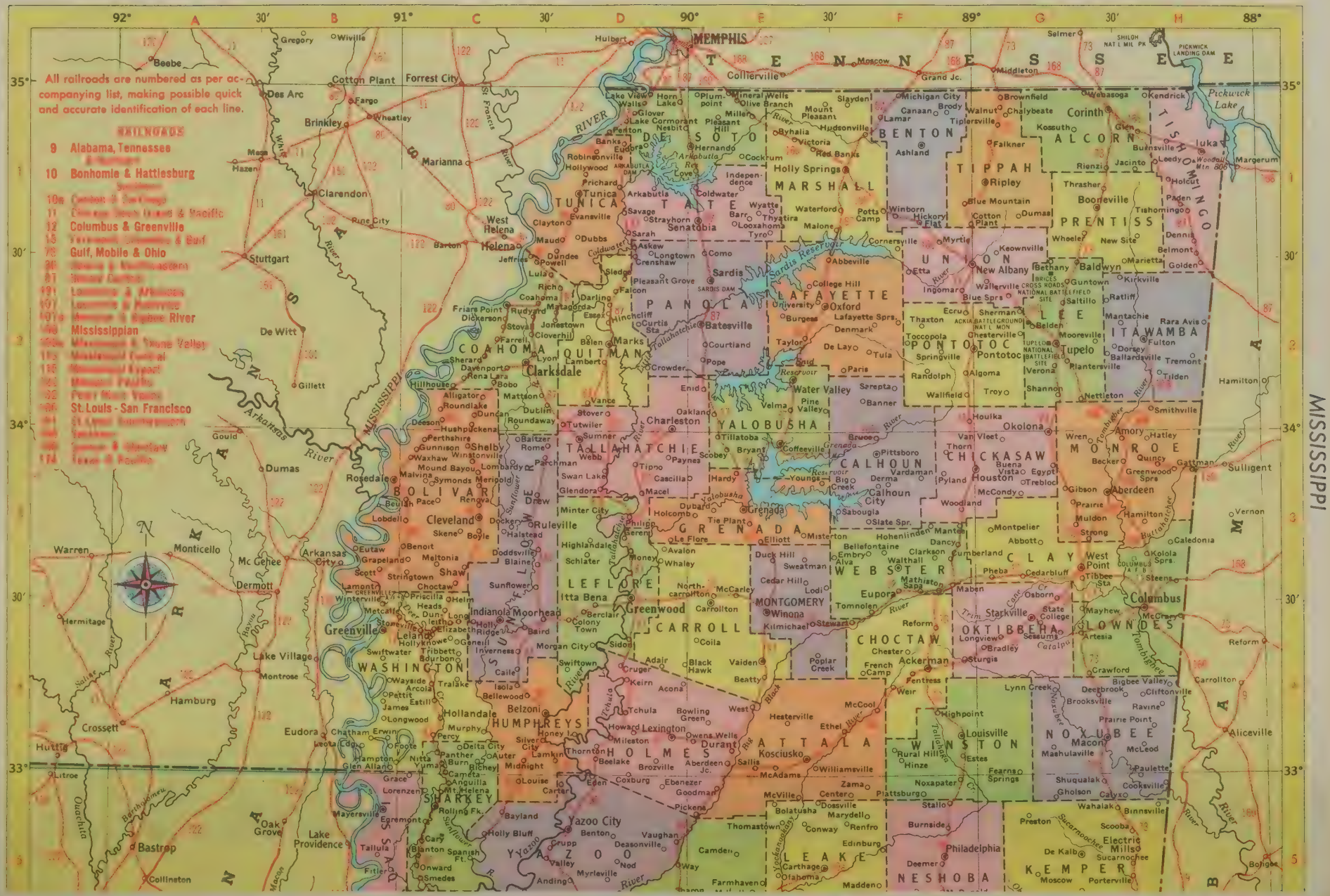
Public Health and Welfare.—The state board of health sponsors 65 full-time health departments aided financially by the county boards of

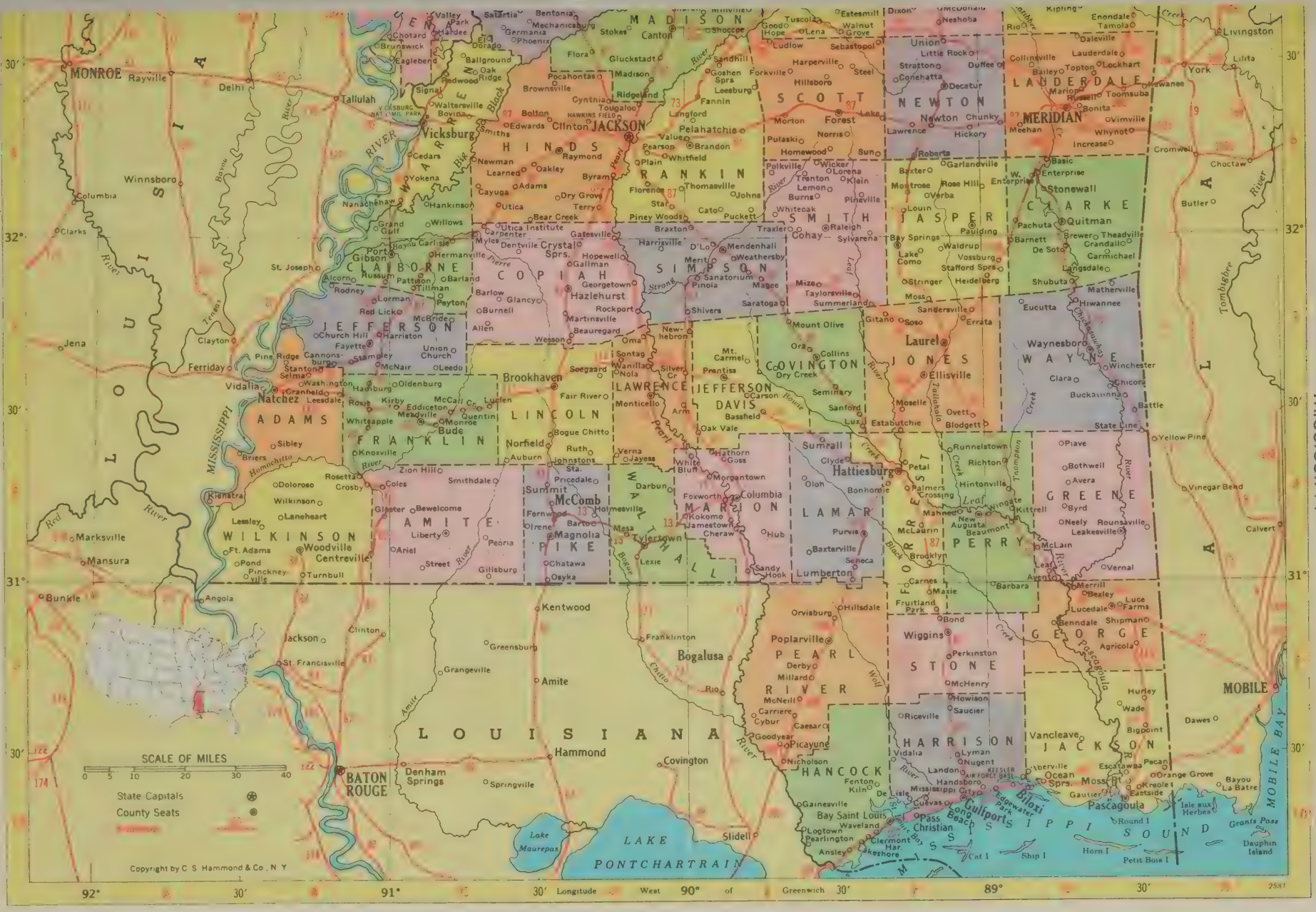
MISSISSIPPI

1950 Total Population 2,178,914

Abbeville (F2)
Abbott (G3)
Aberdeen ◉(H3) 5,290
Aberdeen Jct. (E4)
Ackerman ◉(F4) 1,463
Ackia Battleground Mon. (G2)
Acona (D4) 250
Adair (D4)
Adams (C6) 40
Agricola (G9) 200
Alcorn (B7) 500
Algoma (G2)
Allen (C7)
Alligator (C2) 214
Alva (F3)
Amite (riv.) (C8)
Amory (H3) 4,990
Anding (D5) 140
Anguilla (C5) 601
Ansley (E10) 65
Arcola (C4) 413
Ariel (C8) 19
Arkabutla (D1) 207
Arkabutla (dam) (D1)
Arkabutla (res.) (D1)
Arm (D8) 135
Artesia (G4) 594
Ashland ◉(F1) 328
Askew (D1)
Auburn (C8) 200
Auter (C4) 25
Avalon (D3)
Avent (G8)
Avera (G8)
Bailey (G6) 35
Baird (C4) 193
Baldwyn (G2) 1,567
Ballardsville (H2) 30
Ballground (C5) 300
Baltzer (C3) 250
Banks (D1)
Banner (F2) 125
Barbara (G9) 50
Barland (C7) 10
Barlow (C7) 60
Barnett (G7) 250
Barr (E1) 275
Barto (D8) 25
Basic (G6)
Bassfield (E8) 320
Batesville ◉ (E2) 2,463
Battle (H8)
Baxter (F6)
Baxterville (E8)
Bay St. Louis◉(F10) 4,621
Bay Springs ◉(F7) 1,302
Bayland (C5)
Bear Creek (D6)
Beatty (E4) 50
Beaumont (G8) 1,200
Beauregard (D7) 231
Becker (G3) 300
Bee Lake (D4)
Belden (G2) 360
Belen (D2)
Bellefontaine (F3)
Bellewood (C4) 75
Belmont (H1) 814
Belzoni ◉(C4) 4,071
Benndale (G9)
Benoit (C3) 444
Benton (D5) 225
Bentonia (D5) 496
Berclair (D4) 100
Bethany (G2)
Beulah (B3) 342
Bewelcome (C8)
Bexley (G9)
Big Black (riv.)(C6)
Big Creek (F3) 147
Big Point (H9) 300
Bigbee Valley (H4) 51
Biloxi (G10) 37,425
Binnsville (H5) 50
Black (creek) (F8)
Black Hawk (E4) 100
Blaine (C3) 200
Blanton (C5)
Blodgett (F8) 5
Blue Mountain (G1) 875
Blue Springs (G2) 125
Bobo (C2)
Bogue Chitto (D8)
Bogue Chitto (riv.) (D8)
Bolatusha (E5) 50
Bolton (D6) 741
Bond (F9) 500
Bonhomie (F8)
Bonita (G6)
Booneville ◉(G1) 3,295
Bothwell (G8)
Bourbon (C4)
Bovina (C6) 82
Bowling Green (E4) 28
Boyle (C3) 799
Bradley (G4)
Brandon ◉(E6) 1,827
Braxton (D6) 206
Brewer (G7) 50
Brices Cross Roads Nat'l Battlefield Site (G2)
Briers (B8)
Brody (F1)
Brookhaven ◉(C7) 7,801
Brooklyn (F8) 500
Brooksville (G4) 819
Brownfield (G1) 300
Brownsville (D6) 50
Brozville (D4) 25
Bruce (F3) 1,719
Brunswick (C5) 150
Bryant (E3) 150
Buckatunna (G7) 500
Bude (C8) 1,195
Buena Vista (G3) 50
Burgess (E2)
Burnell (C7) 30
Burns (E6) 213
Burnside (F5) 75
Burnsville (H1) 525
Buttahatchee (riv.) (H3)
Byhalia (E1) 581
Byram (D6)
Byrd (G8)
Caesar (E9) 50
Caile (C4) 150
Caledonia (H3) 252
Calhoun City (F3) 1,319
Calyx (G5) 150
Camden (E5) 350
Cameta (C4) 89
Canaan (F1)
Cannonsburg (B7)
Canton ◉(D5) 7,048
Carlisle (C7) 350
Carmichael (G7)
Carnes (F8)
Carpenter (C6) 150
Carriere (E9) 500
Carrollton ◉(E4) 475
Carson (E7) 206
Carter (D5)
Carthage ◉(E5) 1,925
Cary (C5) 390
Cascilla (D3) 108
Cat (isl.) (F10)
Cato (E6)
Cayuga (C6)
Cedar Hill (E3)
Cedarbluff (G3)
Cedars (C6) 65
Center (F5)
Centreville (B8) 2,025
Chalybeate (G1)
Charleston ◉(D2) 2,629
Chatawa (D8) 240
Chatham (B4) 30
Cheraw (E8) 100
Chester (F4)
Chesterville (G2) 40
Chickasawhay (riv.) (G7)
Chicora (G7) 500
Choctaw (C3)
Chotard (C5)
Chunky (G6) 258
Church Hill (B7)
Clara (G7) 450
Clarksdale ◉(D2) 16,539
Clarkson (F3) 150
Clayton (D1) 350
Clermont Harbor (F10) 175
Cleveland ◉(C3) 6,747
Cliftonville (H4) 300
Clinton (D6) 2,255
Cloverhill (D2)
Clyde (E8)
Coahoma (C2) 300
Cockrum (E1)
Coffeeville ◉ (E3) 739
Cohay (E6)
Coila (E4)
Coldwater (E1) 949
Coldwater (riv.) (D1)
Coles (C8)
College Hill (E2)
Collins ◉(E7) 1,293
Collinsville (G6)
Colony Town (D4)
Columbia ◉(E8) 6,124
Columbus ◉(H3) 17,172
Columbus A.F.B.(H3)
Como (E1) 703
Conehatta (F6) 50
Conway (E5)
Cooksville (H5)
Corinth ◉(G1) 9,785
Cornersville (F1)
Cotton Plant (G1) 125
Courtland (E2) 275
Coxburg (D5)
Crandall (G7) 145
Cranfield (B7) 20
Crawford (G4) 374
Crenshaw (D2) 740
Crosby (B8) 1,152
Crowder (D2) 476
Cruger (D4) 494
Crupp (D5) 135
Crystal Springs (D7) 3,676
Cuevas (F10) 150
Cumberland (F3)
Curtis Station (D2)
Cybur (E9)
Cynthia (D6)
Daleville (G5) 125
Dancy (F3)
Darbun (D8)
Darling (D2)
Davenport (C2) 75
De Kalb ◉(G5) 953
De Lay (F2) 200
De Lisle (F10) 600
De Soto (G7)
Deasonville (D5) 50
Decatur ◉(F6) 1,225
Deemer (F5)
Deer (creek) (C4)
Deerbrook (G4)
Deeson (C2)
Delta City (C4) 250
Denmark (F2) 50
Dennis (H1) 158
Dentville (C7)
Derby (E9)
Derma (F3) 494
D'Iberville (G10) 1,429
Dickerson (C2) 100
Dixon (F5) 100
D'Lo (E7) 516
Dockery (C3) 25
Doddsville (C3) 201
Doloroso (B8)
Dorsey (H2) 58
Dossville (E5) 150
Drew (C3) 1,681
Dry Creek (E7)
Dry Grove (D6)
Dubard (E3)
Dubbs (D1)
Dublin C2)
Duck Hill (E3) 537
Duffee (G6) 65
Dumas (G1) 187
Duncan (C2) 436
Dundee (D1) 250
Dunleith (C4)
Durant (E4) 2,311
Eaglebend (C5) 38
East Side (H10) 1,215
Ebenezer (D5) 95
Ecru (F2) 494
Eddiceton (C8)
Eden (D5) 306
Edgewater Pk.(G10) 500
Edinburg (F5) 900
Edwards (C6) 1,002
Egremont (C5) 43
Egypt (G3)
El Dorado (C5) 50
Electric Mills (G5)
Elizabeth (C4) 200
Elliott (E3) 250
Ellisville ◉(F7) 3,579
Embry (F3) 300
Enid (E2) 94
Enid (res.) (E2)
Enondale (G5) 61
Enterprise (G6) 691
Errata (F7) 50
Erwin (B4)
Escatawpa (G10)
Essex (D2) 25
Estabutchie (F8) 150
Estes (F4)
Estesmill (F5) 150
Estill (C4) 500
Ethel (F4) 723
Etta (F2) 75
Eucutta (G7) 50
Eudora (D1) 200
Eupora (F3) 1,338
Eutaw (B3)
Evansville (D1) 15
Fair River (D7)
Falcon (D2) 200
Falkner (G1) 600
Fannin (E6)
Farmhaven (E5)
Farrell (C2)
Fayette ◉(B7) 1,498
Fearns Springs (G4)
Fenton (F10) 25
Fentress (F4)
Fernwood (D8) 600
Fitler (B5) 300
Flora (D5) 655
Florence (D6) 313
Foote (C4) 100
Forest ◉(F6) 2,874
Forkville (E6) 145
Fort Adams (B8) 105
Foxworth (E8) 750
French Camp (F4) 162
Friars Point (C2) 916
Fruitland Park (F9) 63
Fulton ◉(H2) 1,343
Gainesville (E10) 50
Gallman (D7) 170
Garlandville (F6) 180
Gatesville (D6)
Gattman (H3) 150
Gautier (G10)
Geneill (C4)
Georgetown (D7) 327
Geren (D3)
Germania (C5)
Gholson (G5) 25
Gibson (G3) 275
Gillsburg (C8) 50
Gitano (F7)
Glancy (C7)
Glen (H1)
Glen Allan (B4) 400
Glendora (D3) 178
Gloster (B8) 1,467
Glover (D1)
Gluckstadt (D5)
Golden (H2) 206
Good Hope (E5) 200
Goodman (E5) 878
Goodyear (E9)
Goshen Springs (E6)
Goss (E8) 250
Grace (C5)
Grand Gulf (B6) 25
Grapeland (B3)
Greenville ◉(B4) 29,936
Greenville A. F. B. (B3)
Greenwood ◉(D4) 18,061
Greenwood Springs (H3) 65
Grenada ◉(E3) 7,388
Grenada (res.) (F3)
Gulfport ◉(F10) 22,659
Gunnison (C3) 453
Guntown (G2) 299
Halstead (C3)
Hamburg (B7)
Hamilton (H3)
Hampton (B4) 10
Handsboro (F10) 1,275
Hankinson (C6) 10
Hardee (C5)
Hardy (E3)
Harperville (E6)
Harriston (C7) 150
Harrisville (D7)
Hathorn (E8) 350
Hatley (H3) 100
Hattiesburg ◉(F8) 29,474
Hazlehurst ◉(D7) 3,397
Heads (C4) 100
Heidelberg (F7) 863
Helm (C4) 100
Hermanville (C7) 255
Hernando ◉(E1) 1,206
Hesterville (E4)
Hickory (F6) 614
Hickory Flat (F1) 345
Highlandale (D3) 100
Highpoint (F4) 300
Hillhouse (C2) 100
Hillsboro (E6)
Hillsdale (F9)
Hinchcliff (D2) 50
Hintonville (F8) 150
Hinze (F4)
Hiwannee (G7) 300
Hohenlinden (F3) 200
Holcomb (D3) 229
Holcut (H1) 300
Hollandale (C4) 2,346
Holly Bluff (C5)
Holly Ridge (C4) 518
Holly Springs ◉(E1) 3,276
Hollyknowe (C4)
Hollywood (D1) 117
Holmesville (D8) 70
Homewood (E6)
Homochitto (riv.) (B8)
Honey Island (D4)
Hopewell (D7) 350
Horn (isl.) (G10)
Horn Lake (D1) 1,000
Houlka (G2) 545
Houston ◉(G3) 1,664
Howard (D4) 25
Howison (F9) 75
Hub (E8) 280
Hudsonville (F1) 50
Hurley (H9)
Hushpuckena (C2) 200
Increase (G6) 40
Independence (E1)
Indianola ◉(C4) 4,369
Ingomar (F2)
Inverness (C4) 1,010
Irene (D8) 100
Isola (C4) 450
Itta Bena (D4) 1,725
Iuka ◉(H1) 1,527
Jacinto (H1) 140
JACKSON (D6) 98,271
James (B4) 500
Jamestown (E8) 25
Jayess (D8) 50
Jeffries (C2)
Johns (E6) 800
Johnstons Sta. (D8)
Jonestown (D2) 741
Keesler A.F.B. (G10)
Keirn (D4)
Kendrick (H1)
Keownville (G1) 15
Kewanee (H6) 200
Kienstra (A8)
Kilmichael (E4) 511
Kiln (F10)
Kipling (G5)
Kirby (C7) 98
Kirkville (H2) 125
Kittrell (G8) 100
Klein (F6) 10
Knoxville (B8)
Kokomo (E8) 300
Kolola Springs (H3) 81
Kosciusko ◉(E4) 6,753
Kossuth (G1) 242
Kreole (H10) 1,106
Lafayette Springs (F2)
Lake (F6) 345
Lake Como (F7) 150
Lake Comorant(D1)
Lake View (D1) 100
Lakeshore (F10) 107
Lamar (F1)
Lambert (D2) 1,023
Lamkin (D4) 100
Lamont (B3) 250
Landon (F10) 500
Laneheart (B8)
Langford (E6)
Langsdale (G7) 100
Lauderdale (G5) 648
Laurel ◉ (F7) 25,038
Lawrence (F6) 300
Le Flore (D3) 75
Leaf (G8)
Leaf (riv.) (F8)
Leakesville ◉(G8) 893
Learned (C6) 126
Leedo (C7)
Leedy (H1)
Leesburg (E6)
Leesdale (B7) 20
Leland (C4) 4,736
Lemon (E6)
Lena (E5) 353
Leota Landing (B4) 20
Lessley (B8)
Lexie (D8)
Lexington ◉(D4) 3,198
Liberty ◉(C8) 683
Little Rock (F5)
Little Tallahatchie (riv.) (D2)
Lobdell (B3) 50
Lockhart (G6) 50
Lodi (E3) 50
Logtown (E10) 300
Lombardy (C3) 300
Long (C4) 100
Long Beach (F10) 2,703

◉County Seat


All railroads are numbered as per accompanying list, making possible quick and accurate identification of each line.
RAILROADS
9 Alabama, Tennessee
10 Bonhomie & Hattiesburg
10a
11
12 Columbus & Greenville
15
78 Gulf, Mobile & Ohio
80
87
101
101a
102 Mississippian
103a
105
106
107
108 St. Louis - San Francisco
111
112
114
MEMPHIS
TENNESSEE
MISSISSIPPI
ARKANSAS
LOUISIANA
DE SOTO
MARSHALL
BENTON
TIPPAH
ALCORN
TISHOMINGO
TUNICA
PRENTISS
UNION
LAFAYETTE
PANOLA
LEE
ITAWAMBA
COAHOMA
QUITMAN
PONTOTOC
TALLAHATCHIE
YALOBUSHA
CHICKASAW
MONROE
BOLIVAR
GRENADA
CALHOUN
CLAY
WEBSTER
LEFLORE
CARROLL
MONTGOMERY
OKTIBBEHA
LOWNDES
SUNFLOWER
WASHINGTON
CHOCTAW
HUMPHREYS
HOLMES
ATTALA
WINSTON
NOXUBEE
SHARKEY
YAZOO
LEAKE
NESHOBA
KEMPER
Clarksdale
Batesville
Oxford
Tupelo
Water Valley
Charleston
Houston
Aberdeen
Columbus
Greenwood
Cleveland
Ruleville
Indianola
Moorhead
Greenville
Itta Bena
Carrollton
Winona
Kosciusko
Louisville
Starkville
West Point
Eupora
Ackerman
Yazoo City
Vicksburg
Natchez
Philadelphia
Meridian
Tunica
Senatobia
Holly Springs
Ripley
Corinth
Booneville
New Albany
Pontotoc
Tupelo
Okolona
Amory
Aberdeen
Pittsboro
Houston
Calhoun City
Grenada
Elliott
Duck Hill
Sweatman
Cedar Hill
Lodi
Carrollton
Avalon
Whaley
Money
Schlater
Itta Bena
Greenwood
Leflore
Sunflower
Indianola
Moorhead
Drew
Ruleville
Cleveland
Rosedale
Benoit
Arkansas City
Lake Village
Montrose
Hamburg
Greenville
Dermott
Mc Gehee
Monticello
Warren
Gould
Dumas
Gillett
De Witt
Stuttgart
Helena
West Helena
Marianna
Forrest City
Cotton Plant
Des Arc
Brinkley
Clarendon
Pine City
Barton
Wheatley
Fargo
Wiville
Gregory
Beebe
Hazen
Mesa
Hulbert
Collierville
Moscow
Grand Jc.
Middleton
Selmer
Michigan City
Brownfield
Kendrick
Pickwick Lake
Pickwick Landing Dam
Shiloh Nat'l Mil Pk
Canaan
Chalybeate
Walnut
Tiplersville
Lamar
Kosciusko
Falkner
Ashland
Blue Mountain
Cotton Plant
Dumas
Winborn
Hickory Flat
Potts Camp
Red Banks
Victoria
Byhalia
Hudsonville
Mount Pleasant
Slayden
Olive Branch
Millers Pleasant Hill
Plum point
Mineral Wells
Lake View
Walls
Horn Lake
Glover
Lake Cormorant
Nesbit
Penton
Banks
Eudora
Robinsonville
Hollywood
Arkabutla
Hernando
Cockrum
Coldwater
Arkabutla Dam
Prichard
Tunica
Arkabutla
Savage
Strayhorn
Evansville
Clayton
Maudo
Dubbs
Sarah
Askew
Longtown
Crenshaw
Como
Sardis
Sardis Reservoir
Sardis Dam
Abbeville
College Hill
Falcon
Pleasant Grove
Dundee
Powell
Jeffries
Lula
Sledge
Coldwater
Coahoma
Matagorda
Essex
Darling
Friars Point
Dickerson
Rudyard
Jonestown
Stovall
Cloverhill
Farrell
Sherard
Lyon
Davenport
Rena Lara
Bobo
Hillhouse
Lambert
Clarksdale
Marks
Belen
Curtis
Sta
Hinchcliff
Tallahatchie
Courtland
Crowder
Pope
Taylor
De Lay
Tula
Reid Reservoir
Paris
Randolph
Algoma
Troy
Wallfield
Shannon
Nettleton
Verona
Plantersville
Tilden
Tremont
Fulton
Dorsey
Ballardsville
Mantachie
Rara Avis
Mooreville
Belden
Chesterville
Ecru
Sherman
Thaxton
Toccopola
Springville
Blue Spgs
Ingomar
Ratliff
Saltillo
Guntown
Kirkville
Baldwyn
Bethany
Etta
Wallerville
Lafayette Spgs
Denmark
Burgess
University
Oxford
Abbeville
Sardis Reservoir
Sardis Dam
Belmont
Golden
Marietta
Wheeler
New Site
Dennis
Thrasher
Boonville
Paden
Tishomingo
Holcut
Jacinto
Leedy
Woodall Mtn 806
Margerum
Buenaville
Iuka
Rienzi
Jumpertown
Ripley
Blue Mountain
Falkner
Ashland
Red Banks
Holly Springs
Waterford
Potts Camp
Malone
Tyro
Looxahoma
Thyatira
Barr
Wyatte
Senatobia
Strayhorn
Savage
Arkabutla
Coldwater
Independence
Love
Arkabutla Dam
Hernando
Cockrum


MISSISSIPPI
MONROE
Rayville
Delhi
Tallulah
Winnsboro
Columbia
Clarks
Jena
Clayton
Ferriday
Vidalia
Natchez
Marksville
Mansura
Bunkle
Angola
Jackson
St. Francisville
Clinton
Kentwood
Greensburg
Grangeville
Amite
Hammond
Covington
Denham Springs
Springville
BATON ROUGE
Lake Maurepas
LAKE PONTCHARTRAIN
Slidell
Bogalusa
Franklinton
Poplarville
Wiggins
Perkinston
Hurley
Wade
Dawes
Bigpoint
MOBILE
MOBILE BAY
Vicksburg
Tallulah
Winnsboro
Delhi
Rayville
Monroe
Bayou
Tensas
Black
Ouachita
Red
Little
Saline
Dugdemona
Boeuf
Macon
Arkansas
Louisiana
Mississippi
Tennessee
Alabama
Gulf of Mexico
Mississippi Sound
Chandeleur Sound
Lake Borgne
Lake Pontchartrain
Lake Maurepas
Pearl River
Bogue Chitto
Tangipahoa
Amite
Comite
Homochitto
Buffalo
Big Black
Yazoo
Sunflower
Coldwater
Tallahatchie
Yocona
Tippah
Hatchie
Obion
Forked Deer
Wolf
Loosahatchie
Wolf River
Nonconnah
Creek
Bayou
Lake
Point
Island
Pass
Sound
Bay
Cut I
Ship I
Horn I
Petit Bois I
Round I
Dauphin Island
Pascagoula
Gulfport
Biloxi
Ocean Springs
Moss Point
Gautier
Escatawpa
Pecan
Vancleave
Lyman
Nugent
Handsboro
Mississippi City
Long Beach
Pass Christian
Bay Saint Louis
Waveland
Gainesville
Logtown
Pearlington
Clermont Har.
Kiln
Fenton
Lyman
Saucier
Howison
McHenry
Millard
Derby
Carriere
McNeil
Cybur
Caesar
Goodyear
Picayune
Nicholson
Orvisburg
Hillsdale
Lumberton
Sandy Hook
Purvis
Baxterville
Seneca
Brooklyn
McLain
Maxie
Carnes
Fruitland Park
Bond
Lucedale
Benndale
Shipman
Agricola
Vernal
Leakesville
Rounsville
Neely
Byrd
Richton
Hattiesburg
Petal
Sumrall
Clyde
Oloh
Bonnomie
Hintonville
Palmers Crossing
Wingate
Kittrell
Mahned
New Augusta
Beaumont
McLaurin
Runnelstown
Piave
Bothwell
Avera
Vinegar Bend
Calvert
Yellow Pine
State Line
Battle
Chicora
Winchester
Waynesboro
Clara
Buckatunna
Ellisville
Laurel
Sandersville
Errata
Soso
Gitano
Eucutta
Matherville
Hiwannee
Shubuta
Langsdale
Carmichael
De Soto
Crandall
Theadville
Brewer
Quitman
Pachuta
Paulding
Bay Springs
Lake Como
Vossburg
Stafford Spgs
Heidelberg
Stringer
Taylorsville
Summerland
Saratoga
Shivers
Braxton
Harrisville
D'Lo
Mendenhall
Weathersby
Sanatorium
Pinola
Magee
Mizo
Raleigh
Sylvarena
Cohay
Traxler
Whiteoak
Puckett
Cato
Piney Woods
Star
Florence
Thomasville
Johns
Pineville
Burns
Lemon
Trenton
Klein
Lorena
Wicker
Polkville
Homewood
Suno
Norris
Pulaski
Pelahatchie
Langford
Tougaloo
Fannin
Ridgeland
Madison
Pocahontas
Brownsville
Cynthia
Flora
Gluckstadt
Canton
Stokes
Shoccoe
Sandhill
Goshen Spgs
Forkville
Leesburg
Harperville
Steel
Hillsboro
Morton
Forest
Lake
Union
Little Rock
Conehatta
Decatur
Newton
Chunky
Lawrence
Hickory
Meehan
Meridian
Whynot
Vimville
Increase
Roberts
Garlandville
Basic
Enterprise
Stonewall
Rose Hill
Montrose
Verba
Louin
Laurel
Ellisville
Moselle
Ovett
Blodgett
Estabutchie
Lux
Sanford
Seminary
Carson
Bassfield
Prentiss
Mt. Carmel
Collins
Ora
Mount Olive
Dry Creek
Oma
Sontag
Wanilla
Nola
Silver Cr
Soegaard
Wesson
Beauregard
Martinsville
Rockport
Glancy
Burnell
Allen
Barlow
Georgetown
Hazlehurst
Copiah
Crystal Spgs
Gallman
Hopewell
Gatesville
Carpenter
Utica Institute
Bear Creek
Utica
Cayuga
Dry Grove
Terry
Adams
Oakley
Learned
Newman
Raymond
Byram
Pearl
Plain
Whitfield
Brandon
Pearson
Value
Edwards
Bolton
Clinton
Jackson
Hawkins Field
Vicksburg Nat'l Mil. Park
Waltersville
Bovina
Signal
Redwood
Oak Ridge
Ballground
Eldorado
Phoenix
Germania
Mechanicsburg
Bentonia
Satartia
Valley Park
Hardee
Chotard
Brunswick
Eagleberd
Yokena
Hankinson
Nanachehaw
Grand Gulf
Willows
Port Gibson
Hermanville
Carlisle
Bayou
Rodney
Alcorn
Russum
Pattison
Barland
Tillman
Lorman
Peyton
Rod Lick
McBride
Church Hill
Harriston
Fayette
Stampley
Union Church
Leedo
McNair
Cannonsburg
Pine Ridge
Stanton
Selma
Washington
Hamburg
Oldenburg
Cranfield
Natchez
Leesdale
Roxie
Kirby
Eddiceton
McCall Cr.
Lucien
Meadville
Quentin
Monroe
Bude
Whiteapple
Knoxville
Sibley
Briers
Homochitto
Rosetta
Crosby
Coles
Zion Hill
Smithdale
Doloroso
Wilkinson
Laneheart
Lessley
Kienstra
Gloster
Bewelcome
Liberty
Ariel
Peoria
Street
Gillsburg
Ft. Adams
Woodville
Centreville
Pond
Pinckneyville
Turnbull
Whitworth
Roxie
Quentin
Brookhaven
Fair River
Monticello
Arm
Lawrence
Jefferson
Davis
Lincoln
Franklin
Adams
Amite
Wilkinson
Pike
Walthall
Marion
Lamar
Perry
Forrest
Greene
George
Stone
Harrison
Jackson
Hancock
Pearl River
Covington
Jefferson Davis
Simpson
Smith
Jasper
Clarke
Lauderdale
Newton
Scott
Rankin
Hinds
Madison
Yazoo
Sharkey
Issaquena
Warren
Claiborne
Jefferson
Wilkinson
Amite
Pike
Walthall
Marion
Lamar
Forrest
Perry
Greene
George
Stone
Harrison
Jackson
Hancock
Pearl River
Covington
Jefferson Davis
Simpson
Smith
Jasper
Clarke
Lauderdale
Newton
Scott
Rankin
Hinds
Madison
Yazoo
Sharkey
Issaquena
Warren
Claiborne
Jefferson
SCALE OF MILES
0 5 10 20 30 40
State Capitals
County Seats
Copyright by C. S. Hammond & Co., N. Y.
92° 30′ 91° 30′ Longitude West 90° of Greenwich 30′ 89° 30′
30′
31°
32°

Longtown (D1)..... 82
Longview (G4).....
Longwood (C4)..... 65
Looxahoma (E1)..... 50
Lorena (F6).....
Lorenzen (C5).....
Lorman (B7).....
Louin (F6)..... 478
Louise (C5)..... 479
Louisville ◉(G4).....5,282
Love (D1)..... 75
Luce Farms (H9).... 85
Lucedale ◉(G9).....1,631
Lucien (C7).....
Ludlow (E5)..... 500
Lula (C2)..... 488
Lumberton (E8).....1,803
Lux (F8).....
Lyman (F10).....
Lynn Creek (G4).....
Lyon (D2)..... 386
Maben (F3)..... 616
Macel (D3)..... 50
Macon ◉(G4).....2,241
Madden (F5)..... 350
Madison (D6)..... 540
Magee (E7).....1,738
Magnolia ◉(D8).....1,984
Mahned (F8)..... 100
Malone (E1)..... 25
Malvina (C3).....
Mantachie (H2)..... 178
Mantee (F3)..... 189
Marietta (H2)..... 125
Marion (G6).....
Marks ◉(D2).....2,209
Martinsville (D7)....
Marydell (F5)..... 200
Mashulaville (G4).... 150
Matagorda (D2).....
Matherville (G7).....
Mathiston (F3)..... 584
Mattson (C2).....
Maud (D1)..... 102
Maxie (F9)..... 80
Mayersville ◉(B5)....
Mayhew (G4).....
McAdams (E4).....
McBride (C7)..... 35
McCall Creek (C7).. 300
McCarley (E3)..... 300
McComb (D8).....10,401
McCondy (G3)..... 100
McCool (F4)..... 305
McCrary (H4)..... 10
McDonald (F5).....
McHenry (F9)..... 400
McLain (G8).....
McLaurin (F8).....
McLeod (H4).....
McNair (C7)..... 200
McNeill (E9)..... 500
McVille (E5).....
Meadville ◉(C8)..... 524
Mechanicsburg (D5) 15
Meehan (G6)..... 107
Meltonia (C3).....
Mendenhall ◉(E7)..1,539
Meridian ◉(G6)....41,893
Merigold (C3)..... 682
Merit (E7)..... 25
Merrill (G9).....
Mesa (D8).....
Metcalfe (B4)..... 100
Michigan City (F1).. 38
Midnight (C4)..... 400
Mileston (D4)..... 47
Millard (E9).....
Miller (E1)..... 200
Millville (E5).....
Mineral Wells (E1).. 275
Minter City (D3)..... 400
Mississippi(riv.)(B7)
Mississippi (sound) (G10) .....
Mississippi City (F10) 2,125
Misterton (E3).....
Mize (E7)..... 430
Money (D3).....
Monroe (C8)..... 100
Monticello ◉(D7)....1,382
Montpelier (G3).....
Montrose (F6)..... 222
Mooreville (G2).....
Moorhead (C4).....1,749
Morgan City (D4).....
Morgantown (E8).... 300
Morton (E6).....1,664
Moscow (G5).....
Moselle (F8)..... 500
Moss (F7).....
Moss Point (G10)....3,782
◉County Seat

Mound Bayou (C3)..1,328
Mount Carmel (E7) 50
Mount Helena (C5)
Mount Olive (E7).... 827
Mt. Pleasant (E1).... 300
Muldon (G3)..... 60
Murphy (C4)..... 200
Myles (C7)..... 50
Myrleville (D5).....
Myrtle (F1)..... 331
Nanachehaw (B6).... 19
Natchez ◉(B7).....22,740
Neely (G8)..... 300
Nesbit (D1)..... 250
Neshoba (F5)..... 300
Nettleton (G2).....1,204
New Albany ◉(G2)..3,680
New Augusta ◉(F8) 500
New Site (H1)..... 24
Newhebron (D7)..... 303
Newman (C6)..... 12
Newton (F6).....2,912
Nicholson (E10)..... 500
Nitta Yuma (C4).....
Nod (D5) 20
Nola (D7)..... 120
Norfield (C8)..... 123
Norris (F6).....
Northcarrollton(E3) 506
Noxapater (F5)..... 615
Noxubee (riv.) (G4)
Nugent (F10).....
Oak Ridge (C6)..... 200
Oak Vale (E8)..... 136
Oakland (E2)..... 551
Oakley (D6)..... 205
Ocean Springs (G10)3,058
Ofahoma (E5)..... 50
Okatibbee (creek) (G5) .....
Okolona ◉(G2).....2,167
Oldenburg (C7).....
Olive Branch (E1)....
Oloh (E8)..... 50
Oma (D7)..... 50
Onward (C5).....
Ora (E7).....
Orange Grove (H10) 150
Orvisburg (E9).....
Osborn (G3).....
Osyka (D8)..... 724
Ovett (F8)..... 357
Owens Wells (E4)....
Oxford ◉(F2).....3,956
Pace (C3)..... 422
Pachuta (G6)..... 273
Paden (H1)..... 158
Palmers Crossing (F8) .....
Panther Burn (C4).. 30
Parchman (D3).....
Paris (F2)..... 84
Pascagoula ◉(G10)10,805
Pascagoula (riv.) (G9) .....
Pass Christian (F10)3,383
Pattison (C7)..... 300
Paulding ◉(F6)..... 400
Paulette (H4)..... 126
Paynes (D3).....
Pearl (riv.) (D8).....
Pearlington (E10).... 150
Pearson (D6).....
Pecan (H10)..... 100
Pelahatchie (E6)..... 867
Penton (D1).....
Peoria (C8).....
Percy (C4).....
Perkinston (F9)..... 400
Perthshire (C3).....
Petal (F8).....2,148
Petit Bois (isl.) (H10)
Pettit (C4)..... 175
Peyton (C7)..... 25
Pheba (G3).....
Philadelphia ◉(F5)..4,472
Philipp (D3)..... 350
Phoenix (C5).....
Piave (G8).....
Picayune (E9).....6,707
Pickens (E5)..... 638
Pickwick (lake) (H1) .....
Pierre, Bayou (C7)..
Pinckneyville (B8).....
Pine Ridge (B7).....
Pine Valley (E2).....
Pineville (F6).....
Piney Woods (D6).. 750
Pinola (E7)..... 143
Pittsboro ◉(F3)..... 246
Plain (D6)..... 500
Plantersville (G2).... 479

Plattsburg (F5).....
Pleasant Grove (D2)
Pleasant Hill (E1).... 200
Plumpoint (E1).....
Pocahontas (D6)..... 500
Polkville (E6)..... 150
Pond (B8).....
Pontotoc ◉(G2).....1,596
Pope (E2)..... 246
Poplar Creek (E4).... 350
Poplarville ◉(E9)....1,852
Port Gibson (B7)....2,920
Porterville (G5)..... 88
Potts Camp (F1)..... 432
Powell (D2)..... 80
Prairie (G3)..... 654
Prairie Point (H4)....
Prentiss ◉(E7).....1,212
Preston (G5)..... 375
Pricedale (D8)..... 300
Prichard (D1).....
Priscilla (C3)..... 75
Puckett (E6)..... 300
Pulaski (E6).....1,000
Purvis ◉(F8).....1,270
Pyland (F3)..... 125
Quentin (C8)..... 300
Quincy (H3).....
Quitman ◉(G6).....1,817
Raleigh ◉(F6)..... 580
Randolph (F2)..... 243
Rara Avis (H2).....
Ratliff (H2)..... 60
Ravine (H4).....
Raymond ◉D6.....1,259
Red Banks (F1)..... 450
Red Lick (B7).....
Redwood (C6).....
Reform (F4)..... 400
Rena Lara (C2)..... 50
Renfro (F5).....
Renova (C3)..... 250
Riceville (F9)..... 40
Rich (D2)..... 61
Richey (C4)..... 86
Richton (G8).....1,158
Ridgeland (D6)..... 526
Rienzi (G1)..... 468
Rio (G5).....
Ripley ◉(G1).....2,383
Roberts (F6).....
Robinsonville (D1).. 100
Rockport (D7).....
Rodney (B7)..... 209
Rolling Fork ◉(C5)1,229
Rome (C3)..... 189
Rose Hill (F6)..... 500
Rosedale ◉(B3).....2,197
Rosetta (B8).....
Roundaway (C2)..... 150
Roundlake (C2)..... 230
Rounsaville (G8)..... 19
Roxie (B7)..... 521
Rudyard (C2)..... 110
Ruleville (D3).....1,521
Runnelstown (F8)....
Rural Hill (F4)..... 3
Russell (G6)..... 275
Russum (B7)..... 350
Ruth (D8).....
Sabougla (F3)..... 100
Saint Louis (bay) (F10) .....
Sallis (E4)..... 228
Saltillo (G2)..... 501
Sanatorium (E7).....
Sandersville (F7)..... 681
Sandhill (E5).....
Sandy Hook (E8)....
Sanford (F8).....
Sapa (F3).....
Sarah (D1)..... 93
Saratoga (E7)..... 65
Sardis ◉(E2).....1,913
Sardis (dam) (E2)....
Sardis (res.) (E2)....
Sarepta (F2)..... 90
Satartia (C5)..... 105
Saucier (F9).....
Savage (D1).....
Schlater (D3).....
Scobey (E3)..... 112
Scooba (G5)..... 734
Scott (B3).....2,000
Sebastopol (F5)..... 330
Selma (B7)..... 2
Seminary (E7)..... 345
Senatobia ◉(E1).....2,108
Seneca (F8)..... 12
Sessums (G4).....
Shannon (G2)..... 520
Sharon (E5).....
Shaw (C3).....1,892

Shelby (C3).....2,148
Sherard (C2)..... 75
Sherman (G2)..... 386
Ship (isl.) (G10).....
Shipman (G9)..... 7
Shivers (E7)..... 100
Shoccoe (E5).....
Shubuta (G7)..... 782
Shuqualak (G5)..... 714
Sibley (B8)..... 25
Sidon (D4)..... 361
Signal (C6)..... 360
Silver City (C4)..... 381
Silver Creek (D7).... 275
Skene (C3)..... 250
Slate Spring (F3)..... 134
Slayden (F1)..... 45
Sledge (D2)..... 383
Smedes (C5).....
Smithdale (C8).....
Smiths (C6).....
Smithville (H2)..... 419
Soegaard (D7).....
Sontag (D7).....
Soso (F7)..... 171
Spanish Fort (C5).... 120
Springville (F2)..... 400
Stafford Springs(F7) 200
Stallo (F5)..... 500
Stampley (B7)..... 23
Stanton (B7).....
Star (D6)..... 300
Starkville ◉(G4).....7,107
State College (G4)..4,000
State Line (G8)..... 492
Steel (F6).....
Steens (H3)..... 95
Stewart (F4)..... 311
Stokes (D5).....
Stoneville (C4).....
Stonewall (G6).....1,015
Stovall (C2).....
Stover (D2).....
Stratton (F6).....
Strayhorn (D1)..... 125
Street (C8)..... 50
Stringer (F7)..... 150
Stringtown (C3)..... 500
Strong (G3)..... 500
Strong (riv.) (D7)...
Sturgis (G4)..... 402
Sucarnochee (H5)....
Sucarnoochee (creek) (G5) .....
Summerland (F7).... 112
Summit (D8).....1,558
Sumner ◉(D3)..... 550
Sumrall (E8)..... 853
Sun (F6).....
Sunflower (C3)..... 639
Sunflower (riv.) (C5) .....
Swan Lake (D3)..... 50
Sweatman (E3).....
Swiftown (D4).....
Swiftwater (B4)..... 10
Sylvarena (F6)..... 112
Symonds (C3).....
Tallahala (creek) (F7) .....
Tallahatchie (riv.) (D3) .....
Tallula (B5).....
Tamola (G5)..... 55
Taylor (E2)..... 125
Taylorsville (F7).....1,116
Tchula (D4)..... 927
Tchula (lake) (D4).
Terry (D6)..... 497
Thaxton (F2)..... 300
Theadville (G7)..... 75
Thomastown (E5).... 250
Thomasville (E6)..... 25
Thorn (F3)..... 60
Thornton (D4)..... 50
Thrasher (G1)..... 200
Thyatira (E1).....
Tibbee Station (G3) 35
Tie Plant (E3)..... 400
Tilden (H2)..... 150
Tillatoba (E3)..... 127
Tillman (C7)..... 150
Tiplersville (G1)..... 110
Tippo (D3)..... 80
Tishomingo (H1)..... 335
Toccopola (F2)..... 262
Tombigbee(riv.)(H4)
Tomnolen (F4)..... 150
Toomsuba (G6)..... 500
Topton (G6)..... 15
Tougaloo (D6).....
Tralake (C4)..... 250
Traxler (E6)..... 75

Trebloc (G3)..... 300
Tremont (H2).....
Trenton (E6).....
Tribbett (C4)..... 100
Trim Cane (creek) (G4) .....
Troy (G2).....
Tula (F2).....
Tunica ◉(D1).....1,354
Tupelo ◉(G2).....11,527
Tupelo Nat'l Battlefield Site (G2).....
Turnbull (B8).....
Tuscola (E5)..... 250
Tutwiler (D2)..... 939
Tylertown ◉(D8)....1,331
Tyro (E1)..... 750
Union (F5).....1,559
Union Church (C7).. 275
University (E2).....1,200
Utica (C6)..... 824
Utica Institute (C6)
Vaiden ◉(E4)..... 583
Valley (D5)..... 125
Valley Park (C5).....
Value (D6)..... 300
Van Vleet (G3)..... 300
Vance (D2).....
Vancleave (G9).....
Vardaman (F3)..... 686
Vaughan (D5)..... 350
Velma (E2).....
Verba (F6).....
Vernal (G8).....
Verona (G2)..... 589
Vicksburg ◉(C6)....27,948
Vicksburg Nat'l Mil. Park (C6) .....
Victoria (E1).....
Vidalia (F10)..... 25
Vimville (H6).....
Vossburg (F7)..... 500
Wade (G9)..... 300
Whalak (G5).....
Waldrup (F7).....
Wallerville (G2)..... 100
Wallfield (F2).....
Walls (D1)..... 318
Walnut (G1)..... 481
Walnut Grove (F5).. 517
Waltersville (C6)..... 250
Walthall ◉ (F3)..... 149
Wanilla (D7).....
Washington (B7).....
Water Valley ◉(E2)3,113
Waterford (E1)..... 125
Waveland (F10)..... 793
Waxhaw (C3).....
Way (E5).....
Waynesboro ◉(G7)3,442
Wayside (C4).....
Weathersby (E7)..... 145
Webb (D3)..... 680
Weir (F4)..... 570
Wenasoga (G1)..... 150
Wesson (D7).....1,235
West (E4)..... 354
W. Enterprise (G6)..
West Point ◉(G3)....6,432
Whaley (D3)..... 15
Wheeler (G1)..... 300
White Apple (B8).... 25
White Bluff (E8)..... 25
Whiteoak (E6)..... 50
Whitfield (E6).....
Whynot (G6)..... 60
Wicker (E6).....
Wiggins ◉(F9).....1,436
Wilkinson (B8)..... 300
Williamsville (F4)....
Willows (C6)..... 30
Winborn (F1).....
Winchester (G7).....
Wingate (G8)..... 150
Winona ◉(E4).....3,441
Winstonville (C3).... 322
Winterville (B4).....
Wolf (riv.) (F9).....
Woodall (mt.)(H1)..
Woodland (F3)..... 133
Woodville ◉(B8).....1,609
Wren (G3)..... 250
Wyatte (E1)..... 100
Yalobusha (riv.) (E3) .....
Yazoo (riv.) (C5).....
Yazoo City ◉(D5)..9,746
Yockanookany (riv.) (E5) .....
Yokena (C6)..... 25
Youngs (E3)..... 25
Zama (F5).....
Zion Hill (C8)..... 50

supervisors and city officials. This program of disease prevention is estimated at serving 84 per cent of the population. As a result the total death rate in Mississippi was 9.5 per thousand in 1944, while that of the United States was 10.6. Of public welfare institutions, Mississippi has charity hospitals in Jackson, Vicksburg, Meridian, Natchez, and Laurel. There are two state hospitals for the insane, one near Brandon, the other in Meridian, and a state school for the feeble-minded at Ellisville. Two schools, one for the deaf and one for the blind, are in Jackson. "Beauvoir," the Jefferson Davis shrine, still shelters with state support a few widows of Confederate soldiers. There is a tuberculosis sanatorium near Magee.

The Industrial and Training School, Columbia, cares for white orphans, delinquent children, and children of indigent parents, on the basis of court commitment. There is also a Negro juvenile reformatory at Oakley. The state has a prison farm, Parchman, considered by the Library of Congress as a major source of Negro folk music.

Other private and denominational charitable institutions are: Orphan's Home, Children's Home Society, Old Ladies' Home, Old Men's Home, and Baptist Orphanage, Jackson; Palmer Orphanage (Presbyterian), Columbus; D'Evereux Hall Orphan Asylum, St. Mary's Orphan Asylum, and Protestant Home, Natchez.

Local Government.—The three main types of municipalities are code chapter, commission, and private charter. Twelve cities are governed by commission, the remaining 258 by mayor and aldermen. No city manager government exists as yet within the state.

Educational System.—*Public Education.*—All the state colleges come under one Board of Trustees of Institutions of Higher Learning. They are: the University of Mississippi, Mississippi State College, Mississippi State College for Women (Columbus), Mississippi Southern (Hattiesburg), Delta State Teachers (Cleveland), Alcorn Agricultural and Mechanical (Lorman) for Negroes, and Mississippi Negro Training School (Jackson).

The elective state superintendent of education is the executive head of the public school system. During the school year 1943–1944, Mississippi had 5,000 public schools, white and colored. Stress is placed on consolidation. Free textbooks are provided through the 12 grades. There are 12 agricultural high schools and 12 publicly supported junior colleges. The development of Negro education is receiving emphasis. All Negro schools are taught by Negro teachers. Handicapped children are trained under a program of the Vocational Rehabilitation and Crippled Children's Service.

The legislature in the sessions of 1946 and 1947 made appropriations totaling $38,098,553.46 available for the program of education. This figure does not include grants from the federal government nor revenues raised by county and district taxation.

Private Education.—The Roman Catholic Church has approximately 30 parochial schools, including some for Negroes and Indians. The Baptists have a mission school for Chinese at Cleveland. Two small academies are run by the Presbyterians, Chamberlain-Hunt (Port Gibson) and French Camp. All Saints (Vicksburg) is an Episcopal junior college for girls.

There are two girls' colleges, Belhaven (Jackson) and Blue Mountain, under the auspices respectively of the Presbyterians and Baptists. Millsaps College (Methodist), Jackson, and Mississippi College (Baptist), Clinton, are coeducational. The Roman Catholic bishop of Natchez holds an endowment fund for the education of young men for the priesthood. At Bay St. Louis is a major seminary, St. Augustine's, for the training of Negro priests.

Libraries.—Most of the towns and counties have small lending libraries which received tremendous impetus under the Works Progress Administration (1935–1942). The improvement of many educational features have been due in large measure to the Mississippi Educational Association and the Parent-Teacher Association. The library of the State Department of Archives and History at Jackson is excellent for research. It has special collections of Mississippi and American history. The University of Mississippi Library is well equipped and has special collections of Mississippiana, political science, and international law. The Ricks Memorial Library at Yazoo City has a fine collection of first editions.

History.—Before Mississippi was known to Europeans, and for some time thereafter, it was inhabited by Indians. The Chickasaws were in the north and the Choctaws in the central portion and south. In the southwest were the aristocratic Natchez, related to the highly civilized Indians of Mexico. There were other smaller tribes.

The first appearance of Europeans in this land was in December 1540 when Hernando de Soto and his followers entered. They spent the winter of 1540–1541 in northeastern Mississippi before discovering the river in May 1541. The next were the French priest and trader, Jacques Marquette and Louis Jolliet (1673), who had some contact with the Chickasaws but did not remain long. French interest was continued by Sieur de La Salle who reached the mouth of the river and claimed the valley for Louis XIV, naming it Louisiana in his honor. Father Zenobius Membré celebrated for this party on Easter Sunday, 1682, near the site of Fort Adams, the first Mass in Mississippi. There were other explorers, but no permanent settlement was made until 1699.

In that year Pierre Lemoyne, Sieur d'Iberville, established Fort Maurepas, near the site of Biloxi. From that date until 1763, Mississippi was a part of the French colony of Louisiana, ruled first from Mobile, then Biloxi, later New Orleans. The second location was Fort Rosalie (Natchez) in 1716, and others followed. Women were brought from France as wives for the colonists. Many successful companies were formed to promote immigration. The Scottish adventurer, John Law, created great European interest in 1717 by his speculation which later (1720) fell into disrepute as the "Mississippi Bubble."

British ambition was aroused. As a result of the Seven Years' War and the Treaty of Paris (1763) the country came under British domination as West Florida, governed from Pensacola. Many Anglo-Americans who received land as payment for military services moved in from the Atlantic seaboard. France out of the way, the Anglo-Americans now faced the Spaniards who meanwhile had acquired New Orleans and Louisiana west of the Mississippi River.

During the American Revolution, the Natchez region was relatively neutral and indifferent to the conflict. The Spanish, taking advantage of the situation, moved in and took (1779) Fort Rosalie (Natchez), called Fort Panmure by the British. The American settlers were amenable to the change and took the oath of allegiance to Spain. The territory remained in Spanish hands officially until 1795 and virtually until 1798, except for a short-lived rebellion of the British colonists in 1781–1782.

By the second Treaty of Paris (1783), Britain relinquished its claims north of latitude 31° to the United States, but Spain refused to recognize this transfer. The situation was further confused when the State of Georgia laid claim to the territory, erected it into the county of Bourbon (1783–1788), and later (1795) sold the land. Ultimately the federal government had to redeem the claims obtained in the notorious "Yazoo fraud."

The issue between the United States and Spain was adjudicated in the Treaty of San Lorenzo (1795), Spain relinquishing the land north of latitude 31°. There was considerable delay in running the line of demarcation. Finally the American surveyor, Andrew Ellicott, arrived, February 1797, but now the Spanish governor delayed, not surrendering the government until March 1798.

On April 7, 1798, the federal government made Mississippi a territory. The land problem was made chaotic by conflicting claims based on French, British, Spanish, and Georgia grants. The intrigues of Aaron Burr and James Wilkinson kept the land in confusion. Indian trouble was brewing, until defeats at the Holy Ground (1813) and Horseshoe Bend (1814) were inflicted by Andrew Jackson. Meanwhile the country was at war again with Britain (1812–1815), ending with the success of Jackson at the Battle of New Orleans. Statehood was finally achieved, Dec. 10, 1817.

This was now a fast growing frontier. The population increased from 40,352 (1810) to 75,448 (1820). The state capital was finally located at Jackson (1822). Two thirds of the state were still in Indian hands, but the Indians gradually ceded their lands to the state and were removed.

This period was the heyday of the famous bandits, Hare, Mason, Murrell, the Harpes, and others. It was also the flush times of land-grabbing, financial speculation, panic, and repudiation, in a raw, new country. A great deal of this rambunctious energy went into the support of Texas independence, the Mexican war, and filibustering in Cuba. But much also went into national politics, the discussion of nullification, and the extension of slavery. However, by 1850, the forces of law and order had gradually made themselves felt. A latently aristocratic and feudal society was beginning to take shape in the more settled communities of the state. It did not last long.

The question of secession could not be suppressed. The election of Lincoln and the action of South Carolina was quickly followed by the dissolution of Mississippi's relation with the Union, Jan. 9, 1861. Jefferson Davis, one of the United States senators representing Mississippi, became the president of the Confederate States. The census of 1860 showed 70,295 white men in Mississippi between the ages of 18 and 45, yet the enlistments of Mississippians in the Confederate armies has been estimated at 78,000.

The major operations of the Union forces in Mississippi were the capture of Corinth (1862), the campaign for Vicksburg (1863) culminating in its surrender, and the destruction of Jackson and Meridian. The end of resistance came May 4, 1865.

By presidential proclamation, William L. Sharkey was made provisional governor. A new constitution was adopted, under which Benjamin G. Humphreys was elected governor. Congress declined to accept the mild presidential reconstruction. A military government was established. Humphreys was ejected from the executive mansion and Gen. Adelbert Ames became the military governor. A reign of extravagance and corruption produced another constitution which was at first defeated by the people.

By a process of concession and pressure it was finally accepted. James L. Alcorn, a former Confederate general, was elected governor. He was succeeded by Ridgley C. Powers. Disagreement arose between two Republican factions led respectively by Ames and Alcorn, and Ames became governor again. Under him Negro power reached its zenith. The lieutenant governor, A. K. Davis, and other prominent officials were Negroes. Violence and rioting broke out in Meridian, Vicksburg, and Clinton.

The election of 1875 was a veritable revolution, returning a majority of Democrats to the legislature. In January 1876, that body set itself the task of removing the radical officials. Davis was deposed, Ames resigned under fire, and the reconstruction came to an end. With the accession of John M. Stone (1876), the state government has been Democratic ever since. To destroy the last vestiges of this period, a new constitution was adopted in 1890, under which the state still functions.

Back in power, the Democrats developed a tension never quite amounting to a split in the party. Two vaguely defined groups resulted, the old established group on the one hand, on the other the poorer farmers and plain people. The common man increased his influence during the administrations of Governors Vardaman, Noel, Bilbo, and Johnson.

Advantageous programs sponsored by recent governors have been numerous. Conner's sales tax practically solved the state's financial problems. White, Bailey, and Wright have gone a long way toward balancing agriculture with industrial development. Even in agriculture vast strides have been made. The state is rapidly being relieved of its bondage to cotton and diversification is well under way. Good modern highways have been constructed and electrification is practically universal.

From 1890 to the present have occurred three wars, the Spanish-American and World Wars I and II. In all of these Mississippi has contributed its share. During the last, one of the largest induction centers was Camp Shelby near Hattiesburg, where at the height of its service 120,000 troops were stationed.

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MISSISSIPPI, mĭs-ĭ-sĭp'ĭ, river, United States, is the great river of North America, and with its far-reaching tributaries embraces one of the major river systems of the world. Long ago, Ojibway Indians, roaming the forests of Wisconsin, called it Missi Sipi, which in their musical language meant the Great River. In the lower valley, where the impetuous current swollen in flood time overflows its banks to convert millions of acres of fertile land into a moving sea, other tribes termed it the Father of Waters. Both names were appropriate, for the scope and volume of this vast stream has made it almost a synonym for great rivers everywhere: even the Volga has been termed the Russian Mississippi, and by a more doubtful comparison, the Murray-Darling, has been called the Mississippi of Australia.

An excursion into Recent geological time reveals a different Mississippi, although one quite as interesting. What is now its lower basin was once a prolongation of the Gulf of Mexico, and Cape Girardeau in Missouri then deserved its name, for it was a bluff promontory overlooking a prehistoric sea. This gulf eventually became filled with wind-swept glacial dust which in places accumulated to a depth of several hundred feet, together with the silt borne downward from the eroded uplands by the turbulent waters.

Meanwhile, the upper branches of the river were undergoing an even more extensive transformation. As the continental ice field, which had crossed the valley of the Ohio, slowly retreated before an increasing climatic warmth, its formidable ramparts still damned up all northward egress, so that its melting waters were forced to seek an outlet to the south. How extensive were these waters may be inferred from the fact that several of the Great Lakes became united in one super lake, while another vast expanse called Lake Agassiz, nearly four times as extensive as Superior, sprawled across Minnesota into North Dakota and reached far upward into Canada. Meanwhile, the Missouri, the major branch of the Mississippi system, seems to have gone wandering off on its own to empty into Hudson Bay. Before the Great Lakes subsided into something like their present shorelines, two of them, Superior and Michigan, flowed for a time into the Mississippi. So also did Agassiz until much of its volume had drained away. Eventually its major remnants—the Lake of the Woods and Lakes Winnipeg, Winnipegosis, and Manitoba in Canada—were captured by the Saskatchewan, while Superior and Michigan turned eastward to join their kindred Great Lakes in the valley of the St. Lawrence. Many smaller remnants of huge Agassiz, however, which still dot Minnesota forests, remained within the original system, and among them the upper Mississippi still finds its source. To compensate partially for the loss of its big lakes in this period of changing watersheds, the Missouri turned eastward and the entire system began to assume something of its present form and magnitude.

If we view a map of North America with all man-made boundaries eliminated, we shall observe that the Mississippi system seems to cut an enormous wedge out of the heart of the continent, a wedge comprising 1,243,000 square miles. Southward it narrows to the State of Louisiana and becomes still more restricted as it pours its waters through the several mouths of its narrow delta into the Gulf of Mexico. But to the northwest its remotest tributaries drain the mountainous borderland between Idaho and Montana, while to the northeast the Allegheny branch of the Ohio taps the water sources of western New York. Although it penetrates into the Rockies eastward and courses the wooded valleys of the Appalachians, the Mississippi system primarily drains the alluvial grain belt of the Middle West and that vast area known as the Great Plains. The watery surplus from 31 states and two Canadian provinces swells its current. Of its hundreds of tributaries no fewer than 45 are navigable for at least 50 miles of their course, providing a combined system of waterways which exceeds 15,000 miles.

More than most rivers, the Mississippi has suffered from a mistaken nomenclature. The main trunk is formed by the union of three great branches, and of these the upper Mississippi, which has given its name to the entire system, is the least impressive. There was a time when it drained the vast lakes of the melting ice fields that it deserved such major rating. But when it lost those lakes to the predatory Saskatchewan and St. Lawrence it also lost its priority; for it yields to the Missouri in length and the extent of its drainage basin, and it yields to the Ohio both in drainage basin and the volume of its waters. This fact is recognized in measuring the length of the system which is always reckoned from the headwaters of the Missouri.

A glance at some statistics will illustrate this comparison. The upper Mississippi to its juncture with the Missouri drains an area of 171,500 square miles. In contrast, the Missouri, longer by nearly 1,600 miles, drains an area more than three times as extensive, or approximately 530,000 square miles. Even the drainage basin of the Ohio is 202,000 square miles. The upper branch of the great river was merely the first to come to the attention of exploring white men. A similar situation has occurred elsewhere, which emphasizes the fact that while river systems are geographical, their names are merely historical and subject to confusion and error.

The source of the upper Mississippi is usually given as Lake Itasca in northern Minnesota. More accurate surveys, however, have traced its ultimate beginnings to Elk Lake and one or two lesser bodies of water which empty into Itasca. The region abounds with glacial relics where river stability is still emerging from the confusion following the ice age. From this elevation of 1,670 feet above the sea, the river winds through swamps and forests, descending by numerous rapids and gaining volume from the spillways of other lakes. At one point it approaches fairly close to the St. Louis River which marks the headwaters of the St. Lawrence. From the Falls of St. Anthony, where the river falls 65 feet in three quarters of a mile—a series of rapids which are broken by a sheer drop of 18 feet—it emerges as a navigable stream all the way to the sea.

As it descends from the continental plateau with its ancient rock formations and relatively

thin covering of soil, the Mississippi presents much varied and pleasing scenery. At times it broadens into such lakes as Pepin; other times it is flanked by precipitous heights called bluffs that may rise 300 feet or more. At several places the current is interrupted by other series of rapids. Above Rock Island there is a descent of some 22 feet; the mouth of the Des Moines River is marked by another of 24 feet; while over a 12-mile stretch approaching Keokuk the river again descends 24 feet.

Geographically, the true source of the Mississippi, however, lies far away on the western borders of Montana. There three considerable streams, the Madison, the Jefferson and the Gallatin, unite to form the Missouri. Fed by the melting snows and gushing springs of the Rockies in the tangled watershed which separates Montana from Idaho, it sweeps on through the wide open spaces of the great Northwest, its branches adding picturesque touches to some of the grandest scenery on the continent. One of these tributaries is the Yellowstone which courses among the geysers, hot springs, and painted gorges of a scenic wonderland. Arching northward, the Missouri sends other branches across the border into the two Canadian provinces of Alberta and Saskatchewan. Bending southward, it meets such tributaries as the Platte, often choked with sand bars. Since much of the territory through which it passes has an annual rainfall of 20 inches or less, the volume of the Missouri varies enormously. In times of flood it discharges more than 800,000 cubic feet a second; in times of excessive drought, it has shrunk to barely 13,000 cubic feet. Such violent aberrations make it one of the most ungovernable of rivers, but its normal volume exceeds the smaller but steadier flow of the upper Mississippi. Where the two rivers unite, they maintain their individuality to a singular degree for more than a hundred miles, the yellow waters of the Missouri being distinguishable as they flow beside the clear waters of the upper Mississippi. Eventually, however, the shifting of the channel from one side of its bed to the other mingles these discordant elements.

Some 200 miles to the south the great twin rivers of the north unite with their eastern branch, the Ohio. This river, formed by the junction of the Allegheny and the Monongahela, is nearly 1,000 miles in length. From Olean, N. Y., on the Allegheny, a river steamer may proceed all the way to Great Falls, Mont., on the Missouri, 4,000 miles from east to west, a distance which nearly spans the continent. The Ohio and its many tributaries drain the ridges and valleys of the Appalachian Mountains where the scenery, though less grand than along the upper Missouri, is less empty and desolate. Here the rainfall exceeds 40 inches annually, or more than twice that in the larger basin of the Missouri, so that the Ohio pours a greater volume of water into the Mississippi system than either of the other main branches. Among its many contributing streams the Tennessee, the Wabash, and the Cumberland are noteworthy.

Farther south the Mississippi attracts other tributaries. Chief among these is the Arkansas whose drainage basin, 187,000 square miles, is larger than that of the upper Mississippi itself. Another considerable affluent approaching from the west is the Red River with a drainage area of 93,000 square miles.

Some 30 miles above the junction of the Ohio and the Mississippi, the topography changes decidedly Here the upland plateau terminates and the river enters an alluvial valley largely of its own creation, through which it meanders for some 1,100 miles to the sea. Through this valley it advances in a series of broad loops and horseshoe bends necessitating a frequent diversion of the current from one side to the other, forming shifting mud bars and frequent changes in the channel. In its lower course these horseshoe bends are sometimes cut through leaving semicircular lakes or lagoons. Meanwhile, new curves and horseshoe bends which the restless waters gouge out of the yielding soil are continually forming. The entrance of the Red River presents a picture even more confusing. This river once flowed into the Atchafalaya which roughly paralleled the lower Mississippi. But the old mouth silted up and the Red River opened its present outlet to the Mississippi. From this point all the way to the Gulf of Mexico the river in flood loses itself in a maze of cross channels called bayous, characteristic in newly made land formed of recently deposited silt. All this region might properly be termed delta since it fills the original oceanic trough; but the obvious delta extends far into the sea in a crowfoot formation of quaking mud and marshland. Here, during the past century and a half, some 50 square miles of land have been added to the State of Louisiana.

The head of this advancing formation is broken by five distinct outlets to the sea. These are known respectively as Southwest, South, Southeast, Northeast and North passes. The main volume of waters pours through Southwest Pass, but more accessible South Pass is the channel usually preferred by ocean shipping.

The volume discharged by the Mississippi varies greatly. The maximum reported by the Mississippi River Commission occurred on April 28, 1927, a total of 1,557,000 cubic feet a second. The minimum recorded on Nov. 1, 1939, had shrunk to 49,200. The mean annual output is given as 513,000 cubic feet a second, about one third the maximum, but more than ten times the minimum.

From the Ohio River to the Gulf of Mexico the width of the Mississippi, though occasionally broadening to a mile and a half, usually ranges between 800 and 1,500 yards. Below its juncture with the Red River it narrows to 300 yards for a considerable distance. Although this width compares unfavorably with the expansive shorelines of the great Siberian rivers and with the oceanic horizons of the Amazon, the Mississippi is quite deep, its channel ranging usually from 50 to 100 feet or more.

The length of the Mississippi has long been a theme for argument. Most atlases give this as 4,200 miles, and add that it is the longest river in the world. The Mississippi River Commission, however, reduces this figure to a more moderate and more exact 3,986 miles from the farthest headwaters of the Missouri to the delta outlet at the sea. This is topped slightly by recent reports which give the extreme length of the Nile, including its lake interruptions, as 4,053. Moreover, the length of the Mississippi continues to be a variable factor. Horseshoe loops are cut through, reducing the figure which swells again by the creation of new loops as the river meanders down its lower valley. How considerable

such variations may be is shown by the fact that within recent years a series of such cutoffs has reduced one stretch of river channel from 330 to 210 miles.

History.—Early explorations in the Mississippi Valley are of historic interest. It is believed by some that Columbus' sailors may have sighted the river, for its mouth is indicated on the admiral's map of the region made in 1507. Hernando de Soto, however, is usually credited with its discovery. Advancing all the way from the Atlantic seaboard, de Soto and his band of adventurers reached the banks of the river somewhere in the present State of Mississippi in the year 1541. Disappointed in the quest for gold which lured the conquistadors to incredible hardships, de Soto died there and was buried, and the river remained for over a century little more than a legend and a name on the distorted and almost formless maps of the New World.

In 1673 the French missionary explorers Father Jacques Marquette and Louis Jolliet, venturing westward from Lake Michigan, voyaged down the Mississippi for 300 miles or more, passing the mouth of the Missouri. In 1682, René Robert Cavalier, sieur de La Salle completed this voyage of discovery by sailing down the river to the sea. Naming the present area of Louisiana for his sovereign, Louis XIV of France, he dreamed of founding a vast French empire in the wilderness, but his ambitious schemes were cut short in 1687, when, during a second trip to the mouth of the Mississippi, he was murdered by his mutinous followers. Under his instructions Michel Accault had also ascended the upper Mississippi to the Falls of St. Anthony.

That picturesque character, Pierre Radisson, whose highly colored stories of the wealth of the Canadian wilderness led to the organization of the Hudson's Bay Company, may have sighted the Missouri while on an expedition to the Lake Superior region. At least he may have heard of the river through Indian traders from what he termed the land of "the beef" where great herds of bison ranged. But the honor of discovery is usually conferred upon Pierre Gaultier de Varennes, sieur de La Vérendrye, and his sons, who carried French arms and civilization into the western forests, although they are better remembered for the fort which they established on the shores of the Lake of the Woods and as founders of the city of Winnipeg. In 1797, David Thompson, exploring for the North West Company of Canada, descended a stretch of the Missouri, but it was Meriwether Lewis and William Clark, on their expedition to the Pacific coast during the years 1804–1806, who really introduced the river to the outside world. They ascended it for long distances, then changing their operations to the Columbia, followed that river to the sea.

It would be difficult to exaggerate the influence of the Mississippi upon the development of the United States. Basically, it is the drainage system of more than one third of the country, carrying the surplus rainfall of that semicontinent to the Gulf of Mexico. In the formative period of the country, its waterways provided the major means of transportation. The canoes of the Indians were gradually supplanted by every conceivable type of craft that the ingenuity of the pioneer could devise. Of these the simplest was the log raft. For decades northern timber was thus ferried to the South, usually bearing cargoes of merchantable produce. A voyage to New Orleans on such a raft gave Abraham Lincoln an insight into human slavery which was destined to have momentous consequences. Such one-way traffic was soon followed by the era of the river steamboat, a romantic period dramatized by Mark Twain, himself a river pilot, who adopted his pen name from the leadsman's cry of "by the mark twain," or a two-fathom depth across some shoaling sand bar.

The first river steamboat to follow the route of La Salle left Pittsburgh for New Orleans in 1811. Among the hazards of the voyage, it seems to have become involved in the earthquake disturbance which changed the bed of the river at one point and created Reelfoot Lake. By the year 1857 when this type of navigation reached its height, no fewer than 1,100 river steamers called at St. Paul, while the number on all the tributaries was estimated to swell that total to 3,000 or more. In voyages up the Missouri, pilot houses were made bullet proof, as roving bands of Pawnees or Sioux sometimes resented this intrusion of the white man. A colorful development of the period was the show boat which carried theatrical entertainments to settlements along the shores.

Steamers still ply the Mississippi, but the day of their supremacy has passed. Not a few old favorites were broken up and transferred half way around the world, to be reassembled on other rivers, such as the Congo and the Irrawaddy.

The lower reaches of the Mississippi remain a busy thoroughfare and ocean liners from all parts of the world still assemble at New Orleans. The importance of the river and its principal tributaries as arteries of commerce is well illustrated by the great cities that have sprung up along their banks. Among these the most populous is St. Louis, but there are many others, including New Orleans, Memphis, Minneapolis, St. Paul, Kansas City, Pittsburgh, Cincinnati, Louisville, and Nashville.

Floods and Erosion.—While the great river has conferred benefits that are well-nigh incalculable, there is a darker side to the picture. Its waters sweep away a precious and irreplaceable fortune in soil erosion. In this work of depletion the Missouri has well earned its name of Big Muddy. On an average day, 275,000 tons of topsoil go swirling past the city of Omaha. In flood time a cubic foot of water may contain up to 42 pounds of silt. Disconsolate farmers viewing the ruin remark that this mixture is "too thick to drink, too thin to plow." The annual loss of soil through this one great branch alone is estimated at 240 million tons.

Such wastage is emulated in lesser degree by other tributaries, so that through its yawning mouths, according to the Soil Conservation Service, the Mississippi in flood sweeps away the equivalent of a 40-acre farm every minute.

The historian Garcilaso de la Vega (1539–1616), who described De Soto's expedition in his *La Florida del Ynca* (1605), has given us the first description of one of these episodes: "The flood was forty days in reaching its crest, which came on the twentieth of April. And it was a most magnificent spectacle to behold. That which previously had been forests and fields was converted now into a sea, for from each bank the water extended across more than twenty leagues of terrain." [Tr. by J. and J.

Varner (Austin 1951), p. 554.] This description is based on the account of one of De Soto's companions. Father Marquette in his voyage of 1673 was, however, less favorably impressed. "I have seen nothing more frightful," he wrote. "A mass of large trees . . . real floating islands. They came rushing so impetuously that we could not, without great danger, expose ourselves to pass across."

Several such floods have rated among national calamities. Perhaps the greatest of recorded times began in the autumn of 1926 and extended through the following spring. Another almost as disastrous occurred ten years later, in 1937. Heavy rains had deluged the valley of the Mississippi with an estimated 250 cubic miles of water, or nearly one quarter the content of Lake Erie. At Cairo, Ill., the river rose 56 feet. The lower valley became a lake nearly as extensive as Superior. The city of New Orleans was saved only by dynamiting the dikes and permitting some of the swollen waters to surge across the lowlands to the gulf. Meanwhile, three quarters of a million people were made temporarily homeless and property loss rose above $350,000,000.

While the lower valley has always been the chief sufferer from such inundations, the railroad station at Cincinnati has sometimes been buried beneath 30 feet of water, and the 1951 flood in the Missouri caused enormous damage to Kansas City.

Flood Control and Navigation.—The control of the Mississippi poses a major problem. Two methods for its solution have been suggested, both simple in principle but difficult of application. The first would deepen the channel by employing the erosive force of the waters themselves, or, in other words, divert the vast energies of the river from agents of destruction to useful factors. Below the Missouri, hurdles of piles and brush extending from the banks have caught the sediment of that turbulent stream, restricted the width of the channel, and actually made new land.

Such methods, however, have proved less practicable farther south until the delta region is reached. There through South Pass the current, confined by side obstructions or jetties, has plowed out a channel 31 feet deep across shoals that once showed a depth of only 8 feet. For 20 miles Southwest Pass has been constricted between similar jetties to a width of 1,000 feet, later reduced to 600 feet, and a depth of 35 feet maintained. Through these outlets the furious current in flood has gouged out pockets 104 feet deep.

While jetties have proved their value in limited areas, a more effective method of flood control has been that long since developed in the Netherlands, where the encroaching sea has been thrust back and kept in bounds by dikes. To a degree the Mississippi raises its own dikes. As the river bed fills with silt, the banks are built up in a similar manner by the deposit of sediment from overflows, so that the surface of the water may be higher than the surrounding country. In the cemeteries of New Orleans tombs are built above the water-logged earth.

The first artificial dike, or levee as it is called, was erected at New Orleans in 1717 and the system gradually extended at intervals for 2,130 miles. Along exposed stretches of the upper river, dikes from 8 to 14 feet in height have sufficed, but along the lower river these rise to 24 feet, which is about as great a height as their unstable bases will support. That such shackles of the unruly river are at best precarious is recorded in reports of the late 1880's which show that the dikes were broken through in 712 places.

Along the Missouri where farmers watch acre after acre of rich soil caving into the muddy current, willow mats have been utilized to protect the crumbling banks. Modern engineering has supplemented these devices with articulated concrete mattresses of jointed concrete matting sometimes coated with asphalt. Salt has been strewn beneath to prevent the growth of water vegetation, and points of particular danger have been reinforced with stone riprap.

As far back as 1789 the federal government seems to have made its first appropriation for Mississippi River control, and that initial venture has broadened ever since. In 1879 Congress appointed the Mississippi River Commission, under whose supervision the river and its branches have been more thoroughly studied and investigated than any other waterway of comparable area. At first, governmental appropriations were largely devoted to the maintenance of a minimum depth of channel for navigation purposes, and this was achieved by dredging operations. But it is now recognized that the only practicable method of control is to envisage the entire system as a unit, for a sudden influx of waters from any one of the major branches would upset the normal balance. Harnessing the Tennessee, a particularly unruly member of the Ohio system, has been accomplished through the construction of more than a score of dams, while a similar series of barrages impedes the current of the upper Mississippi. Even more ambitious are plans to tame the Missouri by a series of no fewer than 105 dams designed to cost well over a billion dollars.

Meanwhile, river gages established at strategic points record fluctuations in current and volume that foretell well in advance any serious flood menace.

Although flood control has become a paramount issue, the loss of precious water through mad torrents that rush seaward spreading nothing but havoc has seemed to arid regions of the Far West a tragic waste. Water shortages in many localities have aroused a public consciousness of the extent to which our expanding civilization depends upon an adequate water supply. The building of dams conserves surplus water in artificial lakes which become reservoirs for irrigation projects. A certain dependability in the normal flow of the Missouri should supersede the chaotic era of alternate flood and sand bar.

The development of hydroelectric power is also an issue. Such natural power gave the upper Mississippi its prominence long ago when the Falls of St. Anthony attracted the first settlements at Minneapolis and St. Paul and made possible the great flour mills which brought early prosperity to those cities. Dams, though artificial, are quite as effective as natural waterfalls, and the energy which they develop (called by the Italians white coal), unlike most natural resources, is never dissipated.

In these extensive remodelings of a vast system of waterways, their original function as a means of navigation has not been neglected. The dams of the upper Mississippi tend to maintain a more even depth of current and are bypassed by canals so that steamers ascend readily to St. Paul. In fact, plans have been outlined for

greatly increasing the scope of river navigation. The city of Chicago has repeatedly sought legislation permitting the deepening of the channel through canal and river which would reunite Lake Michigan with the Mississippi, and link the vast commerce of the Great Lakes area with the central United States and the Gulf of Mexico. This reversal to conditions which prevailed during the waning of the ice age is opposed by other cities—Detroit, Cleveland, and Buffalo—which fear that the diversion of any great amount of water would lower the lake surfaces and imperil their own costly harbor facilities.

Quite as intriguing, though less likely to be realized, is the suggestion that a canal little more than a mile in length between Big Stone Lake on the Little Minnesota and Lake Traverse draining into the Red River of the North would provide an uninterrupted water route through the Saskatchewan system from the Gulf of Mexico to Hudson Bay.

In volume and in drainage basin the Mississippi ranks far below the Amazon or the Congo. Its commerce is but a tithe of that of the St. Lawrence with its fabulous empire of the Great Lakes. One might even draw unfavorable comparisons with the La Plata-Paraná of South America, with the giant rivers of Siberia, or with the Yangtze Kiang, the life line of China. But the Mississippi, both in magnitude and importance, remains one of the greatest of world systems, and to Americans it will always be what Algonquian tribes first termed it—the Missi Sipi or Great River.

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FERDINAND C. LANE,
Author of "Earth's Grandest Rivers."

MISSISSIPPI, University of, at University, Miss., near Oxford, was chartered Feb. 23, 1844, and opened for its first session Nov. 6, 1848, with four faculty members and 80 students, under George Frederick Holmes as president; since that time it has operated continuously except for the four years of the Civil War, and since 1882 it has been coeducational. Maintained by the State of Mississippi, the university is governed by a board of trustees, made up of the governor of the state and 13 other members. The institution is a fully accredited member of the Southern Association of Colleges. In addition to the original College of Liberal Arts, the university now comprises, in the order of their establishment, schools of law, engineering, education, medicine, pharmacy, and commerce and business administration, and a graduate school. There are also an extension division and departments of music, home economics, and military science and tactics.

More recent additions are the departments of journalism and office administration. The engineering curriculum has been modernized and bureaus of business research and educational research established. The university library has several thousands of volumes and documents of Mississippiana and the Gardner Collection of Political Science. The 60-acre campus forms part of the 640 acre tract of wooded hills. The University also owns some 23,400 acres elsewhere. The average yearly enrollment is 2,700.

MISSISSIPPI BUBBLE, The, an historical novel by Emerson Hough, published in 1902, and centered around one John Law of Lauriston, adventurer, gambler, and financier. More than one writer has woven his tale around this intriguing hero. Mr. Hough has followed history fairly closely. John Law, penniless and on foot, journeys to London, begging a ride for the last few miles in a coach occupied by two women. These two women greatly influenced his life, as is shown in the book's subtitle, "How the star of good fortune rose and set and rose again, by a woman's grace for one John Law of Lauriston."

The review in *The Bookman,* from which we quote, was published in June 1902, and concerns itself with Law the gambler, the soldier of fortune. "History records the unfortunate duel which destroyed Law's prospects at the outset, his imprisonment in Newgate, his escape, and his reappearance many years later in France as the founder of the famous 'system' and promoter of the 'Mississippi scheme' which, bursting, left a wreckage unparalleled in the annals of finance. Mr. Hough's bold innovation consists in accounting for the intervening years by making Law, a fugitive from justice, bury himself in the wilds of America, joining a band of intrepid voyageurs and pushing on westward and southward to the unknown lands beyond the Mississippi. Here Law beholds the boundless expanse of rolling prairie, of a fertility never yet put to the test; he sees some acres of maize, thinly sown by Indian women, a plant never yet seen by European eyes, and his far-seeing mind of economist and financier grasps at a bound the limitless possibilities of wealth spreading out before him—a drama since realized, of the West converted into a vast granary, rolling its flood of golden grain across the Continent and across the ocean to bring renewed prosperity to European nations. This is the dream which the John Law of Mr. Hough's imagination carries back with him to France; it is this on which he bases his 'system' and his Mississippi Company and all the rest of the financial schemes which ended so disastrously. According to the author's conception, Law was an economist far in advance of his time; his methods were sound and should have been successful, had not the Regent, in defiance of his advice, flooded the market with worthless paper and precipitated a panic." See also LAW, JOHN; MISSISSIPPI BUBBLE (financial scheme).

MISSISSIPPI BUBBLE, a celebrated financial scheme, projected by John Law (q.v.) at Paris in 1717. Law issued shares for a vast company to be called the Compagnie d'Occident, and to be engaged in the colonization and cultivation of the banks of the Mississippi. Reports skillfully spread as to gold and silver mines discovered in these parts raised in the people the hope of great gains. The company soon absorbed those of the Senegal and the East Indies, and took the new title Compagnie des Indes. Such were the hopes raised by this undertaking that the shares originally issued at $100 were sold at 10, 20, 30, and 40 times their value. Law had promised to the regent that he would extinguish

the public debt. To keep his word he required that the shares in this company should be paid for one fourth in coin and three fourths in *billets d'état* or public securities, which rapidly rose in value on account of the foolish demand which was created for them. In October 1719 the shares mounted as high as $4,000. The state took advantage of the popular frenzy to issue increased quantities of paper money, which was readily accepted by the public creditors and invested in shares of the Compagnie des Indes. This went on until the value of the paper money in circulation was more than three milliards, while the value of coined money was no more than 700 millions. Before this stage was reached Law himself who had originated the idea of paper money had endeavored to check the issue but his efforts were unavailing. A catastrophe was now inevitable. About the end of 1719 the more prudent speculators began to sell out. In payment of their shares they received, of course, in great part, *billets d'état,* and with these bought gold, silver, diamonds, lands or anything else having a real value. As the *billets* became depreciated such articles as tallow, soap, etc., were often bought at fabulous prices. Law struggled desperately against the fall in the value of these shares, but all his devices to check their downward course were futile or had only a temporary success, and when the state finally declared that it would receive no further payments in paper, he perceived that all attempts to bolster up the scheme were in vain, and made his escape from France (December 1720). The affairs of the company were wound up by the state acknowledging itself debtor to the creditors of the company to the amount of $340,000,000. The public debt was augmented by $2,600,000 of "annual rentes."

MISSISSIPPI COLLEGE, at Clinton, Mississippi. A private coeducational institution, it was founded as Hampstead Academy under charter of the state legislature in 1826. Renamed Mississippi Academy in 1827, it assumed its present name in 1830. After more than a decade of municipal management, control of the college was assumed by the Clinton Presbytery in 1842; its present owners, the Mississippi Baptist Convention acquired it in 1850. The convention controls its policies through a board of 15 trustees, elected for three-year terms.

The college's 30 buildings, including the Old Chapel (1859) and a new administration and classroom building, are situated on a 300-acre campus. Four undergraduate degrees are conferred (B.A., B.S. in Ed., and B.M.) and the M.A. degree. Preprofessional training is given to students planning careers in medicine, dentistry, nursing, law, teaching, engineering, and theology. The college endeavors to develop in students the highest standards of scholarship and Christian character. It has full accreditation including membership in the National Commission on Accrediting and Southern Association of Colleges and Secondary Schools. There are 52 faculty members. Enrollment averages 1,200.

MISSISSIPPI SCHEME. See MISSISSIPPI BUBBLE.

MISSISSIPPI SOUND, an arm of the Gulf of Mexico, extending along the coasts of Mississippi and Alabama from Bay St. Louis on the east to Mobile Bay on the west and connecting with the latter by Grants Pass. It is about 100 miles long, from 7 to 15 miles wide, from 6 to 10 feet deep, and is formed by a chain of low, narrow, sandy islands, chief of which are Dauphin, Petit Bois, Horn, Ship, and Cat. It is traversed by steamers and coasting vessels trading between New Orleans and Mobile.

MISSISSIPPI STATE COLLEGE, in the northeast part of Mississippi, near the city of Starkville, was established as the Mississippi Agricultural and Mechanical College, Feb. 28, 1878 and opened its doors to students on Oct. 6, 1880 with an initial enrollment of 350 students. It was made coeducational in 1930, receiving its present name two years later. A graduate school was added in 1936. In 1947 new buildings were added to take care of the expanding student body, funds allocated for future building and repairs, and, a year later, plans and funds acquired for a new library building. Yearly enrollment averages about 3,000 students.

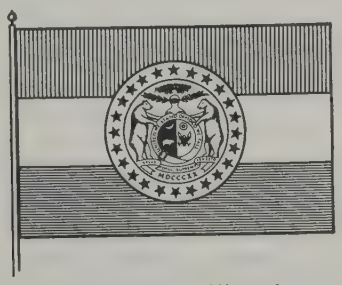
MISSISSIPPIAN. See CARBONIFEROUS.

MISSOLONGHI, mĭs-ô-lông'gĭ, or **MESOLONGION,** mâ-sô-lông'gyôn, city, Greece, capital of Acarnania nome, on the marshy site on the north side of the Gulf of Patras, 24 miles west of Návpaktos (Lepanto) and the seat of an archbishopric. Missolonghi is the most important strategical point of western Greece and is famous for the sieges it has undergone. In 1804 it came under the rule of Ali Pasha of Janina. In the Greek revolt against the Turkish conquerors in 1821 it was brilliantly defended by 400 men against a Turkish army of 14,000 for two months; when reinforced, they again for over a year resisted the Turks, who raised the siege Jan. 6, 1823. The town was hastily fortified, and from September to December 1823 was again besieged by the Turks, who were defeated by a small Greek force under Marco Bozzaris (Markos Botzaris), but with the loss of their patriotic general. In 1825–1826 it stood a long siege by the Turks. A body of its defenders cut their way through the Turkish force and escaped; the remainder determined to sell their lives as dearly as possible, and when the Turks forced their way in, the powder magazine was exploded, thus overwhelming besiegers and besieged in one common catastrophe. Lord Byron, who went to Missolonghi Jan. 5, 1824 to aid the Greeks, died there April 19, 1824; his heart was interred in the Church of St. Spyridion, and a monument erected by the Greeks in his honor. Here also is the tomb of Bozzaris. Pop. (1940) 10,565.

MISSON, mĭ-sôn', **François Maximilien,** French traveler and author: b. Lyon, about 1650; d. London, England, Jan. 12, 1722. He was a councillor in the Parlement of Paris, but at the revocation of the Edict of Nantes, as a Protestant, fled to England. There, in 1685, he became tutor to Charles Butler, afterward earl of Arran, whom he accompanied on his travels. In 1691 he published *Nouveau Voyage d'Italie,* in which his comments on the customs of the Roman Catholic Church led to a celebrated controversy with Father Freschot. In 1698 he published a volume of *Mémoires et Observations,* which constitutes a humorous descriptive dictionary of London life in Queen Anne's reign. His other chief work is *Théâtre sacré des Cévennes* (1707).

MISSOULA, mĭ-zōō'là, city, Montana, and Missoula County seat; altitude 3,223 feet; on the Pacific slope of the Rocky Mountains; and the Clark Fork of the Columbia River (locally called the Missoula); 120 miles northwest of Butte; served by the Northern Pacific; and Chicago, Milwaukee, St. Paul and Pacific railroads. The city is built on both banks of the river at the mouth of Hell Gate Canyon, and is the marketing center for four fertile valleys: Flathead, Bitterroot, Blackfoot and Missoula. Major industries are flour milling and sugar refining. There are also lumber mills, a brewery, meat-packing plant, and several creameries. Gold, lead and copper are mined nearby. It is the seat of Montana State University and headquarters of the Lolo National Forest. First settled in 1860, it was called Missoula Mills. Fort Missoula, southwest of the city, was established in 1877. The city was incorporated in 1885. Pop. (1950) 22,485.

MISSOURI, mĭ-zŏŏr'ĭ, one of the West North Central states of the United States, is bounded on the north by Iowa, on the east by Illinois, Kentucky, and Tennessee, on the south by Arkansas, and on the west by Nebraska, Kansas, and Oklahoma. The Mississippi River flows along the eastern boundary and the Missouri forms the western boundary from the northwest corner to its junction with the Kansas River at Kansas City. The Des Moines River in the extreme northeast and the St. Francis on the western side of the "boot heel" in the southeast are also boundary streams. The name Missouri is of Indian origin and probably means "the town of the big canoes."



State flag of Missouri
(Officially adopted, March 13, 1913)

(Colors, from top to bottom: single red, white, and blue stripes of equal width, with centered circular band of blue enclosing coat of arms.)

State seal of Missouri
(Adopted Jan. 11, 1822)

Total area (18th in national rank)	69,674 square miles
Land area	69,226 square miles
Water area	448 square miles
Latitude	36° to 40°35'N.
Longitude	89°6' to 95°42'W.
Altitude	230 to 1,772 feet
Population, 1950 (11th in national rank)	3,954,653
Estimate, July 1, 1956	4,255,000
Capital—Jefferson City; population (1950)	25,099
Admitted to Union as 24th state	Aug. 10, 1821
State motto	*Salus Populi Suprema Lex Esto* (Let the welfare of the people be the supreme law)
State bird (approved March 30, 1927)	Bluebird
State flower (approved March 16, 1923)	Hawthorn
State tree (approved June 20, 1955)	Flowering dogwood
State song (approved June 30, 1949)	The Missouri Waltz
State nickname	"'Show Me' State"

A discussion of Missouri's geography, government, social and economic life, and history is presented under the following headings:

1. Physical Features and Resources
2. Population and Political Divisions
3. Government and Politics
4. Education and Welfare
5. Economic Activities
6. Places of Interest
7. Famous Men and Women
8. History

1. PHYSICAL FEATURES AND RESOURCES

Topography.—Missouri's topography is varied because the state is located where three physiographical regions converge. Most of the land north of the Missouri River and in a triangular region south and west of the center of the state is prairie with rolling hills interspersed along streams. Generally, this area resembles the prairies of Illinois and Iowa, but parts are like the Great Plains. The Ozark uplift, low and ancient mountains of only 1,200 to 1,700 feet above sea level, runs southwest from the region near St. Louis to the southern and southwestern boundaries of the state. The crest of the Ozarks is relatively level, but the edges are eroded with sharp ridges and deep valleys. Between the Ozark border and the prairies are regions of rough hills. In the extreme southeast is a flat alluvial area of river plains that is like the Mississippi Delta. Before it was drained about the turn of the century, it was a swampy region. Along the Mississippi, Missouri, and some of the smaller rivers are flat bottomlands that are largely alluvial flood plains.

Climate.—The average annual temperature for the entire state is about 55°F., ranging from a January average of 31°F. to a July average of 77.5°F. The variations are considerable and often abrupt, but seldom fall below −10°F. or rise much over 100°F. The frost-free period averages from mid-April to mid-October. The average annual precipitation is 30 to 40 inches in the northwest and from 40 to 50 inches in the southeast, with a maximum in May and June, the most important months of the growing season.

Soils.—The soils of Missouri are of infinite variety in geological origin, physical properties, texture, depth, color, and fertility. Five different soil regions further subdivided into 16 areas have been designated, but in each of these there is great variation. The soils in the Ozark region are geologically much older than those of the northern prairies. Weathering and leaching through the centuries have made the Ozark soils relatively less fertile. The presence of large amounts of chert makes these soils less valuable for farming. In prehistoric times, the soils of the northern Missouri prairies were covered by glaciers. Through the action of the wind, during later geological periods, much of it was covered by loessial deposit. Thus, the prairie region is deeper, more uniform in texture, darker, and more fertile than the Ozark soils. In the northwest section is an area of loess that is deep and very fertile. In the southeast lowlands and along the rivers are deep alluvial bottoms that are rich and productive. In the southeast lowlands there is

also a ridge of loess. The triangular prairie region south of the Missouri and toward the western boundary has a great variety of soils. Much of it is a brown, stony limestone soil that is excellent for grass and hay. In any region the soils will differ in tilth, depth, color, and fertility.

Erosion, the removal of timber, and overcropping have depleted much of the soil resources. Since the mid-1930's the balanced farming program of the Agricultural Extension Service of the College of Agriculture of the University of Missouri and the effective work of the various federal soil districts have led to the building of terraces, the conservation of timber and grasses, and the use of fertilizers that make production on the best areas much more abundant.

Water Resources.—There are 11,500 miles of permanently flowing streams in the state, of which 1,060 miles are classified as navigable, and of these nearly all are on the Mississippi and Missouri rivers. Tributaries of the Mississippi north of the Missouri are small, the Salt River being the largest. South of the Missouri the Meramec, St. Francis, Current, and Black rivers are in the Mississippi watershed and are much longer than the northern rivers. These, with the White River in the southwest, throw much of the Ozarks into the Mississippi drainage system. Into the Missouri from the south flow the Gasconade, draining the northern Ozarks, and the Osage, draining the western Ozarks and the southern plains. From the north the Missouri's tributaries are the Tarkio, Platte, Grand, and Chariton.

The rivers and flowing streams furnish over half the people of the state with a bountiful water supply for industrial and domestic use. The problems of flood control and navigation have been troublesome ones because of the uneven flow due to alternating periods of drought and heavy rainfall. The construction of dams and canals on the Mississippi and its eastern tributaries has brought to that river an enormous expansion in navigation since the late 1930's. Although there are dams on the upper Missouri and the river has a 6- to 9-foot channel from its mouth to Sioux City, Iowa, navigation has not developed to any great extent. In 1944, the Pick-Sloan Plan was authorized by Congress for the purpose of building dams on the Missouri and its tributaries, in order to improve navigation on the Missouri, minimize the effects of floods, and promote irrigation and power development throughout the whole Missouri Valley. See also DAMS.

By 1954, the state's developed hydroelectric generating capacity totaled about 194,000 kilowatts, 11 per cent of the state's electric power capacity. The potential supply, principally in the

Ozarks, is another 100,000 kilowatts. There are no reservoirs for irrigation projects in the state, but many farmers are using water from streams, small lakes, and wells for supplementary irrigation in limited areas.

Missouri has seven large artificial lakes and numerous small ones formed by the construction of dams. They include Lake Taneycomo on the White River in the southwest and the Lake of the Ozarks on the Osage above Bagnell. The latter is one of the largest artificial lakes in the world, covering an area of 65,000 acres with 1,672 miles of shoreline. Wappapello Reservoir on the St. Francis and Clearwater Lake on the Black River in the southeast are federal flood control projects. Lake Norfolk on the Arkansas line is formed by Norfolk Dam in Arkansas on the north fork of the White River and is a combination power and flood control reservoir. Bull Shoals Dam on the White River in Arkansas creates Bull Shoals Lake that extends into Missouri. The dam is a combination power and flood control project. A third combination project at Eagle Rock is being constructed on the upper reaches of the White Rock above Lake Taneycomo.

The Missouri Ozarks have over 10,000 springs, some of which rank among the largest in the world. There are 159 large springs, 98 of which have a flow of over a million gallons a day. Big Springs in Carter County is the largest and has had a daily measured flow of 840 million gallons. Double Spring in Ozark County, Bennett Spring in Dallas, Alley Springs in Shannon, Blue Spring in Oregon, Blue Spring in Shannon, Cave Spring in Shannon, Greer Spring in Oregon, Hahatonka Spring in Camden, Meramec Spring in Phelps, and Montauk Spring in Phelps are all large.

Minerals.—Missouri has a wide variety of mineral resources. The lead area in the southeast, chiefly in the St. Francis River Valley, at one time led the world in production, and Missouri has always been a leading lead-producing state in the United States. The extreme southwestern part of the state, with neighboring portions of Kansas and Oklahoma, lies in the so-called Tri-State zinc area, which also leads nationally in production; and limited iron deposits in Missouri have been worked more than 100 years. Missouri, with Idaho, is the leading American producer of cobalt. Small quantities of nickel have been produced from the complex ores at Fredrickstown. Cadmium, germanium, pyrites, copper, and silver are also found in small quantities throughout the state. Bituminous coal is widely distributed throughout the prairie areas, with the heaviest concentration of production occurring in the west-central counties. Missouri is a leading producer of barite. Other minerals produced in increasing quantities include cement, clays, lime, sand and gravel, and stone.

Plant Life.—At the time of Missouri's settlement, nearly two thirds of the area of the state was covered with virgin timber. The native trees were short-leaf pine, hickory, elm, maple, walnut, cedar, sweet gum, cottonwood, black tupelo, sassafras, hornbeam, redbud, service-berry, persimmon, and many varieties of oak.

Missouri's virgin forests succumbed quickly to modern industry, so that most first-class lumber was soon depleted. The acreage of forests has declined from its original 31 million acres to 15 million.

The short-leaf pine was an important species on more than 4 million acres and could be found interspersed with other trees on 2½ million additional acres. At present, little of this acreage is left. Most of the forested area is covered with second-growth oak and hickory of relatively small size. Present forest areas are concentrated heavily in the Ozarks and the Missouri River counties from Howard County eastward. In recent years two national forests (Clark and Mark Twain) have been established in the Ozarks.

Missouri abounds with numerous varieties of well-known wild plants and flowers, such as May apple, sweet William, jack-in-the-pulpit, and goldenrod, as well as verbena, columbine, white bloodroot, and snakeroot. The Ozark region, because of its unusual geological history, contains the most complex and varied flora in the state.

Animal Life.—The settling of the state, the plowing up of the prairies, and the removal of the forests have changed the availability of wildlife in the state. Big game such as elk, bear, bison, and antelope have vanished, and wild turkey and deer have almost disappeared. The passenger pigeon, Louisiana paroquet, ivory-billed woodpecker, and Eskimo curlew are extinct. But other birds and animals have found modern Missouri attractive. Today the bobwhite quail, red fox, crow, and fox squirrel thrive where once the prairie chicken, ruffed grouse, gray fox, raven, and gray squirrel held sway. The coyote has taken the place of the gray wolf. Rabbits, opossums, skunks, racoons, and muskrats are common. Native to the state are the mourning dove, bluebird, bullfinch, cardinal, and woodpecker.

Aquatic life has been affected more adversely than has animal and bird life. Fish life has been depleted in some streams because of poor drainage, land erosion, untreated sewage, the emptying of industrial waste into streams, the damming of rivers, and the lowering of the water table. In the Ozark streams and in many of the lakes are to be found crappie and large- and small-mouth bass. The cold Ozark streams have been stocked with trout. In the slow-flowing and turbid streams of northern Missouri, channel and flathead catfish abound, and bluegill and green sunfish are not uncommon. The Grand, Meramec and St. Francis rivers are the homes of carp, buffalo, drum, shad, sucker, gar, river sturgeon, and spoonbill, as well as the channel, blue, and flathead catfish.

2. POPULATION AND POLITICAL DIVISIONS

Population Characteristics.—Missouri's population grew rapidly from 1820 to 1900, while there was still vacant land in the state and while the cities were still absorbing large numbers of people. The state's population rose at a slower rate in the 20th century. In the decade between 1940 and 1950 the population grew from 3,784,644 to 3,954,653, representing an increase of 4.5 per cent, compared with the national gain of 14.5. The following table indicates population growth since 1830, the year of Missouri's first census as a state in the Union:

Year	Population	Year	Population
1830	140,455	1900	3,106,665
1840	383,702	1910	3,293,335
1850	682,044	1920	3,404,055
1860	1,182,012	1930	3,629,367
1870	1,721,295	1940	3,784,664
1880	2,168,380	1950	3,954,653
1890	2,679,185		

After the Civil War, Missourians began emigrating to the new frontiers of the Great Plains

and the Far West. In recent decades the cities of the Middle West, as well as those of the Far West and Southwest, have attracted many Missourians. As a result, Missouri has sent more of its people to other states than it has received. Also, there has been a shift of population within the state from rural areas to the cities, and since 1910 there has been an absolute decline in the rural population. In some areas the rural population has fallen very sharply as families have become smaller and farms much larger. The ratio shifted from 63.7 per cent rural and 36.3 per cent urban in 1900 to 38.5 per cent rural and 61.5 per cent urban in 1950.

Largely as a result of emigration, Missouri's population is relatively older than that of the nation as a whole and its birthrate and rate of natural increase have been below the national average. In 1954 the estimated birthrate of the United States was 25.3; the death rate, 9.3. Missouri's corresponding figures were 23.3 and 10.8.

The state's population is heavily native American, with only 2.3 per cent of the 1950 population being foreign born. Up to the Civil War, Kentucky, Tennessee, Virginia, and North Carolina furnished the bulk of immigrants. From 1830 to 1860 large numbers of Germans, Irish, and English emigrated to St. Louis and surrounding areas. Southern and eastern European immigrants did not migrate to Missouri in great numbers between 1870 and 1920, the years when the greatest number of these immigrants went to the United States.

The Negro population is concentrated in St. Louis, Kansas City, the southeast lowlands, and in some cities along the Missouri. Since 1910, due to migrations from the South, Negroes have increased slowly, both in total and as a percentage of the population. In 1910, the state's 157,452 Negroes represented 4.8 per cent of the total, and in 1950 its 297,088 Negroes were 7.5 per cent of the total.

Political Divisions.—Missouri is divided into 114 counties and the City of St. Louis. The county is the principal division of local government, although 23 counties have organized township governments, with limited duties in the hands of township officers. The counties vary in size from Texas County (1,183 square miles) to Worth (264). Populations vary from that of Jackson County (541,035) to Carter (4,777). Of the 87 cities in Missouri all but four are under 50,000, and 55 are under 10,000. St. Louis and Kansas City are the only large cities in the state. In 1956, the population of St. Louis proper was estimated at 841,000. That of the metropolitan area totaled 1,892,000, representing an increase of 35 per cent over the area's population of 1,400,058 in 1950. Kansas City's population was estimated at just a little over 500,000 in 1956; its metropolitan area, at over 800,000, compared with 698,350 in 1950. St. Joseph and Springfield are centers of smaller metropolitan areas which in 1950 had populations of 82,290 and 75,549, respectively.

The state's counties and their county seats are as follows:

County	County Seat	County	County Seat
Adair	Kirksville	Livingston	Chillicothe
Andrew	Savannah	McDonald	Pineville
Atchison	Rockport	Macon	Macon
Audrain	Mexico	Madison	Fredericktown
Barry	Cassville	Maries	Vienna
Barton	Lamar	Marion	Palmyra
Bates	Butler	Mercer	Princeton
Benton	Warsaw	Miller	Tuscumbia
Bollinger	Marble Hill	Mississippi	Charleston
Boone	Columbia	Moniteau	California
Buchanan	St. Joseph	Monroe	Paris
Butler	Poplar Bluff	Montgomery	Montgomery City
Caldwell	Kingston	Morgan	Versailles
Callaway	Fulton	New Madrid	New Madrid
Camden	Camdenton	Newton	Neosho
Cape Girardeau	Jackson	Nodaway	Maryville
Carroll	Carrollton	Oregon	Alton
Carter	Van Buren	Osage	Linn
Cass	Harrisonville	Ozark	Gainesville
Cedar	Stockton	Pemiscot	Caruthersville
Chariton	Keytesville	Perry	Perryville
Christian	Ozark	Pettis	Sedalia
Clark	Kahoka	Phelps	Rolla
Clay	Liberty	Pike	Bowling Green
Clinton	Plattsburg	Platte	Platte City
Cole	Jefferson City	Polk	Bolivar
Cooper	Boonville	Pulaski	Waynesville
Crawford	Steelville	Putnam	Unionville
Dade	Greenfield	Ralls	New London
Dallas	Buffalo	Randolph	Huntsville
Daviess	Galatin	Ray	Richmond
DeKalb	Maysville	Reynolds	Centerville
Dent	Salem	Ripley	Doniphan
Douglas	Ava	St. Charles	St. Charles
Dunklin	Kennett	St. Clair	Osceola
Franklin	Union	St. Francois	Farmington
Gasconade	Hermann	Ste. Genevieve	Ste. Genevieve
Gentry	Albany	St. Louis	Clayton
Greene	Springfield	Saline	Marshall
Grundy	Trenton	Schuyler	Lancaster
Harrison	Bethany	Scotland	Memphis
Henry	Clinton	Scott	Benton
Hickory	Hermitage	Shannon	Eminence
Holt	Oregon	Shelby	Shelbyville
Howard	Fayette	Stoddard	Bloomfield
Howell	West Plains	Stone	Galena
Iron	Ironton	Sullivan	Milan
Jackson	Independence	Taney	Forsyth
Jasper	Carthage	Texas	Houston
Jefferson	Hillsboro	Vernon	Nevada
Johnson	Warrensburg	Warren	Warrenton
Knox	Edina	Washington	Potosi
Laclede	Lebanon	Wayne	Greenville
Lafayette	Lexington	Webster	Marshfield
Lawrence	Mt. Vernon	Worth	Grant City
Lewis	Monticello	Wright	Hartville
Lincoln	Troy		
Linn	Linneus		

3. GOVERNMENT AND POLITICS

Constitution.—The first constitution of the state was put into effect in 1820. This document, although amended several times, lasted until 1865. In that year the Radical Republicans submitted a constitution that was adopted. This fundamental law did away with slavery, disfranchised Southern sympathizers, and reformed the governmental structure in a number of ways. By 1875 the Southern element had recaptured the government, and the Liberal Republican Party was strong in the state. As a result, a new constitution of 1875 was adopted. This constitution reflected the impact of the Panic of 1873 and mounting heavy state and local debts, as well as reaction against the Radical Republican rule of the 1860's. Many of its provisions were restrictive and conservative, and in the years following World War I constituted a barrier to economic and social progress. Its archaic character was illustrated by the fact that by 1940 a total of 167 amendments had been submitted and 56 had been adopted. Between 1920 and 1940, amendments were approved that provided for a state highway system financed by gasoline taxes, a social welfare system, tighter budgetary control by the governor with the power of item veto, a bipartisan conservation commission, and a plan for the selection of certain judges without regard to partisan politics.

In 1942 the voters provided for a new constitutional convention. In 1945 the constitution submitted by this body was ratified by the voters and put into operation. The convention's objectives

were clearly a frame of government to increase efficiency with sufficient flexibility to meet modern problems. The bicameral system was retained, but a plan was introduced to force a reorganization of the senatorial districts through a bipartisan commission appointed by the governor after each decennial census.

Many of the most restrictive provisions on legislation were relaxed. The assembly was not to be restricted to short sessions and it was provided with power to set up a legislative reference service, now known as the Committee on Legislative Research.

The constitution can be amended only by a majority of the popular vote in a regular or special election. Amendments may be submitted by an initiative petition signed by 8 per cent of the legal voters in two thirds of the congressional districts, or by a majority vote of both houses of the General Assembly.

Executive.—The governor, elected for four years and ineligible to succeed himself, is the chief executive officer of the state and has sufficient power to accomplish his constitutional duties. The voters also elect a lieutenant governor, secretary of state, attorney general, state treasurer, and state auditor. These officers are strictly limited by the constitution to functions germane to their offices. The executive branch must be organized into not more than 15 departments. The governor appoints the heads of these departments with the advice and consent of the Senate. In the cases of the highway, conservation, and educational departments, the control of their functions lies with bipartisan commissions. Other executive departments are headed by single officials.

The constitution provides for a Department of Revenue that collects all taxes and fees, preaudits all accounts, and prepares the budget for the governor. The governor has the power of item veto in appropriation bills.

A list of Missouri's territorial and state governors and their dates in office follows:

GOVERNORS

Territorial Period

William C.C. Claiborne	Acting governor general and intendant of Louisiana	1803–1804
Amos Stoddard	First civil commandant of Upper Louisiana	1804
William Henry Harrison (Gov. of Indiana Terr.)	Governor, District of Louisiana	1804–1805
James Wilkinson	Governor, Territory of Louisiana	1805–1807
Joseph Browne	Acting governor	1807
Frederick Bates	" "	1807
Meriwether Lewis	Governor	1807–1809
Frederick Bates	Acting governor	1809–1810
Benjamin Howard	Governor	1810–1812
Frederick Bates	Acting governor, Territory of Missouri	1812–1813
William Clark	Governor	1813–1820

State

Alexander McNair	Democrat	1820–1824
Frederick Bates[1]	"	1824–1825
Abraham J. Williams[2]	"	1825
John Miller	"	1825–1832
Daniel Dunklin	"	1832–1836
Lillburn W. Boggs	"	1836–1840
Thomas Reynolds[1]	"	1840–1844
M. M. Marmaduke[2]	"	1844
John C. Edwards	"	1844–1848
Austin A. King	"	1848–1852
Sterling Price	"	1852–1856
Trusten Polk[3]	"	1856–1857
Hancock Jackson[2]	"	1857
Robert M. Stewart	"	1857–1861
Claiborne F. Jackson[4]	"	1861
Hamilton R. Gamble [5]	Provisional	1861–1864
Willard P. Hall[2]	"	1864–1865
Thomas C. Fletcher	Republican	1865–1869
Joseph W. McClerg	"	1869–1871
B. Gratz Brown	Liberal	1871–1873
Silas Woodson	Democrat	1873–1875
Charles H. Hardin	"	1875–1877
John S. Phelps	"	1877–1881
Thomas T. Crittenden	"	1881–1885
John S. Marmaduke[1]	"	1885–1887
Albert P. Morehouse[2]	"	1887–1889
David R. Francis	"	1889–1893
William Joel Stone	"	1893–1897
Lon V. Stephens	"	1897–1901
Alexander M. Dockery	"	1901–1905
Joseph W. Folk	"	1905–1909
Herbert S. Hadley	Republican	1909–1913
Elliot W. Major	Democrat	1913–1917
Frederick D. Gardner	"	1917–1921
Arthur M. Hyde	Republican	1921–1925
Sam A. Baker	"	1925–1929
Henry S. Caulfield	"	1929–1933
Guy B. Park	Democrat	1933–1937
Lloyd C. Stark	"	1937–1941
Forrest C. Donnell	Republican	1941–1945
Phil M. Donnelly	Democrat	1945–1949
Forrest Smith	"	1949–1953
Phil M. Donnelly	"	1953–1957
James T. Blair, Jr.	"	1957–

[1]Died in office. [2]Acting. [3]Resigned. [4]Expelled by convention. [5]Appointed by convention.

Legislature.—The legislature, legally known as the General Assembly, is composed of a House of Representatives of 157 members and a Senate of 34. Representatives are elected for two-year terms and senators for four years. The House, in general, represents the counties, while the Senate is representative of the people on the basis of population. Rural areas, therefore, find their strength in the House of Representatives and the cities in the Senate. The General Assembly meets on the first Wednesday after the first day of January in odd-numbered years and may remain in session five months or until May 31. The governor may convene it in extraordinary session at any time, but only subjects recommended by him can be considered and the session is limited to 60 days.

Judiciary.—The system of courts is made up of a Supreme Court of 7 judges, 3 courts of appeals, 38 circuit courts, and a probate judge for each county. Magistrate courts are provided in each county to hear cases of first instance. Supreme Court and appellate court judges serve for 12 years, circuit court judges for 6 years, and probate judges and magistrates for 4 years. For the selection of Supreme Court judges, appellate court judges, judges of the circuit and probate courts of St. Louis City and Jackson County, and judges of the St. Louis courts of criminal corrections, a nonpartisan court plan, adopted in 1940 and retained in the constitution of 1945, is used. In case of a vacancy the governor makes his appointment from among three nominations presented by a nonpartisan judicial commission. After a year's service the name of the appointee is submitted to a popular vote if he desires to continue in office, but no one can run against the incumbent and there is no political designation on the ballot. A similar ballot is provided for a judge whose term is expiring and who wishes to remain in office. The judges in other parts of the state are elected by the voters on a general party ballot. The Supreme Court has the power to make rules of procedure for all courts and to transfer judges temporarily from one court to another. It has extensive power to review opinions of the appellate courts.

Special Government Bodies.—In 1949, the legislatures of Missouri and Illinois created a bistate development agency for the metropolitan

Massie-Missouri Resources Division

Missouri State Capitol, Jefferson City.

area around St. Louis. The agency is empowered to carry on activities in transportation, sanitation, water works, recreational projects, and civil defense. The Missouri-Tennessee Bridge Commission manages the bridges across the Mississippi at the mouth of the Ohio.

Taxation and Revenue.—The Department of Revenue, headed by a director, is the chief fiscal agent of the state. This department collects all fees, licenses, and taxes due the state, except taxes on tangible property. The latter are collected by the county or township collectors in the units of local government. The Division of the Budget is also in the Department of Revenue and collects budget data and prepares budget estimates for the governor. The Department of Revenue must also pre-approve all claims and accounts against the state before payment. All pre-audits are performed by the comptroller and all post-audits are done by the state auditor. All accounts are deposited with the state treasurer.

For the fiscal year 1955–1956, state treasury receipts from all sources totaled $388,381,232. The state government received tax revenues totaling $191,231,296. The sales tax and gross receipt taxes were the greatest producers of tax revenue, bringing in $100,440,250. This total included $10,000,000 collected from a special cigarette tax of 2 cents per pack approved by Missouri's voters in October 1955. Individual and corporate income taxes produced $35,389,808, licensing yielded $45,521,023, and $9,880,215 was collected from property taxes. Federal grants-in-aid, some other taxes, and earnings on permanent funds accounted for the rest of the treasury receipts.

Suffrage and Elections.—The general election is held on the first Tuesday after the first Monday in November in even-numbered years, and the primary is held on the first Tuesday in August of the same years. To vote, a citizen must have lived in the state a year and in the county and district 60 days before an election. The constitution provides that a bill passed by the General Assembly and signed by the governor can be submitted to the people by referendum if 5 per cent of the legal voters in each of two thirds of the congressional districts sign a petition asking that the law be referred. In the case of either a referendum or initiative a majority of those voting is required for passage.

Although Missouri is considered a politically unpredictable state, the Democratic Party is generally the majority party. In each presidential election since 1904, Missouri voted for the national winner, with the exception of 1956 when the Democrats carried the state for Adlai Stevenson. However, in four of these elections the major party that lost the national election carried the governorship. Missouri is represented in Congress by 2 senators and 11 representatives.

4. EDUCATION AND WELFARE

School Administration.—The supervision of the State Department of Education is lodged in a bipartisan State Board of Education of eight members appointed by the governor and approved by the Senate for eight-year terms. The executive officer of the state department is the commissioner of education, appointed by the state board and serving at its pleasure. For higher education there are boards of curators for the University of Missouri, for Lincoln University, and for each of the five state colleges. The State Board of Education has broad powers of supervision of the public schools and governs the schools for the deaf and the blind. The board allocates state and federal appropriations to local districts, supervises and classifies school systems for accreditation, issues teaching certificates to teachers, collects and publishes information on the schools, and directly regulates many educational functions.

Elementary and Secondary Schools.—Missouri's schools are growing in size and scope. Expenditures for public education increased rapidly in the years following World War II. In 1948 there were 629,878 pupils in Missouri public schools, while in 1955 enrollment was 724,739. In 1948 there were 24,295 teachers, while in 1955 there were 26,245. Total revenue for education from all sources grew from about $83,532,000 in 1948 to $198,304,000 in 1955. Direct state support of public schools increased from $17,000,000 in 1942 to $56,500,000 in 1955. In addition to the enrollment of public schools, Roman Catholic elementary and secondary schools enroll over 100,000 pupils.

Higher Education.—In the field of higher education, Missouri has 5 universities, 12 four-year colleges of arts and science, 5 state colleges, 18 junior colleges, of which 8 are public, 5 theological seminaries, 2 colleges of music, 1 college of art, 2 colleges of pharmacy, and 2 osteopathic colleges.

The University of Missouri (q.v.) at Columbia and Rolla, chartered in 1839 and opened in 1841, is the oldest state university west of the Mississippi. Other higher institutions include Central College (Methodist), Fayette; College of St. Teresa (Catholic), Kansas City; Culver-Stockton College (Disciples of Christ Church), Canton; Drury College (Congregational), Springfield; Lincoln University (state), Jefferson City; Lindenwood College for Women (Presbyterian), St. Charles; Missouri Valley College (Presbyterian), Marshall; Park College (Presbyterian), Parkville; Rockhurst College (Catholic), Kansas City; Tarkio College (United Presbyterian), Tarkio; University of Kansas City (private), Kansas City; Washington University (private), St. Louis; Westminster College (Presbyterian), Fulton; and William Jewell College (Baptist), Liberty. Incorporated within St. Louis University (Catholic), at St. Louis, are Fontbonne College, Maryville College, Mercy Junior College, Notre Dame College, St. Mary's Junior College, and Webster College.

In the fall of 1956, the combined enrollment of these institutions was 45,288 full-time and 20,000 part-time students. A survey conducted by the institutions of higher education in 1956 indicated that enrollment in Missouri colleges would more than double by 1970 and might go as high

as 120,000. In order to meet this rapid growth the state's colleges and universities have been seeking funds for expansion and support. Plans under way in 1957 were expected to expand existing facilities to accommodate a total of 85,000 students. St. Louis University, Washington University, the University of Missouri, and the state colleges and Lincoln University have launched extensive building programs, and church-related colleges have been working together to encourage industry and business to support their expansion.

Libraries.—The constitution of 1945 provided for the promotion and support of public libraries by state aid as well as by local taxation. As a result of small appropriations under this provision, the number of public libraries had grown from 135 in 1936 to 266 in 1950. A bookmobile service, for areas without public libraries, has also been instituted. Expenditures for buildings, expansion, and support have had a sizable growth since 1945.

Special libraries of note in the state are the library of the University of Missouri and the State Historical Society of Missouri at Columbia, the libraries of Washington University and of St. Louis University in St. Louis, the Linda Hall Library in Kansas City, the Missouri Historical Society Library in St. Louis, and the St. Louis Mercantile Library. The Linda Hall Library has one of the best collections in science and technology in the Middle West. St. Louis University, soon to contain the microfilm records of the Vatican Library, is one of the finest libraries on religion in the world. The University of Missouri Library at Columbia, which also houses the State Historical Society Library of Missouri and the Western Historical Manuscripts Collection, is a superior library in American history and agriculture. At Independence, the Harry S. Truman Library and Museum contains 3,500,000 documents and numerous mementos of President Truman's administration.

Public Health and Welfare.—The State Department of Public Health and Welfare is one of the principal administrative units of the state government. The Division of Health within this department is the central health authority of the state and exercises its powers through such bureaus as those of Vital Statistics, Laboratories, Communicable Diseases, Food and Drug Inspection, Child Hygiene and Maternity Care, and Tuberculosis Control. The department directly administers the Missouri State Tuberculosis Sanatorium at Mt. Vernon, the Ellis Fischel Cancer Hospital at Columbia, and the Trachoma Hospital at Rolla. Its laboratories are at Jefferson City, Sikeston, and Springfield. The Division of Mental Diseases maintains state hospitals at St. Louis, Fulton, St. Joseph, Nevada, and Farmington, and the state schools for the feeble-minded at St. Louis, Marshall, Carrollton, and Higginsville.

Missouri maintains, through its Division of Welfare, programs of old-age assistance, aid to dependent children, general relief, aid to the permanently and totally disabled, and aid to the blind. The division also places qualified welfare workers in the field to help take care of children, accepts the guardianship of neglected children, and inspects child-caring institutions. In recent years, the annual budget for all the services of the division has reached the $200,000,000 level.

The Division of Employment Security administers the cooperative unemployment compensation system of the state and federal government and maintains a system of public employment offices. Reserves in the unemployment insurance fund were over $200,000,000 by 1955. The Division of Workmen's Compensation enforces the workmen's compensation law, an optional statute covering protection of workers on any job.

Public Safety.—The Missouri National Guard is composed of approximately 10,000 officers and men with home stations in 60 communities. It has infantry, artillery, antiaircraft, and air wing components.

The state Highway Patrol is composed of about 350 patrolmen and officers. The patrol has an identification bureau for the detection of crime and the identification of criminals. An auto theft and information bureau and a crime detection laboratory are maintained.

The state has a maximum security penitentiary at Jefferson City, which was opened in 1836 and is one of the largest in the nation. The Algoa Farms near Jefferson City is an intermediate reformatory for young men and has a minimum security unit. The Church Farm unit, also near Jefferson City, is a minimum security unit for prisoners about to be released. An appropriation of $15,000,000 has been made to construct a medium security prison to be built near Moberly.

5. ECONOMIC ACTIVITIES

In 1955, the per capita income of Missourians was $1,800, just a little below the national average. Missourians derived this income from a wide variety of occupations. By July 1956, Missouri's labor force totaled 2,057,400 persons, of whom 273,500 were agricultural workers. Persons employed in nonagricultural establishments numbered 1,280,500, of whom 29.9 per cent were engaged in manufacturing and 24.7 per cent in wholesale and retail trade. Service industries engaged 12.1 per cent, government (local, state, and federal) 11.9, transportation, communication, and other public utilities 9.9, construction 5.8, finance, insurance, and real estate 5.0, and mining and quarrying 0.7 per cent.

Agriculture.—Historically, agriculture has been Missouri's chief industry, but in recent years manufacturing has surpassed it both in value of production and in the number of persons employed. Nevertheless, the state ranks in the upper ten in the total value of farm products.

Missouri's agriculture is built heavily around its livestock industry, with nearly 70 per cent of cash income being derived from dairy, poultry, and other livestock enterprises. About 13,000,000 acres are planted each year to harvested crops, accounting for almost 40 per cent of the total acreage in farms. In 1954, the total value of farm property was estimated at $2,785,371,000, and the value of all farm products sold, including livestock and forest products, totaled $733,733,793. Because of a diversity of agricultural products, ranging from corn and wheat to cotton and tobacco, the state's crop production is well-balanced. Since 1945, the production of all hay has been about 4 million short tons a year and corn production has ranged from 4,657,000 acres harvested in 1945 to 3,946,000 in 1956. Relatively small amounts of hay and corn reach the central markets because most of both crops are fed to livestock. In 1955, wheat and soybeans were the best cash crops, accounting for cash receipts totaling $88,059,000 and $76,629,000, respectively.

Mining.—In recent years, Missouri's diversified mineral production has ranked the state be-

tween 21st and 23d among the states. The state has led in lead output for many years (125,412 short tons in 1955 valued at $37,422,941), and is usually first or second in barite production (363,-692 short tons in 1955 valued at $4,003,842). Other leading minerals include cement, 12,255,346 short tons ($34,912,186); lime, 1,464,828 ($14,-408,279); coal 3,232,485 ($12,771,570); and zinc, silver, sand and gravel, copper, native asphalt, natural gas, and nickel.

Manufacturing.—Missouri ranks in the top 12 states in manufacturing, and has 319 of the 446 types of manufactures listed by the federal Bureau of the Census. The state has expanded steadily in manufacturing. In 1947, there were 5,725 establishments employing 327,114 people. By 1954, the number had increased to 6,198 employing 368,479. About 80 per cent of all manufacturing plants were located in the metropolitan areas of St. Louis and Kansas City. The accompanying table provides employment, payroll, and production data for Missouri's leading manufactures.

LEADING MANUFACTURES, 1954

	Employees[1]	Payroll (thousands of dollars)	Value added by manufacture[2]
All industries, total	*368,479*	*$1,420,103*	*$2,727,266*
Transportation equipment	45,696	212,879	488,533
Motor vehicles and equipment	18,038	85,422	248,502
Motor vehicles and parts	14,579	69,197	226,606
Aircraft and parts	25,405	118,523	226,235
Food and kindred products	53,750	216,678	460,274
Beverages	9,258	46,542	129,224
Beer and ale	6,132	34,914	104,738
Chemicals and products	17,890	80,166	225,617
Fabricated metal products	24,652	104,218	181,838
Machinery, except electrical parts	23,469	101,146	171,841
Leather and leather goods	36,719	91,910	171,449
Footwear, except rubber	30,730	74,724	143,340
Printing and publishing	23,997	101,855	162,896
Electrical machinery	22,260	93,415	153,455
Electrical industrial apparatus	14,456	63,280	105,183
Apparel and related products	35,375	90,803	145,390
Stone, clay, and glass products	14,495	62,859	125,287

[1]Average for year. [2]Value of shipments less cost of materials, supplies, containers, fuel, purchased electric energy, and contract work.
(Source: *U.S. Census of Manufactures, 1954.*)

Banking.—As of June 30, 1956, the banking facilities of the state were supplied by 535 state-chartered banks and 76 national banks with combined assets of $5,627,768,094. Missouri has two Federal Reserve banks, one in St. Louis and the other in Kansas City. Each serves the large trade territory of which the home city is the center.

Trade.—Wholesale trade in the state totaled $8,209,588,000 in 1954, with most of the trade centering in St. Louis ($3,700,524,000) and Kansas City. In St. Louis, leading wholesale businesses were those handling groceries, drugs, chemicals and allied products, farm products, electrical appliances, and machinery equipment. In recent decades, the women's apparel trade has had a vigorous growth in St. Louis.

Retail sales throughout the state in 1954 amounted to $4,525,308,000, with the St. Louis metropolitan area ranking eighth as a retail market in the United States. Between 1948 and 1954, retail sales in the area climbed from $1,539,-391,000 to $2,062,538,000, an increase of about 33 per cent.

The Kansas City metropolitan area, dominated more by the grain and livestock area to the west, is also a distribution center for farm machinery, automobiles and parts, and construction materials consumed by the Southwest and the Great Plains areas. Its retail trade sales increased from $977,-244,000 in 1948 to $1,273,899,000 in 1954. In the latter year the Kansas City metropolitan area ranked 15th in retail sales in the nation.

Tourism.—Since the development of state parks and power dams in Ozark regions, Missouri has had a very rapidly developing recreational and tourist business. In recent years the State Division of Resources and Development, the official agency that promotes recreation, has reported that annual recreation income amounts to $250,000,000 or four times what it was in 1938.

Transportation.—The location of Missouri at the crossroads of the nation makes the state a major unit in the transportation and communication fields. The state has 11,202 miles of railroad track (8,147 line miles), and both St. Louis and Kansas City are great railroad terminals served by 22 trunk line systems. St. Louis has 200 passenger trains arriving and departing daily. Also, St. Louis has 275 truck carriers providing daily freight service to 45 states and Canada. Both metropolitan cities have large air terminals served by nine major airlines that connect directly with the major cities of the continent. A new Kansas City air terminal was nearing completion in 1956. All highways and roads in the state (federal, state, and local combined) totaled 74,-777 miles in 1955, of which 58,444 miles were surfaced. In 1952 the financing of a new major 10-year state development highway program was launched. In addition, major interstate roads were planned through the allotment of $30,565,542 granted to Missouri under the Federal Highway Act of 1956.

Communications.—In 1956, the state was served by 87 commercial broadcasting stations, of which 64 were AM, 7 were FM, and 16 were television stations. Over 95 per cent of Missouri families owned radios. There were 1,402,000 telephones in use in Missouri, of which 385,300 were business phones. The state is served by 1,292 post offices whose annual gross receipts amount to $86,000,000. There were 388 weekly newspapers and 58 dailies published in the state in 1956. Total circulations (daily and Sunday) ran above 3 million. The St. Louis *Post-Dispatch,* the St. Louis *Globe-Democrat,* and the Kansas City *Star* are dailies of outstanding reputation and influence.

6. PLACES OF INTEREST

Parks.—Of the more than 20 state parks, ranging in size from 16,148 acres (Lake of the Ozarks) to 34 acres (Arrow Rock State Park), 9 are in the Ozarks. Several of these include big springs, and most of them are in good fishing areas and have camping facilities. Three are of historical interest, two containing the birthplaces of Mark Twain (Florida) and of Gen. John J. Pershing (Laclede), and the third including Arrow Rock Tavern, a meeting place for men significant in the early history of the West. Mention should be made also of the private

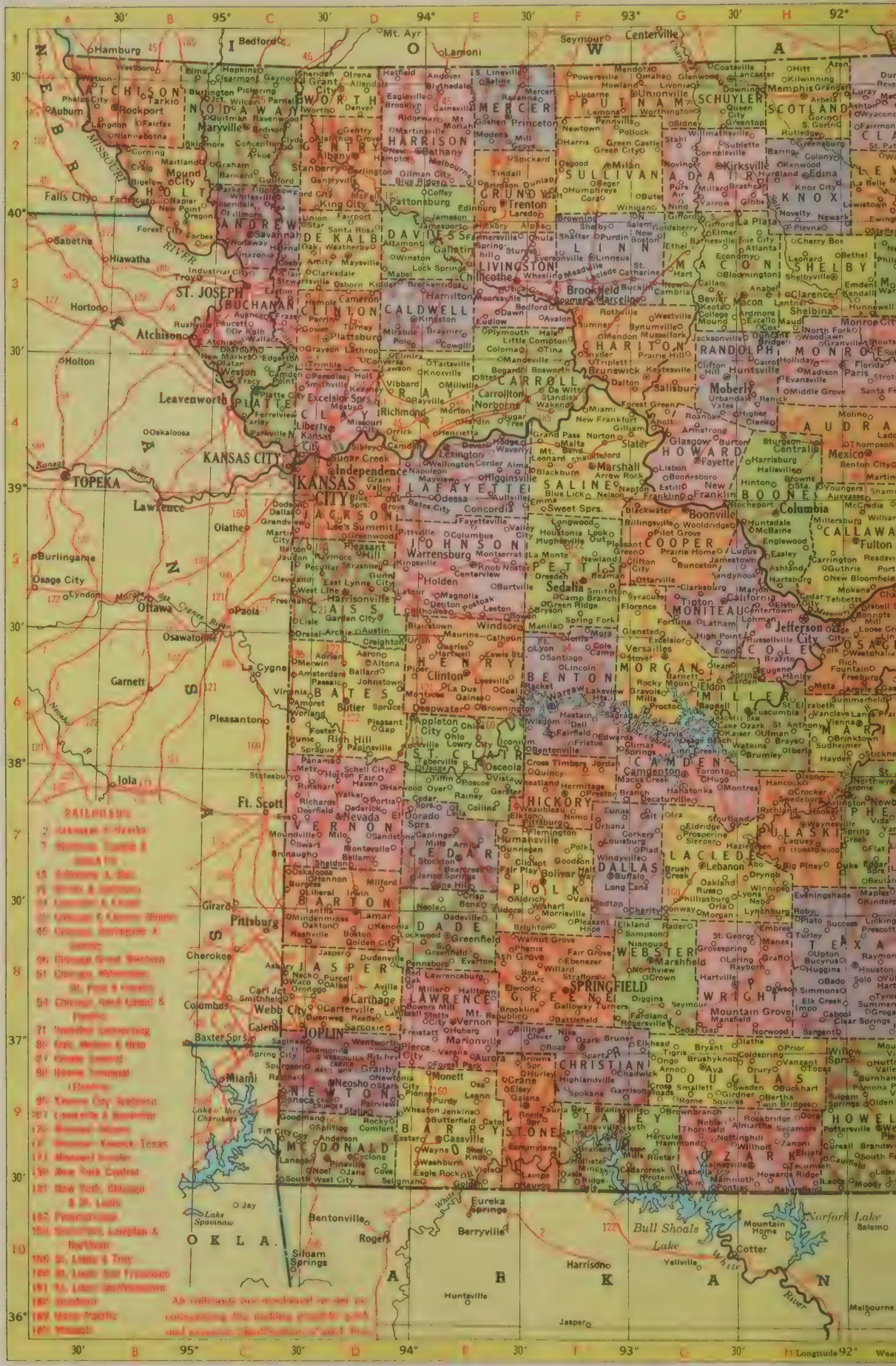
MISSOURI

1950 Total Population 3,954,653

Adrian (D6) 905
Advance (N8)..... 733
Affton (P3).....5,000
Agency (C3)..... 234
Alba (D8)..... 352
Albany ◉(D2).....1,850
Aldrich (F7)..... 198
Alexandria (K2)..... 465
Allendale (D2)..... 142
Allenville (N8)..... 125
Alma (E4)..... 357
Altamont (D3)..... 178
Altenburg (O7)..... 272
Alton ◉(K9)..... 571
Amazonia (C3)..... 308
Amity (D3)..... 128
Amoret (C6)..... 255
Amsterdam (C6)..... 160
Ancell (N8)..... 295
Anderson (D9).....1,073
Annada (L4)..... 93
Annapolis (L8)..... 490
Anniston (O9)..... 377
Anutt (J7)..... 250
Appleton (Old Appleton) (N7).. 120
Appleton City (E6)..1,150
Arbela (H2)..... 87
Arbyrd (M10)..... 679
Arcadia (L7)..... 414
Archie (D5)..... 300
Argyle (J6)..... 162
Armstrong (G4)..... 424
Arrow Rock (F4).... 170
Asbury (C8)..... 210
Ash Grove (E8)..... 970
Ashburn (K3)..... 153
Ashland (H5)..... 416
Ashley (K4)..... 205
Atherton (R5)..... 375
Atlanta (H3)..... 438
Augusta (M3)..... 218
Aullville (E4)..... 123
Aurora (E9).....4,153
Auxvasse (J4)..... 507
Ava ◉(G9).....1,611
Avalon (F3)..... 200
Avilla (D8)..... 142
Avondale (P5)..... 532
Bagnell (dam) (G6)
Ballwin (O3)..... 600
Baring (H2)..... 274
Barnard (C2)..... 275
Barnett (G6)..... 200
Bates City (E5)..... 87
Beaufort (K6)..... 250
Bell City (N8)..... 482
Belle (J6)..... 906
Bellflower (K4)..... 226
Belton (C5).....1,233
Benton ◉(O8)..... 546
Benton City (J4)..... 141
Berger (K5)..... 210
Berkeley (P2).....5,268
Bernie (M9).....1,308
Bertha (H9)..... 80
Bertrand (O9)..... 390
Bethany ◉(E2).....2,714
Bethel (J3)..... 194
Beulah (J7)..... 110
Bevier (G3)..... 838
Big Piney (H7)..... 80
Bigelow (B2)..... 132
Billings (F8)..... 597
Birch Tree (K9)..... 409
Birmingham (P5).... 236
Bismarck (L7).....1,244
Black (riv.) (L10)...
Black Jack (P2)..... 700
Blackburn (F4)..... 306
Blackwater (G5)..... 313
Blairstown (E5)..... 199
Bland (J6)..... 596
Blodgett (O8)..... 218
Bloomfield ◉(M9)..1,382
Blue Springs (R6)....1,068
Blythedale (E2)..... 238
Bogard (E4)..... 285
Bolckow (C2)..... 250
Bolivar ◉(F7).....3,482
Bonfils (O2)..... 125
Bonne Terre (L7)....3,533
Bonnots Mill (J5).... 150
Boonville ◉(G5).....6,686
Bosworth (F4)..... 503
Bourbon (K6)..... 543
Bowling Green ◉(K4) 2,396
Bragg City (N10).... 294
Braggadocio (N10).. 350
Brandsville (J9)..... 204
Branson (F9).....1,314
Brashear (H2)..... 119
Brasher (N10)..... 152
Braymer (E3)..... 955
Breckenridge (E3).. 617
Brentwood (P3).....7,504
Bridgeton (P2)..... 202
Brighton (F8)..... 84
Brimson (E2)..... 139
Bronaugh (C7)..... 214
Brookfield (F3).....5,810
Broseley (M9)..... 177
Browning (F2)..... 492
Brownington (E6).... 179
Browns Station (H4) 75
Brumley (H6)..... 78
Bruner (F8)..... 85
Brunswick (F4).....1,653
Brush Creek (G7).... 91
Bucklin (G3)..... 783
Buckner (R5)..... 639
Buffalo ◉(F7).....1,213
Buick (K7)..... 101
Bull Shoals (lake) (G10) .....
Bunceton (G5)..... 556
Burfordville (N8).... 88
Burgess (C7)..... 123
Burlington Junction (B2) 746
Burtville (E5)..... 75
Bute (G2).....
Butler ◉(D6).....3,333
Butterfield (E9)..... 136
Butts (K7)..... 90
Bynumville (G3)..... 75
Cabool (H8).....1,245
Cainsville (E2)..... 618
Cairo (H4)..... 264
Caledonia (L7)..... 143
Calhoun (E6)..... 463
California ◉(H5)....2,627
Callao (G3)..... 370
Camden (D4)..... 383
Camden Point (C4) 147
Camdenton ◉(G6)..1,142
Cameron (D3).....3,570
Camp Crowder (D9)
Campbell (M9).....1,931
Canalou (N9)..... 438
Canton (J2).....2,490
Cape Girardeau (O8) 21,578
Caplinger Mills (E7) 91
Cardwell (M10)..... 952
Carl Junction (C8)..1,006
Carrollton ◉(E4)....4,380
Carterville (D8).....1,552
Carthage ◉(D8)....11,188
Caruth (N10)..... 150
Caruthersville ◉(N10) 8,614
Cassville ◉(E9).....1,441
Castlewood (O3)..... 300
Catawissa (N4)..... 121
Catron (N9)..... 278
Cedar City (H5)..... 600
Cedar Hill (L6)..... 250
Center (J3)..... 415
Centertown (H5)..... 248
Centerview (E5)..... 179
Centerville ◉(L8).... 350
Centralia (H4).....2,460
Chadwick (F9)..... 175
Chaffee (N8).....3,134
Chamois (J5)..... 621
Chariton (riv.) (G1)
Charleston ◉(O9)....5,501
Chesterfield (O3)..... 351
Chicopee (K9)..... 100
Chilhowee (E5)..... 335
Chillicothe ◉(E3)....8,694
Chula (F3)..... 314
Clarence (H3).....1,123
Clark (H4)..... 276
Clarksburg (G5)..... 366
Clarksdale (D3)..... 282
Clarksville (K4)..... 702
Clarkton (M10).....1,004
Clayton ◉(P3).....16,035
Clearmont (C1)..... 283
Clearwater (lake) (L8) .....
Cleveland (C5)..... 163
Clever (F8)..... 273
Clifton City (G5).... 109
Clifton Hill (G4).... 262
Climax Springs (G6) 151
Clinton ◉(E6).....6,075
Clyde (C2)..... 115
Coffey (E2)..... 253
Cole Camp (F6)..... 814
College Mound (G3) 89
Collins (E7)..... 109
Columbia ◉(H5)....31,974
Commerce (O8)..... 360
Conception Junction (C2) 285
Concordia (E5).....1,218
Connelsville (G2).... 113
Conway (G7)..... 514
Cooter (N10)..... 490
Corder (E4)..... 541
Corning (B2)..... 184
Cornwall (M7)..... 100
Cosby (C3)..... 142
Cottleville (N2)..... 162
Couch (K9)..... 78
Country Club Hills (P2) 1,731
Courtney (R5)..... 175
Cowgill (E3)..... 241
Craig (B2)..... 578
Crane (E9)..... 939
Creighton (D6)..... 269
Crescent (O3)..... 200
Creve Coeur (O3)....2,040
Crocker (H7)..... 712
Cross Timbers (F6).. 179
Crowder (N9)..... 133
Crystal City (M6)....3,499
Cuba (K6).....1,301
Cuivre (riv.) (N2)...
Current (riv.) (K8).
Curryville (K4)..... 258
Cyrene (K4)..... 67
Dadeville (E8)..... 208
Dalton (F4)..... 237
Darlington (D2)..... 217
Davisville (K7)..... 250
Dawn (E3)..... 170
De Kalb (C3)..... 300
De Soto (M6).....5,357
De Witt (F4)..... 254
Dearborn (C3)..... 391
Deepwater (E6)..... 885
Deerfield (D7)..... 200
Deering (N10)..... 138
Defiance (N3)..... 120
Delta (N8)..... 453
Denton (E5)..... 150
Denton (N10)..... 126
Denver (D2)..... 144
Des Arc (L8)..... 376
Des Moines(riv.) (J1)
Desloge (M7).....1,957
Dexter (N9).....4,624
Diamond (D9)..... 405
Diehlstadt (N9)..... 165
Diggins (G8)..... 126
Dillon (J7)..... 175
Dixon (H6)..... 988
Dodson (P6).....1,500
Doe Run (M7)..... 900
Doniphan ◉(L9).....1,611
Dora (H9)..... 150
Dover (E4)..... 173
Downing (H2)..... 453
Dresden (F5)..... 110
Drexel (C6)..... 456
Dudley (M9)..... 319
Duenweg (D8)..... 500
Durham (J3)..... 264
Eagleville (D2)..... 360
East Atchison (C3).. 110
East Kansas City (P5) 206
East Lynne (D5)..... 204
East Prairie (O9).....3,033
Easton (C3)..... 173
Edgerton (C4)..... 408
Edina ◉(H2).....1,607
Edinburg (E2)..... 100
El Dorado Springs (E7) 2,618
Eldon (G6).....2,766
Eldridge (G7)..... 145
Elkland (F8)..... 203
Ellington (L8)..... 777
Ellisville (N3)..... 628
Ellsinore (L9)..... 299
Elmer (G3)..... 295
Elmira (D3)..... 128
Elmo (B1)..... 258
Elsberry (L4).....1,565
Elsey (E9)..... 105
Elston (H5)..... 110
Elvins (L7).....1,977
Eminence ◉(K8)..... 527
Emma (F5)..... 200
Eolia (L4)..... 476
Essex (N9)..... 549
Esther (M7).....2,000
Ethel (G3)..... 226
Eugene (H6)..... 180
Eureka (N3)..... 875
Everton (E8)..... 306
Ewing (J2)..... 316
Excello (H3)..... 95
Excelsior Springs (R4) 5,888
Exeter (D9)..... 355
Fagus (M9)..... 96
Fair Grove (F8)..... 308
Fair Play (E7)..... 383
Fairfax (B2)..... 806
Fairport (D2)..... 88
Fairview (D9)..... 259
Farber (J4)..... 358
Farley (O4)..... 98
Farmington ◉(M7)..4,490
Faro (M8)..... 75
Faucett (C3)..... 170
Fayette ◉(G4).....3,144
Fayetteville (E5)..... 100
Fenton (O3)..... 207
Ferguson (P2).....11,573
Ferrelview (O4)..... 126
Festus (M6).....5,199
Fillmore (C2)..... 284
Fisk (M9)..... 542
Flat River (M7).....5,308
Flatwoods (L9)..... 112
Flemington (F7)..... 181
Florence (G5)..... 100
Florissant (P2).....3,737
Foley (L4)..... 203
Forbes (B3)..... 177
Fordland (G8)..... 302
Forest City (B3)..... 484
Forest Green (G4).. 100
Foristell (M2)..... 165
Fornfelt (O8).....1,539
Forsyth ◉(F9)..... 354
Fort Leonard Wood (H7) .....
Fortescue (B2)..... 117
Fortuna (G5)..... 150
Foster (D6)..... 225
Frankford (K4)..... 449
Franklin (G4)..... 324
Fredericktown ◉(M7) 3,696
Freeburg (J6)..... 370
Freeman (C5)..... 309
Freistatt (E8)..... 135
Fremont (K9)..... 207
Fristoe (F6)..... 100
Frohna (N7)..... 208
Frontenac (O3).....1,099
Fruitland (N8)..... 150
Fulton ◉(J5).....10,052
Gainesville ◉(G9).... 309
Galena ◉(F9)..... 439
Gallatin ◉(E3).....1,634
Galt (F2)..... 409
Garden City (D5).... 590
Gasconade (J5)..... 448
Gasconade (riv.) (H7) .....
Gashland (P5).....1,200
Gatewood (K9)..... 75
Gentry (D2)..... 159
Geo. Washington Carver Nat'l Mon. (D9) .....
Gerald (K6)..... 429
Gibbs (H2)..... 144
Gibson (M10)..... 117
Gideon (N10).....1,754
Gilliam (F4)..... 306
Gilman City (D2).... 450
Gilmore (N2)..... 104
Glasgow (G4).....1,440
Glenallen (M8)..... 107
Glencoe (N3)..... 250
Glendale (P3).....4,930
Glenwood (G1)..... 258
Glover (L8)..... 134
Golden (E9)..... 650
Golden City (D8).... 839
Goodman (C9)..... 477
Gordonville (N8).... 130
Gorin (H2)..... 500
Gower (C3)..... 350
Graham (C2)..... 311
Grain Valley (S6).... 348
Granby (D9).....1,670
Grand (riv.) (F3)....
Grand Pass (F4)..... 124
Grandin (L9)..... 263
Grandview (P6).....1,556
Granger (H2)..... 122
Grant City ◉(D2)....1,184
Granville (H3)..... 105
Gravelton (M8)..... 97
Gray Summit (M3).. 250
Grayridge (N9)..... 253
Green Castle (G2).. 287
Green City (F2)..... 673
Green Ridge (F5)..... 335
Greenfield ◉(E8)....1,213
Greentop (H2)..... 281
Greenville ◉(M8).... 270
Greenwood (R6)..... 400
Grover (O3)..... 300
Grovespring (G8).... 104
Guilford (C2)..... 164
Hale (F3)..... 452
Half Way (F7)..... 150
Hallsville (H4)..... 225
Halltown (E8)..... 99
Hamilton (E3).....1,728
Handy (K9)..... 65
Hannibal (K3).....20,444
Hardin (E4)..... 747
Harris (F2)..... 181
Harrisburg (H4)..... 117
Harrisonville ◉(D5)2,530
Hartsburg (H5)..... 171
Hartville ◉(G8)..... 526
Harvester (O2)..... 75
Harviell (M9)..... 190
Harwood (D7)..... 141
Hattie (J8)..... 114
Hawk Point (K5).... 254
Hayti (N10).....3,302
Hematite (L6)..... 250
Hemple (D3)..... 75
Henrietta (E4)..... 462
Herculaneum (M6)..1,603
Hermann ◉(K5).....2,523
Hermitage ◉(F7).... 204
Hickman Mills (P6)1,325
Higbee (H4)..... 674
Higginsville (E4).....3,428
High Hill (K5)..... 224
Hilliard (M9)..... 75
Hillsboro ◉(L6)..... 390
Hoberg (E8)..... 90
Hodge (E4)..... 141
Hogan (L7)..... 74
Holcomb (N10)..... 505
Holden (E5).....1,765
Holland (N10)..... 409
Holliday (H3)..... 196
Hollister (F9)..... 542
Hollywood (M10).... 79
Holmes Park (P6).... 100
Holt (D4)..... 270
Hopkins (C1)..... 825
Hornersville (M10).. 875
House Springs (O4) 151
Houston ◉(J8).....1,277
Houstonia (F5)..... 309
Hughesville (F5)..... 180
Humansville (E7).... 803
Hume (C6)..... 474
Humphreys (F2)..... 185
Hunnewell (J3)..... 293
Hunter (L9)..... 134
Huntsville ◉(H4)....1,520
Hurdland (H2)..... 268
Hurley (F9)..... 250
Hutton Valley (J9).. 108
Iantha (D8)..... 166
Iberia (H6)..... 595
Illmo (O8).....1,247
Independence ◉(R5) 36,963
Industrial City (C3)
Ionia (F6)..... 120
Irondale (L7)..... 443
Ironton ◉(L7).....1,148
Jackson ◉(N8).....3,707
Jacksonville (G3).... 177
Jameson (E2)..... 185
Jamesport (E3)..... 720
Jamestown (G5)..... 245
Jasper (D8)..... 776
JEFFERSON CITY (H5) 25,099
Jennings (P2).....15,282
Jerico Springs (E7).. 235
Jerome (J7)..... 250
Jewett (L8)..... 125
Jonesburg (K5)..... 433
Joplin (D8).....38,711
Kahoka ◉(J2).....1,847
Kansas City (P5)..456,622
Kearney (D4)..... 570
Kelso (O8)..... 276
Kennett ◉(M10).....8,685
Kewanee (N9)..... 96
Keytesville ◉(G4).... 733
Kidder (D3)..... 222
Kimmswick (M6).... 207
King City (D2).....1,031
Kingston ◉(E3)..... 338
Kingsville (D5)..... 207
Kinloch (P2).....5,957
Kirksville ◉(H2)....11,110
Kirkwood (O3).....18,640
Knob Noster (E5).... 585
Knox City (H2)..... 362
Knoxville (E4)..... 100
Koshkonong (J9).... 333
La Belle (J2)..... 840
La Grange (K2).....1,106
La Monte (F5)..... 502
La Plata (H2).....1,331
Labadie (N3)..... 300
Laclede (F3)..... 544
Laddonia (J4)..... 599

◉County Seat

MISSOURI


30′ B 95° C 30′ D 94° E 30′ F 93° G 30′ H 92°
Mt. Ayr
Bedford
Centerville
Seymour
Lamoni
Hamburg
Westboro
Watson
Clearmont
Gaynor
Grant City
Sheridan
Orrena
Hatfield
Andover
Allendale
Blythedale
Eagleville
Brooklyn
Gainsville
Ridgeway
Mt. Moriah
Goshen
Princeton
Modena
Mill Grove
Harris
Green Castle
Green City
Spickard
Osgood
Milan
Novinger
Kirksville
Auburn
Rockport
Tarkio
Phelps City
Langdon
Fairfax
Nishnabotna
Quitman
Ravenwood
Bedison
Maryville
Skidmore
Conception
Arkoe
Corning
Maitland
Graham
Barnard
Guilford
Stanberry
Gentry
Albany
Darlington
Gilman City
Blue Ridge
Hampton
Bethany
Martinsville
Melbourne
Harrison
Spickard
Tindall
Brimson
Dunlap
Jamesport
Pattonsburg
Trenton
Laredo
Edinburg
Grundy
Sullivan
Linneus
Brookfield
Marceline
Macon
Shelby
Falls City
Forest City
Sabetha
Hiawatha
Troy
Industrial City
Mound City
Bigelow
Oregon
Fillmore
New Point
Napier
Rosendale
Pickering
Princeton
Andrew
Savannah
Rosendale
Oregon
Fillmore
Union Star
Fairport
Jamesport
Hickory
Alpha
Shelby
Purdin
Boston
Ethel
Barnesville
Sue City
Atlanta
Macon
Shelbina
Shelby
Monroe City
Horton
Atchison
Holton
Rushville
Buchanan
St. Joseph
Faucett
Dr. Kalb
Wallace
Aspinwall
Frazier
Gower
Perrin
Turney
Plattsburg
Mirabile
Braymer
Polo
Cowgill
Hamilton
Caldwell
Kingston
Ludlow
Dawn
Avalon
Bogard
Bosworth
Sumner
Bynumville
Mussellfork
Mendon
Rothville
Westville
Jacksonville
Duncan
Woodlawn
Bridge
Granville
Stouts
Clinton
Plattsburg
Lathrop
Grayson
Edgerton
Platan
Trimble
Converse
Lawson
Knoxville
Tarkville
Millville
Vibbard
Rayville
Richmond
Norborne
Carrollton
Wakenda
Da Witt
Standish
Miami
Forest Green
Carroll
Brunswick
Keytesville
Salisbury
Moberly
Huntsville
Randolph
Monroe
Paris
Middle Grove
Evansville
Madison
Cairo
Holliday
Florida
Stroter
Santa Fe
Leavenworth
Platte City
Weston
Camden
Point
Smithville
Kearney
Excelsior Spgs.
Missouri City
Liberty
Parkville
N. Kansas City
Sibley
Camden
Napoleon
Mayview
Orrick
Henrietta
Sugar Tree
Grand Pass
New Frankford
Gilliam
Arnold
Armstrong
Higbee
Clarence
Audrain
Molino
Thompson
Mexico
Benton City
Martinsburg
Kansas City
Sugar Creek
Independence
Grain Valley
Blue Spgs.
Lexington
Wellington
Corder
Alma
Higginsville
Blackburn
Arrow Rock
Marshall
Lisbon
Boonesboro
Glasgow
Burton
Howard
Fayette
Harrisburg
Hallsville
Topeka
Lawrence
Oskaloosa
Oakland
Jackson
Lee's Summit
Greenwood
Pleasant Hill
Raymore
Peculiar
Strasburg
Gunn City
Cleveland
East Lynne
West Line
Freeman
Harrisonville
Cass
Garden City
Drexel
Archie
Austin
Johnson
Warrensburg
Montserrat
Kingsville
Knob Noster
Centerview
Holden
Burtville
Latour
Magnolia
Dayton
Oak
Leeton
Calhoun
Windsor
Blairstown
Maurine
Osceola
Stockton
Dunnegan
Polk
Humansville
Flemington
Weaubleau
Hermitage
Preston
Hickory
Pittsburg
Urbana
Eldridge
Prosperine
Sleeper
Laclede
Lebanon
Abo
Big Piney
Duke
Edgar Spgs.
Beulah
Evansville
Maples
Kinderhook
Lincoln
Santiago
Camp Branch
Green Ridge
Sedalia
Smithton
Syracuse
Florence
Tipton
Monitau
Jefferson City
Osage
Cole
Loose Creek
Westphalia
Osage City
Lyndon
Ottawa
Paola
Osawatomie
Garnett
La Cygne
Pleasanton
Mound City
Squaw Creek
Missouri
Kansas
River
Neosho
R.
Iola
Fort Scott
Girard
Pittsburg
Cherokee
Columbus
Webb City
Carterville
Carthage
Joplin
Galena
Baxter Spgs.
Miami
Lake o' the Cherokees
Lake Spavinaw
Jay
Okla.
Bentonville
Rogers
Siloam Springs
Eureka Springs
Berryville
Harrison
Huntsville
Jasper
Bull Shoals Lake
Norfork Lake
Mountain Home
Cotter
Yellville
White River
Melbourne
Salem
Lebanon
Conway
Morrilton
Russellville
Clarksville
Fayetteville
Springdale
Siloam Springs
Rogers
Bentonville
Eureka Springs
Berryville
Harrison
Huntsville
Jasper
Bull Shoals Lake
Norfork Lake
Mountain Home
Cotter
Yellville
White River
Melbourne
Salem
Lebanon
Conway
Morrilton
Russellville
Clarksville
Fayetteville
Springdale
Longitude 92°
Vernon
Cedar
Dade
Barton
Jasper
Newton
McDonald
Barry
Lawrence
Greene
Christian
Stone
Taney
Webster
Douglas
Ozark
Wright
Texas
Howell
Oregon
Shannon
Carter
Ripley
Butler
Stoddard
Scott
Mississippi
New Madrid
Pemiscot
Dunklin
Cape Girardeau
Bollinger
Wayne
Iron
Reynolds
Madison
St. Francois
Ste. Genevieve
Perry
Jefferson
Washington
Crawford
Dent
Phelps
Pulaski
Gasconade
Franklin
Warren
St. Charles
Lincoln
Pike
Ralls
Marion
Clark
Scotland
Knox
Lewis
Clark
Shelby
Monroe
Ralls
Pike
Lincoln
Warren
St. Charles
Montgomery
Audrain
Callaway
Boone
Howard
Cooper
Moniteau
Morgan
Miller
Camden
Laclede
Pulaski
Phelps
Dent
Crawford
Gasconade
Osage
Maries
Texas
Howell
Oregon
Shannon
Carter
Ripley
Butler
Stoddard
Scott
Mississippi
New Madrid
Pemiscot
Dunklin
Cape Girardeau
Bollinger
Wayne
Iron
Reynolds
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St. Francois
Ste. Genevieve
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Warren
St. Charles
Montgomery
Audrain
Callaway
Boone
Howard
Cooper
Moniteau
Morgan
Miller
Camden
Laclede
Pulaski
Phelps
Dent
Crawford
Gasconade
Osage
Maries
RAILROADS
1 Chicago, Burlington & Quincy
2 Chicago, Rock Island & Pacific
3 Chicago & Alton
4 Chicago & Eastern Illinois
5 Chicago, Milwaukee, St. Paul & Pacific
6 Chicago, Rock Island & Pacific
7 Chicago, Milwaukee, St. Paul & Pacific
8 Chicago & North Western
9 Kansas City Southern
10 Missouri-Kansas-Texas
11 Missouri Pacific
12 New York Central
13 New York, Chicago & St. Louis
14 Pennsylvania
15 Southern, Langdon & Northern
16 St. Louis & Troy
17 St. Louis-San Francisco
18 St. Louis Southwestern
19 Southern
20 Union Pacific
21 Wabash
All railroads are numbered as an aid in connecting the reading of table and location of rail lines.

MISSOURI

ST. LOUIS AND VICINITY
SCALE OF MILES
KANSAS CITY AND VICINITY
SCALE OF MILES
SCALE OF MILES
State Capitals
County Seats
Railroads
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Ladue (P3).....5,386
Lake Ozark (G6).... 350
Lamar ◉(D8).....3,233
Lanagan (C9)..... 368
Lancaster ◉(H1).... 856
Laredo (E2)..... 426
Larussell (D8)..... 82
Latham (G5)..... 172
Lathrop (D3)..... 888
Latour (D5)..... 80
Lawrenceton (M6)..
Lawson (D4)..... 486
Leadwood (L7).....1,479
Leasburg (K6)..... 178
Lebanon ◉(G7).....6,808
Leeper (L8)..... 375
Lee's Summit (R6) 2,554
Leeton (E5)..... 372
Lemons (F2)..... 176
Leonard (H3)..... 165
Leslie (K6)..... 114
Lesterville (L8)..... 163
Levasy (S5)..... 139
Lewistown (J2)..... 415
Lexington ◉(E4)....5,074
Liberal (D7)..... 739
Liberty ◉(R5).....4,709
Licking (J8)..... 733
Liege (K5)..... 77
Lilbourn (N9).....1,361
Lincoln (F6)..... 316
Linden (P5)..... 800
Linn ◉(J5)..... 758
Linn Creek (G6).... 162
Linneus ◉(F3)..... 513
Little Blue (R6)..... 250
Livonia (G1)..... 193
Lock Springs (E3).. 137
Lockwood (E8)..... 791
Lohman (H5)..... 123
Lonejack (S6)..... 200
Longtown (N7)..... 139
Louisiana (K4).....4,389
Lowndes (M8)..... 100
Lowry City (E6)..... 493
Lucerne (F2)..... 227
Ludlow (E3)..... 260
Lupus (H5)..... 97
Luray (J2)..... 184
Lutesville (M8)..... 694
Luxemburg (P3).....
Machens (P2)..... 86
Macks Creek (G7).. 108
Macon ◉(H3).....4,152
Madison (H4)..... 571
Maitland (B2)..... 456
Malden (M9).....3,396
Malta Bend (F4)..... 414
Manchester (O3).....
Manes (H8)..... 120
Manley (M10)..... 75
Mansfield (G8)..... 963
Maplewood (P3)....13,416
Marble Hill ◉(N8) 454
Marceline (F3).....3,172
Marionville (E8).....1,167
Marquand (M8)..... 369
Marshall ◉(F4).....8,850
Marshfield ◉(G8)....1,925
Marston (N9)..... 610
Marthasville (L5).... 347
Martinsburg (J4).... 296
Martinsville (D2).... 90
Martin City (P6).... 350
Maryland Heights (O2) .....
Maryville ◉(C2).....6,834
Matthews (N9)..... 498
Maysville ◉(D3)..... 973
Mayview (E4)..... 268
Maywood (J3)..... 149
McBaine (H5)..... 75
McBride (N7)..... 75
McCredie (J5)..... 90
McFall (D2)..... 255
McKittrick (J5)..... 100
Meacham Park (P3)
Meadville (F3)..... 446
Melbourne (E2)..... 102
Memphis ◉(H2).....2,035
Mendon (F3)..... 349
Menfro (N7)..... 80
Meramec(riv.) (M4)
Mercer (F2)..... 377
Merwin (C6)..... 88
Meta (H6)..... 353
Metz (C6)..... 178
Mexico ◉(J4).....11,623
Miami (F4)..... 217
Middletown (J4)..... 240
Midridge (K8)..... 75
Milan ◉(F2).....1,972
Milford (D7)..... 100
Millard (G2)..... 100
Millcreek (M7)..... 75
Miller (E8)..... 615
Millville (E4)..... 150
Milo (D7)..... 124
Mindenmines (D8).. 425
Mineola (J5)..... 75
Mineral Point (L7).. 304
Mingo (M9)..... 200
Mississippi(riv.)(L4)
Missouri (riv.) (H5)
Missouri City (R5).. 314
Moberly (G4).....13,115
Modena (E2)..... 95
Mokane (J5)..... 477
Monett (E9).....4,771
Monroe City (J3)....2,093
Montgomery City ◉ (K5) 1,679
Monticello ◉(J2).... 154
Montreal (G7)..... 83
Montrose (E6)..... 518
Montserrat (E5)..... 130
Moody (J9)..... 100
Mooresville (E3)..... 134
Mora (F5)..... 75
Morehouse (N9).....1,635
Morley (N8)..... 494
Morrison (J5)..... 291
Morrisville (F8)..... 296
Mosby (R4)..... 213
Moscow Mills (M1) 350
Moselle (M4)..... 130
Mound City (B2)....1,412
Moundville (C7)..... 168
Mt. Leonard (F4).... 142
Mt. Moriah (E2).... 260
Mt. Vernon ◉(E8)..2,057
Mountain Grove (H8) 3,106
Mountain View (J8) 892
Murphy (O4)..... 160
Myrtle (K9)..... 95
Napoleon (E4)..... 143
Napton (F4)..... 80
Naylor (L9)..... 520
Neck (C8)..... 117
Neelyville (M9)..... 457
Nelson (F4)..... 297
Neosho ◉(D9).....5,790
Netherlands (N10).. 72
Nevada ◉(D7).....8,009
New Bloomfield (J5) 400
New Boston (G3).... 86
New Cambria (G3).. 295
New Florence (K5) 522
New Franklin (G4)..1,060
New Hamburg (O8) 156
New Hampton (D2) 375
New Haven (K5)....1,009
New Hope (L4)..... 175
New London ◉(K3) 858
New Madrid ◉(O9)2,726
New Melle (M2).... 150
New Offenburg(M7) 111
New Point (B2)..... 80
Newark (H2)..... 156
Newburg (J7)..... 949
Newtonia (D9)..... 190
Newtown (F2)..... 231
Niangua (G8)..... 344
Nixa (F8)..... 509
Noel (D9)..... 685
Norborne (E4).....1,114
Norfork(lake)(H10)
Normandy (P3).....2,306
N. Kansas City (P5) 3,886
Northview (G8)..... 200
Northwye (J7)..... 99
Norwood (H8)..... 345
Novelty (H2)..... 188
Novinger (G2)..... 734
Oak Grove (S6)..... 761
Oak Ridge (N7)..... 202
Oakland (P3).....1,041
Oakwood (K3).....
Odessa (E5).....1,969
O'Fallon (N2)..... 789
Old Appleton (N7).. 120
Old Monroe (N1).... 268
Olean (G6)..... 165
Olney (K4)..... 93
Oran (N8).....1,156
Oregon ◉(B2)..... 870
Oronogo (D8)..... 519
Orrick (S5)..... 675
Osage (riv.) (D6)....
Osage Beach (G6).. 237
Osage City (H5)..... 250
Osborn (D3)..... 237
Osceola ◉(E6).....1,082
Osgood (F2)..... 173
Otterville (G5)..... 414
Overland (P3).....11,566
Owensville (K6).....1,946
Owls Bend (K8)..... 75
Oxly (L9)..... 150
Ozark ◉(F8).....1,087
Ozark (plat.)(F9)....
Ozarks (lake)(G6)..
Pacific (N4).....1,985
Pagedale (P3).....3,866
Palmyra ◉(J3).....2,295
Paradise (D4)..... 120
Paris ◉(J4).....1,407
Parkville (O5).....1,186
Parma (N9).....1,163
Parnell (C2)..... 362
Pascola (N10)..... 242
Passaic (D6)..... 75
Patterson (L8)..... 125
Patton (M7)..... 162
Pattonsburg (D2).... 883
Peculiar (D5)..... 267
Peerless Park (O3).. 119
Perkins (N8)..... 164
Perry (J4)..... 813
Perryville ◉(N7).....4,591
Peruque (O2)..... 85
Pevely (M6)..... 416
Phelps City (A2)..... 139
Philadelphia (J3).... 200
Phillipsburg (G7).... 170
Pickering (C2)..... 213
Piedmont (L8).....1,548
Pierce City (E8).....1,156
Pilot Grove (G5).... 635
Pilot Knob (L7)..... 582
Pine (K9)..... 100
Pine Lawn (P3).....6,425
Pineville ◉(D9)..... 464
Plato (H8)..... 100
Platte (riv.) (C3).....
Platte City ◉(C4).... 742
Plattsburg ◉(D3)....1,655
Pleasant Hill (D5)..2,200
Pleasant Hope (F8) 174
Plevna (H3)..... 120
Pocahontas (N8)..... 130
Point Pleasant(O10) 101
Polo (D3)..... 549
Pomona (J9)..... 300
Pond (N3)..... 260
Poplar Bluff ◉ (L9) 15,064
Portageville (N10) 2,662
Portage Des Sioux (P2) 264
Portland (J5)..... 200
Potosi ◉(L7).....2,359
Powe (M9)..... 95
Powersville (F1)..... 227
Prairie Hill (G3)..... 124
Prairie Home (G5).. 208
Preston (F7)..... 109
Princeton ◉(E2).....1,506
Prospect Hill (R2)..
Purcell (D8)..... 334
Purdin (F3)..... 255
Purdy (E9)..... 437
Puxico (M9)..... 749
Queen City (H2)..... 554
Quitman (C2)..... 135
Qulin (M9)..... 426
Racine (C9)..... 150
Randles (N8)..... 169
Ravanna (E2)..... 132
Ravenwood (C2)..... 319
Raymondville (J8).. 175
Raymore (D5)..... 208
Raytown (P6).....
Rayville (E4)..... 193
Rea (C2)..... 110
Reeds (D8)..... 136
Reeds Spring (F9).. 313
Reger (F2)..... 103
Renick (H4)..... 157
Republic (E8)..... 965
Revere (J2)..... 180
Rhineland (J5)..... 198
Rich Hill (D6).....1,820
Richards (D7)..... 190
Richland (H7).....1,133
Richmond ◉(D4)....4,299
Richmond Heights (P3) 15,045
Richwoods (L6)..... 250
Ridgeway (D2)..... 560
Risco (N9)..... 495
Ritchey (D9)..... 137
Rivermines (L7)..... 485
Rives (M10)..... 166
Robertson (P2).....1,200
Robertsville (N4).... 117
Rocheport (H5)..... 376
Rock Hill (P3).....3,847
Rockport ◉(B2).....1,511
Rockville (D6)..... 372
Rocky Comfort(D9) 230
Rogersville (G8)..... 321
Rolla ◉(J7).....9,354
Rosati (J6)..... 650
Roscoe (E7)..... 128
Rosebud (K6)..... 254
Rosendale (C2)..... 245
Rothville (F3)..... 152
Ruble (L8)..... 75
Ruegg (P2)..... 200
Rush Hill (J4)..... 127
Rushville (B3)..... 319
Russellville (H6)..... 336
Rutledge (H2)..... 217
Saco (M8)..... 75
Saint Ann (P2).....4,557
St. Catharine (G3).. 80
St. Charles ◉(O2)..14,314
St. Clair (L6).....1,779
St. Francis(riv.)(M9)
St. Francisville (J2) 275
St. Francois (M7).... 295
St. George (H8)..... 642
St. James (J6).....1,811
St. Johns (P2).....2,499
St. Joseph ◉(C3)....78,588
St. Louis ◉ (P3) 856,796
St. Marys (M7)..... 635
St. Paul (N2)..... 102
St. Peters (N2)..... 377
Ste. Genevieve ◉ (M6) 3,992
Salem ◉(J7).....3,611
Salem (Coffey)(E2) 253
Salisbury (G4).....1,676
Salt (riv.) (H3).....
Santa Fe (J4)..... 83
Sarcoxie (D8).....1,042
Savannah ◉(C3).....2,332
Saverton (K3)..... 150
Schell City (D6)..... 400
Sedalia ◉(F5).....20,354
Sedgewickville(N7).. 92
Senath (M10).....1,528
Seneca (C9).....1,195
Seymour (G8).....1,015
Shelbina (H3).....2,113
Shelbyville ◉(H3).... 635
Sheldon (D7)..... 427
Sheridan (C1)..... 370
Sherman (O3)..... 225
Shrewsbury (P3).....3,382
Sibley (S5)..... 200
Sikeston (N9).....11,640
Silex (K4)..... 188
Skidmore (B2)..... 485
Slater (G4).....2,836
Sleeper (G7)..... 131
Smithfield (C8)..... 150
Smithton (F5)..... 339
Smithville (D4)..... 947
Snyder (F3)..... 150
South Gifford (G3).. 128
S. Gorin (H2)..... 303
S. Greenfield (E8).... 186
S. Lineville (E1)..... 92
S. West City (D9).. 595
Sparta (F9)..... 244
Spickard (F2)..... 517
Spoonerville (M9).... 500
Spring City (C9)..... 140
Spring Creek (J7).... 85
Spring Fork (F5).... 120
Springfield ◉(F8)..66,731
Stanberry (C2).....1,651
Stanton (K6)..... 250
Stark City (D9)..... 154
Steele (N10).....2,360
Steelville ◉(K7).....1,157
Stella (D9)..... 177
Stewartsville (C3).... 414
Stockton ◉(E7)..... 811
Stotts City (E8)..... 285
Stoutland (G7)..... 192
Stoutsville (J3)..... 146
Stover (G6)..... 693
Strafford (F8)..... 300
Strasburg (D5)..... 180
Studivant (M8)..... 103
Sturgeon (H4)..... 544
Sugar Creek (R5)....1,858
Sullivan (K6).....3,019
Sulphur Springs (M6) 135
Summerfield (J6)..... 75
Summersville (J8).... 306
Sumner (F3)..... 309
Swedeborg (H7)..... 150
Sweet Springs (F5)..1,439
Syracuse (G5)..... 221
Taberville (E6)..... 100
Taneyville (F9)..... 132
Tarkio (B2).....2,221
Taum Sauk (mt.) (L7) .....
Tebbetts (J5)..... 150
Thayer (J9).....1,639
Tiff (L8)..... 75
Tiffin (E7)..... 100
Tina (F3)..... 224
Tindall (E2)..... 102
Tipton (G5).....1,234
Tracy (C4)..... 201
Trenton ◉(E2).....6,157
Trimble (D4)..... 141
Triplett (F4)..... 301
Troy ◉(L5).....1,738
Truesdail (K5)..... 235
Truxton (K4)..... 125
Turney (D3)..... 152
Tuscumbia ◉(H6).... 221
Tyler (N10)..... 150
Ulman (H6)..... 75
Union ◉(L6).....2,917
Union Star (C2)..... 373
Unionville ◉(G2)....2,050
University City(P3)39,892
Urbana (F7)..... 359
Urich (E6)..... 400
Utica (E3)..... 475
Valles Mines (L6).... 225
Valley Park (O3)....2,956
Van Buren ◉(L8).... 708
Vandalia (J4).....2,624
Vanduser (N9)..... 281
Verona (E9)..... 396
Versailles ◉(G6).....1,929
Vibbard (D4)..... 83
Vichy (J6)..... 150
Victoria (M6)..... 250
Vienna ◉(H6)..... 471
Vigus (O2)..... 400
Villa Ridge (M4)..... 142
Vulcan (L8)..... 200
Waco (C8)..... 177
Wakenda (F4)..... 255
Waldron (O5)..... 95
Walker (D7)..... 204
Walnut Grove (F8).. 347
Wappapello (M9).... 210
Wappapello (lake) (L8) .....
Wardell (N10)..... 454
Warrensburg ◉(E5)6,857
Warrenton ◉(K5)....1,584
Warsaw ◉(F6)..... 936
Washburn (E9)..... 250
Washington (K5)....6,850
Watson (A1)..... 199
Waverly (E4)..... 809
Wayland (J2)..... 350
Wayne (E9)..... 84
Waynesville ◉(H7)..1,010
Weatherby (D3)..... 156
Weaubleau (F7)..... 432
Webb City (C8).....6,919
Webster Groves (P3) 23,390
Wellington (E4)..... 649
Wellston (P3).....9,396
Wellsville (K4).....1,519
Wentworth (D8)..... 212
Wentzville (M2).....1,227
Wesco (K7)..... 100
W. Eminence (J8).... 144
W. Plains ◉(J9).....4,918
Westalton (R2)..... 400
Westboro (B1)..... 297
Weston (C4).....1,067
Westphalia (J6)..... 319
Wheatland (F7)..... 299
Wheaton (E9)..... 394
White (riv.) (G10)..
Whiteoak (M10)..... 91
Whiteside (K4)..... 93
Whitewater (N8)..... 187
Whiting (O9)..... 125
Wilcox (C2)..... 100
Wilderness (K9)..... 155
Willard (F8)..... 300
Williamsburg (J5).... 95
Williamstown (J2).. 158
Williamsville (L9).... 492
Willow Springs (H9) 1,914
Windsor (E5).....2,429
Winfield (L5)..... 474
Winigan (G2)..... 110
Winona (K8)..... 473
Winston (D3)..... 278
Wishart (F7)..... 90
Wooldridge (G5).... 137
Worth (C2)..... 141
Worthington (G2).... 186
Wright City (K5).... 543
Wyaconda (J2)..... 483
Wyatt (O9)..... 345
Zalma (N8)..... 137

◉County Seat

recreational centers on Lake Taneycomo and especially around the Lake of the Ozarks.

Memorials.—The Jefferson National Expansion Memorial in St. Louis is a park newly developed along the river front through the razing of old buildings and the improvement of the site at a cost of several million dollars. It contains various landmarks of the city, including the Old Rock House built in 1818 for the use of the Missouri Fur Company, the old Court House, and the old Cathedral of Saint Louis. Also at St. Louis is the Soldiers' Memorial Building dedicated to St. Louis soldiers who died in World War I. There are many other memorials scattered throughout the state commemorating historic events or honoring men who served their state.

Wildlife Refuges.—There are nearly 50 wildlife refuges, public and private, of which 3 are federal, 20 are located in state parks, and 10 are under the control of the state Department of Conservation. This agency has done excellent work in restocking the rivers and in restoring wildlife in game areas, particularly deer and wild turkeys.

Other Points of Interest.—Hannibal, the home of Mark Twain, is full of interest to anyone who enjoys reading about Huckleberry Finn or Tom Sawyer. St. Louis, aside from its many points of historical interest, has many beautiful modern sights to offer. Near the Union Station stands Carl Milles' fountain, *The Meeting of the Waters*. On Government Drive is the Polychrome Electric Fountain, a terraced limestone formation, illuminated by colored lights at night. The St. Louis Zoological Garden is famous for its large collections of animals and birds and many rare specimens. The Missouri Botanical Garden contains more than 12,000 species of trees and plants and is nationally known for its flower shows.

Cultural Activities.—St. Louis provides educational and cultural facilities, such as the City Art Museum and the Auditorium Opera House, in which are given concerts of the nationally known St. Louis Symphony Orchestra and presentations of the Grand Opera Association. The St. Louis Playgoers Association, the Light Opera Guild, and the St. Louis Artists Guild are other cultural organizations.

Kansas City boasts a philharmonic orchestra in addition to the William Rockhill Nelson Gallery of Art and the Mary Atkins Museum of Fine Arts. See also KANSAS CITY; SAINT LOUIS; and articles on other Missouri cities.

7. FAMOUS MEN AND WOMEN

Among political leaders may be mentioned Thomas Hart Benton (1782–1858), born in North Carolina, who represented Missouri in the United States Senate for 30 years, and Francis Preston Blair (1821–1875), who, though born in Kentucky, lived in St. Louis and practiced law there. He organized the Free Soil Party, opposed slavery, and supported the Union during the Civil War. Missouri placed his statue in the United States Capitol. Richard Parks Bland (1835–1899), Kentucky-born lawyer who was a United States representative from Missouri for 24 years, was the leader of the free silver bloc and coauthor of the Bland-Allison Act remonetizing silver. Champ (James Beauchamp) Clark (1850–1921), born in Kentucky, was a United States representative from Missouri for many years and speaker of the House for eight years. Harry S. Truman (1884–), born in Lamar, Mo., served as president of the United States from 1945 to 1953.

In the military field, Missouri is represented by two citizens of outstanding importance. John Joseph Pershing (1860–1948), born in Linn County, Mo., became a full general and commanded the American Expeditionary Force in World War I, and became army chief of staff in 1921; and Omar Nelson Bradley (1893–), born in Clark, Mo., became chief of staff, United States Army, in 1948, and served as chairman, Joint Chiefs of Staff, 1949–1953.

In science, Missouri is represented by William Pope McArthur (1814–1850), born in Ste. Genevieve, Mo., a naval officer and hydrographer who was the first surveyor of the Pacific Coast; George Washington Carver (c. 1864–1943), born near Diamond, Mo., an agricultural chemist known especially for his research on the industrial use of the peanut; and Harlow Shapley (1885–), astronomer, born in Nashville, Mo., director of Harvard College Observatory (1921–1952).

Literature and the arts have been favored by several very well-known natives of Missouri. These include Samuel Langhorne Clemens (Mark Twain, 1835–1910), humorist and author, born in Florida, Mo., and lived in Hannibal; Eugene Field (1850–1895), poet and journalist, born in St. Louis; Rupert Hughes (1872–1956), author, born in Lancaster, Mo., prolific writer of both fiction and plays; Sara Teasdale (1884–1933), poet, born in St. Louis; Zoe Akins (1886–), poet and playwright, born in Humansville, Mo., winner of the Pulitzer drama prize for 1934–1935; Thomas Stearns Eliot (1888–), poet and essayist, born in St. Louis; Augustus Thomas (1857–1934), playwright, born in St. Louis; James Carroll Beckwith (1852–1917), portrait painter, born in Hannibal, Mo.; Gladys Swarthout (1904–), soprano, born in Deepwater, Mo.; Helen Traubel (1903–), operatic and concert soprano, born in St. Louis, Mo.; and Thomas Hart Benton (1889–), artist, born in Neosho, Mo., painter of many famous murals.

Massie-Missouri Resources Division

The boyhood home of Mark Twain in Hannibal, and the whitewashed fence immortalized in "Tom Sawyer."

Others of note include Susan Elizabeth Blow (1843–1916), educator, born in St. Louis, where she opened the first public kindergarten in the United States (1873); and Bernarr Macfadden (1868–1955), physical culturist and publisher, born near Mill Springs, Mo.

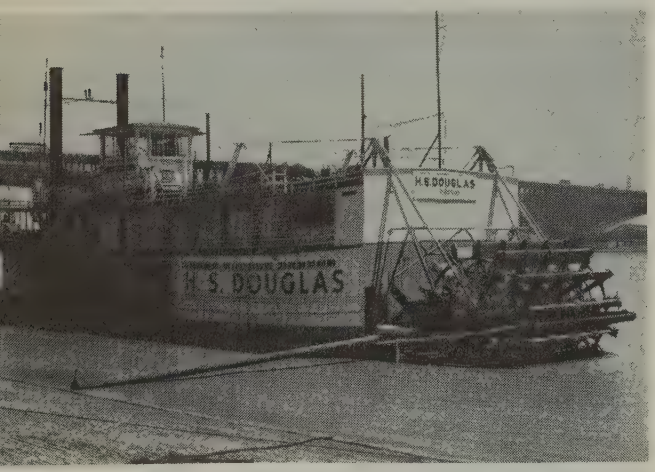
8. HISTORY

Early Settlement.—Missouri, with her role as the gateway to the West for the fur traders and Forty-niners and for settlers of Oregon, California, and Texas, and her tragic division of opinion as a border slave state in the 1860's, has had an unusually colorful history. White occupation began around 1700 with the establishment of French-Canadian villages just across the Mississippi. Young men on hunting trips up the Missouri began to mine lead in the St. Francis Valley. The state's first permanent settlement was made around 1735 at Ste. Genevieve, at the crossing to the lead country. After Illinois and the eastern half of the great Mississippi Valley

were ceded by France to England in 1763, many French Canadians moved across the river. St. Louis, founded in the winter of 1763–1764 as a fur trading post, became a prosperous little town. Under the Spanish, to whom France had ceded the western Mississippi Valley, absolute government continued, and little trace of French influence remained in Missouri.

By the time of the Louisiana Purchase of 1803, settlers from east of the Mississippi constituted the majority of Missouri's population. Until 1815, the growth of population was slow, but after 1815, pioneers poured into Missouri, especially into lands along the Missouri and Mississippi rivers. By 1820 the population of Missouri Territory, which had been granted an elective legislature in 1812 and 1816, was over 66,000. St. Louis, Ste. Genevieve, and Franklin were the leading towns.

Statehood.—The admission of Missouri to statehood, for which she applied in 1818, precipitated the first clear-cut clash between Northern and Southern interests, when the House of Representatives at Washington proposed the ex-



Devaney Inc.

A sternwheeler on the Mississippi at St. Louis.

clusion of slavery from the new state. The result was the well-known Missouri Compromise (q.v.) of 1820, by which Missouri was admitted without restriction, but by which slavery was prohibited elsewhere in the Louisiana Purchase north of 36°30′, the southern boundary of the state. Due to a secondary dispute over free Negroes, Missouri was actually admitted by presidential proclamation on Aug. 10, 1821. Meanwhile, in 1820, Missouri had drawn up a constitution and had elected and organized a state government 10 months before her actual admission.

Expansion and Trade.—The most important activity in the next three decades was the extension of settled areas and the conquest of the wilderness. The spread of settlement was chiefly in the plains areas. The dates of occupation and the emergence of more mature economic and social conditions in the different areas depended partly on the relative fertility of the soil but more significantly on the availability of river transportation. A considerable number of blue-grass Kentuckians, cashing in on increased land values, moved into Missouri with capital and slaves, and became the ruling class along the Missouri and Mississippi rivers. A similar society developed in the Platte Purchase, the northwestern corner (the original western boundary was a straight line) that was added to the state in 1837. Steamboats, the first of which reached St. Louis in 1817 and Franklin in 1819, were supplementing the rafts and flatboats, and stage lines of a sort were running from St. Louis to the western border of the state. Settlers were taking up the narrow fertile valleys in the Ozarks, but the real settlement of the rougher country awaited the 1850's.

The upper Missouri River fur trade and the Santa Fe trade provided romance and adventure. William Henry Ashley made a fortune in the fur trade from the area north of the Great Salt Lake. His Rocky Mountain Fur Company did not have fixed trading posts or hired hunters. The furs were gathered by the "mountain men," such as Jim Bridger and Jedediah Smith, who along with others took their furs each year to an agreed-upon rendezvous and got their supplies. In the 1830's the American Fur Company, managed by men from St. Louis and backed with capital from John Jacob Astor, forced out all competition. By the 1840's, the institutionalizing of the fur trade, the killing off of the beaver, and the coming of the silk hat were factors responsible for the decline of the fur trade and of the romance and adventure associated with it.

Furs from the southern Rockies went to St. Louis by the overland route from Santa Fe. The trade that grew up was carried on chiefly by individual adventurers who outfitted at western Missouri River towns, and rendezvoused for the annual caravan in southern Kansas. In their covered wagons they took out manufactured goods, especially textiles, and brought back fur, gold and silver bullion, horses, and the ancestors of the Missouri mule. Individuals and small groups suffered severely from the Indians but caravans were seldom attacked. The trade was profitable, often netting 50 per cent, and took into Missouri as much as $200,000 in bullion in one year.

The hunters and fur traders were followed in the 1840's by an increasing migration of Missourians who settled in Oregon and California before the arrival of the Forty-niners. Missourians also were prominent in early Texas history and were keenly interested in the annexation of Texas and the resulting Mexican War.

The Mormons furnished another colorful incident in Missouri's history. In 1831 their leader, Joseph Smith, went to Independence, declared it to be the future Zion of his church, and dedicated the temple site. After Smith's return east, the Mormons arrived at Independence in increasing numbers, and friction with the "gentiles" developed until mob violence, turning into guerrilla warfare, necessitated the calling out of the state militia. Eventually, the Mormons agreed to withdraw to Nauvoo, Ill., their last station before the long trek to Utah. Their combination of church and state, the fear that they would thus secure local political control, and their open opposition to slavery were major causes of friction. The Mormons still own the temple site at Independence and have acquired extensive real estate holdings there.

Economic and Social Changes.—The economic and social changes of the hectic 1850's transformed the state. With the gold rush came the development of the overland traffic. With St. Louis as the supply center, goods went by steamer to St. Joseph and to rapidly growing Kansas City, and then westward by ox and mule team. St. Joseph was the starting point of the famous Pony

Devaney Inc.

The skyline of Kansas City, with Union Depot in the foreground.

Express to California. The rapid development of the upper Mississippi Valley and the growing Southern market, because of its increasing specialization in cotton, were added stimuli to trade and to the growth of St. Louis. The coming of the railroads was the outstanding change. In addition to the need for better transportation within the state was the conviction, shared by Missouri's outstanding political leader, Senator Thomas Hart Benton, and St. Louis interests, that a railroad across the state would inevitably make St. Louis the eastern terminus of the proposed transcontinental railroad. Liquid capital for construction was lacking, however, and in 1851 the state lent $2,000,000 in state bonds to the proposed Pacific road to Kansas. Despite additional loans and state and federal land grants, the great expectations of railroad enthusiasts were not realized. But a beginning had been made, and clearly a new economic era was dawning.

In 1860, Missouri topped the million mark in population. More than half were natives of Missouri. Of the total white population, 15 per cent were born in free states, chiefly Ohio, Indiana, and Illinois, and about 15 per cent were foreign born, chiefly German and Irish. More than half of these were in St. Louis and constituted more than half of that city's population of 190,500. That is, nearly a third of the total population and nearly two thirds of the population of St. Louis were born in free states or abroad. In people, as in economics, the earlier Southern coloring was fading out. The institution of slavery itself was losing ground; the percentage of slaves in the total population, steadily declining since 1830, had dropped to about 9 per cent in 1860. The institution was holding its own only in some 20 of the older, richer river counties, in a few of which the percentage was over 25. Slaveholdings for the most part were small, and the majority of slaves were household or personal servants. Slave labor was used, however, in raising tobacco and hemp and even more for general farming.

The Civil War.—The political downfall of Thomas Hart Benton who, as Missouri's United States senator from 1821, had been one of the dominant leaders of the Democratic Party during the Jacksonian period, and the breakup of the Whig Party during the decade of the 1850's confused party politics in Missouri. Benton was never reconciled to the growing dominance of the Southern wing within the Democratic Party. His arrogance toward local party leaders and his failure to build up a personal machine were responsible for his defeat in the election of 1850. His defeat was a portent of the division that was to take place in ante-bellum Missouri politics. Benton's strong nationalism and anti-Southern views forced the victorious anti-Benton leaders generally into a close alliance with the Southern wing of the Democratic Party. In the presidential election of 1860, however, the rank and file of the party compelled them reluctantly to support Stephen A. Douglas, who just barely carried the state. In addition, troubles on the Missouri-Kansas border, having their origin in the Kansas-Nebraska Act, and agitated by the Border Ruffians, a collection of frontier roughnecks and ne'er-do-wells, further divided the state's politics.

The secession of South Carolina presented Missouri and the border slave states with a most difficult choice. Except for the Southern market, Missouri's economic interests were clearly Northern and Western. Consequently, there was increasing feeling for a strong federal government that would support Missouri's interest in westward expansion. On the other hand, the pro-Southern and well-to-do ruling groups in the older sections of Missouri looked eastward to Kentucky and Virginia as their original homelands, regarded the Southerners as kinsfolk, and therefore had strong states' rights feelings. Most Missourians hoped desperately for compromise and the avoidance of civil war. A convention meeting in March 1861 to determine Missouri's allegiance did not include a single advocate of immediate secession. It defeated the attempt of the pro-Southern minority to pledge Missouri to secession if compromise failed, and by a two-

thirds majority pledged the state's support to any peaceful settlement.

When Governor Claiborne F. Jackson surreptitiously tried to push Missouri into the Confederacy by gathering a group of militia into a camp just outside St. Louis, federal forces under Nathaniel Lyon broke it up. On the militia's return, Lyon's forces fired into a civilian mob and the state was in an uproar. The governor called for 50,000 vounteers for a state army, but Lyon occupied Jefferson City, and the officials fled to the southwest. This federal interference and the unfortunate Camp Jackson affair certainly drove thousands of Missourians into Jackson's militia and eventually into the Confederate Army. In October 1861, Jackson convened a rump of the legislature at Neosho, which passed an ordinance of secession, and Missouri was formally admitted to the Confederacy. However, the decisive defeat of the Confederate Army early in 1862 at the Battle of Pea Ridge in Arkansas ended any chance of establishing a Confederate state government by force.

The old convention, controlled by the conservative Unionists, reconvened and appointed Hamilton R. Gamble, an old-line Whig, as provisional governor, and authorized him to borrow money and organize a militia. This loyal state government was recognized by Lincoln, who aided Gamble to equip his militia. Gamble and the convention—it did not dissolve until 1863—were moderate and conciliatory and won the acceptance if not the too active support of the great majority. Throughout 1862 and most of 1863, local government broke down over much of Missouri. There were local civil wars and guerrilla raids, accompanied by much destruction of public and private property. During 1864 law and order were slowly restored.

Reconstruction.—Meanwhile there was a steadily rising Radical opposition to the Gamble regime. Originally unconditional Unionists, the Radicals by 1863 were demanding immediate abolition of slavery and more drastic treatment of Confederate sympathizers. They won the election of 1864, which restored a regular state government and, in the Constitutional Convention of 1865, abolished slavery immediately and without compensation. Through the use of "ironclad" test oaths they sought to disfranchise and to exclude from the professions even passive sympathizers with the Confederacy. The new constitution was ratified by a narrow plurality, which had been provided by the absentee soldier vote.

The unpopularity of the Radicals was increased by their activities with the railroads. All the state-aided roads, except the Hannibal and St. Joseph, were hopelessly in arrears on the interest on the bonds lent to them. Their rolling stock was worn out, and rights of way were seriously damaged. The state finally foreclosed on most of the roads and sold them, recovering a little over $6,000,000 of an overall investment of more than $31,000,000. An important condition of the sale was the completion of the roads by the new owners. This was accomplished by 1872. Unverifiable stories of graft and favoritism, and numerous unsuccessful or fraudulent local railroad promotions added to the popular dissatisfaction with the Radical rule. The reorganized Democratic Party was hopelessly handicapped by the test oaths. However, a large minority of the Republicans had accepted the test oaths with reluctance. They regarded them as a temporary measure and demanded their repeal after the 15th Amendment in 1869 had given the Negro the vote. They demanded "universal suffrage and universal amnesty." Under the leadership of Carl Schurz these Liberal Republicans nominated a separate ticket in 1870, and with the aid of the Democrats elected B. Gratz Brown as governor. In the same election the voters repealed the test oaths and the Radical regime was over. The new constitution of 1875, therefore, was a reaction to the Radical Reconstruction rule. The attempt to make this coalition of Liberal Republicans and Democrats nationwide was defeated in the presidential campaign of 1872, and the local Liberals drifted back to the regular parties.

Later 19th Century Developments.—The last three decades of the century were a period of recovery and readjustment. Economically the state had suffered severely as a result of the war. Railroads were destroyed and bankrupt, the emancipated slaves had been worth at least $40,000,000, and, more important, Missouri had lost its chance of continuing as the single gateway to the Far West. By 1870 Chicago had surpassed St. Louis in population and influence and was emerging as the railroad, distribution, and meatpacking center of the upper Mississippi Valley, as well as the connecting link with the Far West. Nevertheless, the rapid spread of railroads across the state and into the Great Plains gave St. Louis and the emerging metropolis of Kansas City a new but restricted trading area, and both cities grew rapidly.

The farmer was passing through a period of falling prices and difficult transition from subsistence farming to a money economy. Dissatisfaction with railroads, low prices, and a restricted currency drove him into Grange politics in the 1870's and the Farmers' Alliance in the 1880's, but the state Democratic Party supported free silver, so that the Greenback and Populist parties never gained ascendancy. Conservatism in politics was manifest by a program of low taxes, economy, and a refusal to expand governmental activities and services. The Democratic Party was dominant after 1872, although its plurality was often small.

20th Century Politics.—The younger generation's growing impatience with conservatism was shown in the popularity of William Jennings Bryan, who carried the state in 1896 and 1900. In 1904, Theodore Roosevelt swept the state into the Republican column for the first time since Reconstruction days. As a result of the leadership of two reform governors, Joseph W. Folk and Herbert S. Hadley, Missouri adopted many progressive measures, such as the direct primary, stricter control of railroads, a pure food law, and the initiative and the referendum. After 1904, Missouri became a politically doubtful state, usually voting with the party that carried the nation. Missouri had its most spectacular intraparty struggle in 1939 when Governor Lloyd C. Stark broke with the Democratic organization of Thomas J. Pendergast in Kansas City and, with the assistance of United States District Attorney Maurice M. Milligan, convicted Boss Pendergast of income tax evasion.

This conflict within the Democratic Party, combined with the disgrace shed upon the Democrats by the uncovering of frauds in the election of 1936, broke the preponderance of Democratic strength and paved the way for Republicans to win the governorship in 1940 despite the victory

of Democrats nationally. With the election of Missouri's Senator Harry S. Truman as vice president of the United States and his subsequent elevation to the presidency following the death of Frankin D. Roosevelt in 1945, Missouri Democrats slowly began to rebuild their strength. From 1948 on, they again were the dominant party in state politics.

20th Century Social and Economic Changes.—More important than party politics were the rapid social and economic changes that took place. After 1920, Missouri had moved into an era of expanded state services. The state highway system was planned and started in the 1920's. After that time, with the added help of federal funds, the highway system was constantly improved. The extension of the state road system into all parts of the state opened the isolated sections and greatly changed the whole pattern of rural and urban life.

The growth of high schools in number and enrollment accelerated after 1920. The state budget for education constantly rose following World War II. In 1950 the voters approved a constitutional amendment that would make it easier for school districts to raise levies for school support. Missouri faithfully complied with the United States Supreme Court ruling of 1954 outlawing segregation in public schools so that by 1956 the process of integration was almost completed.

During the depression of the 1930's legislation was passed for the relief of the handicapped, the blind, and the unemployed. In 1937, a state Social Security Commission, administering old-age benefits, and a state Unemployment Commission were organized. Despite these innovations, it soon became evident, in the face of demands for more social and economic legislation, that the constitution of 1875 was too restrictive and that a new constitution would have to replace the old. In order to keep pace with the growingly popular philosophy of increased governmental involvement in economic and social affairs, a new constitution was adopted in 1945.

The continued economic growth of the Kansas City and St. Louis metropolitan areas, as well as of other parts of the state, was due not only to governmental reorganization and legislation but also to World War II and the Korean War, both of which greatly stimulated economic activity and expansion. By the mid-1950's, trends and ideals in step with 20th century concepts were strong in Missouri. Manufacturing had become the dominant type of economic activity, and Missouri's farmers were using modern farming methods and had developed large cooperative marketing and buying organizations. Despite the ruinous floods in 1950–51, which were followed by several years of intense drought, Missouri's farmers continued to produce bumper crops. But the Missourian, especially the rural Missourian, continued to retain quite a bit of his conservatism. He also retained his older loyalty to a new idea when once thoroughly accepted. There is still much truth in the popular slogan "I'm from Missouri and you'll have to show me," but it might well be added, "but you don't have to show me but once."

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MISSOURI, University of, a higher educational institution established by an act of the General Assembly of the State of Missouri, approved Feb. 11, 1839, two days after the approval of the act establishing the public school system of the state. In June of the same year the university was located at Columbia, Boone County, which is near the state's geographic center. The cornerstone of the main building was laid July 4, 1840, and in the following spring, April 1841, instruction in academic courses was begun. The first class, consisting of two members, was graduated in 1843. Women were admitted to the teacher-training department of the university in 1869. Since that time all other departments have been opened to them, and gradually the proportion of women students to men has grown.

The government of the University of Missouri is vested in a board of curators, consisting of nine members appointed by the governor of the state, the terms of three members expiring every two years.

The university has extended its educational scope to include in the curriculums of its various schools and colleges theoretical instruction and practical training in all the leading activities of its constituents. Starting in 1841 with only an academic department, it is now composed of the following colleges and schools: College of Arts and Science, College of Agriculture, College of Education, School of Law, School of Medicine, College of Engineering, School of Mines and Metallurgy, School of Journalism, School of Business and Public Administration, Graduate School, and the Adult Education and Extension Service.

The School of Mines and Metallurgy is at Rolla, Phelps County, Missouri; the other divisions are at Columbia. In addition to the work of the above schools and colleges, emphasis is given in particular lines of study by the establishment of minor divisions, chief of which are the Agricultural Experiment Station, the Engineering Experiment Station, the Missouri State Military School, the Mining Experiment Station at Rolla, and departments offering degrees in nursing, social work, forestry, veterinary science, and music. The university also holds a summer session. In all the divisions of the university the laboratory method is followed. A 20-acre tract of timber land near the university is used for experimental work in forestry and a demonstration forest. About five miles south an 80-acre tract is used for experimental work in horticulture. On a 90-acre tract two miles north of the university is a new plant for the manufacture of

hog cholera serum. The university also has a forest of 50,000 acres in the Ozark Mountains of southern Missouri, and a forestry and pasture experiment area of over 7,000 acres in St. Charles County. The libraries of the university are the general library; law library; medical library; engineering library; agricultural library; collections in the chemical, geological and zoological buildings; and the library of the School of Mines at Rolla. Statewide programs in fire and police training and training for rural newspaper correspondents are also conducted along with many other programs. The Agricultural Extension Service has one or more county agents and home agents in each of the 114 counties of the state.

Scholarship at the university is promoted by the offering of a large number of fellowships, scholarships, and prizes.

The university is now supported and maintained by appropriations from the state treasury, by federal appropriations, income from its endowment funds and by the fees and deposits received from students. Tuition is free to residents of Missouri; students from other states pay a tuition fee.

MISSOURI COMPROMISE. When the State of Louisiana, comprising the southern part of the Louisiana Purchase, or Lower Louisiana, was admitted to the Union in 1812, Upper Louisiana, of which St. Louis was the capital, was organized as the Territory of Missouri. Popular and legislative petitions were presented to Congress by the inhabitants in 1818 and 1819 requesting statehood with boundaries approximately those of the present state. However, slavery had existed in the territory since French colonial days, and in 1819 the United States comprised an equal number of slave and free states. The admission of Missouri as a slave state would, therefore, have given the Southern agrarian slaveholding states majority control of the Senate, a prospect most distasteful to the free states of the North with their rapidly developing industrial economy. But perhaps more important than the economic issue was the moral question—whether the government should foster and extend slavery or discourage and eventually destroy it. Representative James Tallmadge of New York proposed to add to a House of Representatives bill, which authorized Missouri to frame a state constitution, an amendment prohibiting the further introduction of slaves into Missouri and providing that all children born to slaves should be free at the age of 25. Passed by the House (Feb. 16–17, 1819), the amendment was rejected by the Senate, after which Congress adjourned. Before Congress reconvened in December 1819, Maine had formed a constitution and asked admission as a free state. The House passed an act admitting Maine and the Senate joined to it an act admitting Missouri without mention of slavery. However, Senator J. B. Thomas of Illinois offered an amendment to the Senate bill which would admit Missouri as a slave state with the proviso that, in what remained of the Louisiana Purchase (an area far greater than the states of Louisiana and Missouri combined), slavery should be prohibited north of 36°30′ north latitude. The debate that followed electrified the nation. On March 1, 1820, the House passed a bill admitting Missouri as a free state; the Senate struck out the anti-slavery provision and added the Thomas amendment. The compromise consisted of an admission of Maine as a free state (March 3, 1820, effective March 15), and authorization of Missouri to form a constitution with no restrictions on slavery, March 6, 1820. But Missouri's statehood was delayed to Aug. 10, 1821, until she had agreed by a further congressional compromise of March 2, 1821 that nothing in her constitution should be interpreted to abridge the privileges and immunities of United States citizens. The compromise was repealed in 1854 by the Kansas-Nebraska Bill (q.v.).

MISSOURI RIVER, though called the most important branch of the Mississippi, might better be regarded, because of its greater length and drainage area, as the main stem. For it was an accident of history, rather than geographical accuracy, which imposed the name of the far smaller Mississippi rising among the wooded lakes of Minnesota, upon that vast system of which it is at best a minor part.

The Missouri, named for a Sioux tribe which lived upon its banks, is formed by the junction of three considerable streams, the Jefferson, Madison, and Gallatin, which have their source among the Rockies at an elevation of 8,000 feet and come together at Three Forks in southwestern Montana. From that town, 4,045 feet above the sea, the Missouri flows on its irregular course for 2,714 miles to meet the much shorter Mississippi, 1,215 miles long, some 17 miles above St. Louis, meanwhile draining 530,000 square miles or more than 42 per cent of the entire Mississippi Valley. The Missouri is the longest river of the United States.

For 500 miles or more the Missouri traverses a mountainous region of impressive beauty. Veering to the northeast past Montana's capital at St. Helena, it has eroded a deep gorge called the "Gate of the Mountains." At Great Falls it descends for some 10 miles over a series of foaming cascades and sheer waterfalls, the loftiest 87 feet high, which once marked the head of navigation in the age of the river steamboat. Near the Bear Paw Mountains the river turns east, its current swelled by the waters of the Judith, Musselshell, and Milk rivers, the latter's branches penetrating the Canadian provinces of Alberta and Saskatchewan. Near the North Dakota border the Missouri also receives the silt-laden Yellowstone. From that point its course is generally southeast then south, meanwhile accumulating the waters of the Little Missouri, Heart, and Cannonball rivers. A number of towns, including Bismarck, the capital city, have been erected upon its banks. In its southeasterly course through South Dakota the Missouri also receives a number of minor streams, the Grand, Moreau, Cheyenne, Teton, White, and James. Leaving South Dakota it provides the boundary between Nebraska and Iowa. In this sector it is joined by the Niobrara, the Big Sioux, and the much longer and more important Platte. Sioux City and Council Bluffs in Iowa and Yankton and Omaha in Nebraska have grown up along its shores.

For some distance the river marks the boundaries between Missouri and the states of Nebraska and Kansas. In the latter state Atchison, Leavenworth, and Kansas City overlook its current. From Kansas City, Mo., the metropolis of its valley, the river turns eastward receiving as its last considerable tributaries the Kansas River, Osage, Gasconade, and Grand rivers, meanwhile flowing past St. Joseph and the state capital, Jefferson City.

From the western border of North Dakota to its junction with the Mississippi, the Missouri crosses the Great Plains where it has eroded a valley which lies generally from 100 to 300 feet below the surrounding country. In some places sheer bluffs face the current, in others the intervening valley is 15 miles wide. As the sandy soil is deep, soft, and easily washed away, the restless river continually gnaws at its banks, altering state boundaries and in time of flood engulfing whole farms and even villages. The melted snows and spring rains of March and April swell the current, while the belated thaw in the remoter mountains may cause a second flood stage in June. In midsummer the high waters subside, sand bars may emerge and the current dwindle to a comparative trickle. Hence, the volume varies enormously. In flood the river may discharge 800,000 cubic feet a second, in a prolonged drought that total may shrink to 13,000 cubic feet or less than two per cent of its maximum.

The destruction caused by the Missouri is proverbial. In the spring of 1952 flood waters in various localities reached record heights. Unnumbered homes and farms were abandoned and large areas in such important cities as Omaha and Kansas City inundated. So great was the damage that President Truman, who visited the region, pronounced it a national calamity and the resources of the Red Cross were strained to provide for thousands of homeless refugees.

How to curb the Missouri has presented a major problem for the past century. Riparian owners have tried to protect the caving banks with willow mats more recently supplemented with articulated mattresses of concrete, while more settled communities have erected levees. But such measures in time of flood are wholly inadequate.

More ambitious is an enlarged version of the Tennessee Valley Authority which would chain the unruly Missouri by a series of dams and divert its surplus waters into productive irrigation projects. In this plan, which is taking form from the blueprint stage, no fewer than 105 dams have been suggested to cost more than a billion dollars, and some progress has already been made. The Fort Peck Dam on the Upper Missouri, the largest earth-filled dam in the world, is two miles long, half a mile wide at the base and 242 feet high.

Even more destructive, though less spectacular than periodic floods, is the vast wastage of the soil which has given the Missouri its nickname, "Big Muddy." Residents along its banks call the water "too thick to drink, too thin to plough." On an average day 275,000 tons of top soil go swirling past the city of Omaha, while the annual loss is 240 million tons. The "Big Muddy" retains its yellow burden for nearly 100 miles after it joins the clearer waters of the upper Mississippi River.

To this prodigious leaching of productive farm lands must be added the waste of waters, a tragic loss, for throughout much of its course the Missouri traverses semi-arid regions where annual precipitation falls to 20 inches or less.

Navigation on a river which alternates between a raging torrent and a series of sand bars has always been hazardous. Indians plied its waters in dugout canoes or clumsy coracles of buffalo skin stretched over willow frames. White settlers used rafts or flat-bottomed Mackinaw boats or keelboats 60 feet long but of shallow draught, while even the steamboat, which for a time revolutionized commerce, drew but three or four feet. The *Independence,* the pioneer among these picturesque craft, ventured some way up the Missouri in 1819, while the American Fur Company maintained some service in 1830. Pilot houses were armored to deflect the bullets of roving bands of Pawnees, Black Feet, Mandans, Sioux, and other tribes who resented the intrusion of the white man. After the Civil War the romantic age of the river steamboat passed with the building of transcontinental railways.

The Missouri has had an eventful history. In 1673 Jacques Marquette and Louis Jolliet passed its mouth in an Indian canoe. Those French enthusiasts, the Vérendryes, may have sighted the upper river on their westward wanderings from Winnipeg and the Lake of the Woods. Somewhat later, in 1797, David Thompson, scouting for the Northwestern Fur Company, descended a stretch of the river. Meriwether Lewis and William Clark explored much longer reaches on their journey to the Pacific in the years 1804–1806. For many years the great river remained a highway to the northwest for fur traders, gold seekers, and other adventurers, and with the establishment of missions and military posts became for a time a fortified frontier.

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Ferdinand C. Lane,
Author of "Earth's Grandest Rivers."

MISSOURI VALLEY, Iowa, city in Harrison County; altitude 1,006 feet; on the Willow River; 21 miles north of Council Bluffs, and about 120 miles west of Des Moines, the capital of the state; on the Chicago and North Western Railroad. It is in a fruit-growing and stock-raising district; is a trading and shipping point for farm produce; and has a large trade in hogs. It has manufactures of flour and dairy products. Settled between 1854 and 1856, it was known as McIntosh Point and later as St. Johns. It has a Carnegie library. Pop. (1950) 3,546.

MISSOURI VALLEY COLLEGE, in Marshall, Mo., a coeducational institution founded under the auspices of the Cumberland Presbyterians in 1888. The courses lead to the ordinary college degrees. For meritorious students there are available about 30 endowed scholarships which pay $100 to $200 yearly. The Murrell Memorial Library has some 30,000 volumes.

MISTASSINI, mĭs-tà-sē′nē, Canada, (1) a lake in the province of Quebec, located about 300 miles north of the City of Quebec. It is 100 miles long, 12 miles wide, and has an area of 975 square miles. It drains by the headstream of Rupert River into James Bay. (2) A river in Quebec, 185 miles long, which flows into Lake St. John.

MISTLETOE, a popular name for several related shrubs parasitic upon various deciduous trees, such as apple, thorn, maple, poplar, locust, linden, but rarely oak. The European or common mistletoe (*Viscum album*) of the natural order Loranthaceae, is the one referred to in

poetry and prose but a relative named *Phoradendron flavescens* is the species most commonly found at Christmas time in the markets of America. The former, which is common almost throughout Europe, is an evergreen, bifurcately branched shrub, with opposite, almost sessile, oblong, leathery leaves; inconspicuous flowers in small terminal heads or in the angles of the branches, the pistillate and staminate flowers upon separate plants; and whitish, translucent, glutinous berries about a quarter of an inch in diameter. The stickiness serves to attach the berries to the host plant until germination is complete, the sprout, it is said, always turning toward the point of attachment. The American or false mistletoe is similar in habit and appearance, and has fallen heir to some of the traditions and functions of its European cousin, especially the Christmas practice of kissing under a suspended sprig. Anciently the European species was held to be sacred by the Druids and the Germans, and by the Celts was credited with magical properties, references to all of which are frequent in literature. Its formerly reputed value in medicine has also passed away. Several other species are well known, especially the fragrant flowered *Loranthus odoratus,* and *L. europæus;* the latter being distinguished for its racemes of flowers and its frequent appearance upon oak trees. The common American species mentioned above ranges from New Jersey to Indiana and southward to Florida and Texas. Several related species are found on the Pacific coast.

MISTRAL, mēs-träl, **Frédéric,** French poet: b. Maillane, Bouches-du-Rhone, 8 Sept. 1830; d. there, 25 March 1914. He studied law for a time, but abandoned it and gave his attention to writing in Provençal, the dialect of southern France, which, under the influence of Jasmin, the "barber-poet," had entered on a renaissance as a literary medium. In 1854 he, with six others, founded the well-known Society of the Felibrige; and in 1859 he published his 'Mirèio,' a narrative poem in the recovered language, which was crowned by the Académie in 1861. A second work in verse, 'Calendau,' came out in 1867; a volume of poems, 'Lis Isclo d'Or' (The Isles of Gold), in 1875; 'Lou Trésor dou Félibrige,' a dictionary of modern Provençal, in 1878–86; and the historical poem 'Nerto,' in 1884. 'La Rèino Jano' (1890) is a tragedy, and 'Le Poème du Rhône' (1879), another narrative poem. There are English renderings of 'Mirèio' by Grant (1867), Crichton (1868) and Preston (1872). In 1904 he was awarded, jointly with José Echegaray, the Nobel prize in literature. Consult Downer, 'Frédéric Mistral' (1901).

MISTRAL, the local or provincial name of a strong northwest wind, which, blowing from the Alps, forms one of the scourges of Provence and the valley of the Rhône. It is caused by low atmospheric pressure in the Gulf of Lyons with high pressure in the north, and corresponds with the "bora" of southern Russia. It blows with great violence during the winter and spring months. Its approach is indicated by a sudden change in the temperature from warmth to cold; the air becomes purer and more invigorating, light fleecy clouds are seen in the sky and at night the stars shine with extraordinary brightness. The tempest it causes in the Mediterranean from Ebro to the Gulf of Genoa is very dangerous to small vessels.

MISTRETTA, mē-strĕt'ta, Sicily, town in the province of Messina, 34 miles northeast of Caltanissetta, 50 miles northwest of Catania and about 11 miles from the sea. It is in the most fertile region of Sicily and is 3,200 feet above sea-level. Lignite is mined in the vicinity. The chief industries are farming and cattle-raising. An annual fair is held here. The name was anciently Aniestratus. Pop. about 15,000.

MISTRIAL, a trial which is erroneous on account of some defect in the persons trying, as if the jury come from the wrong county, or because there was no issue formed, as if no plea be entered, or some other defect of jurisdiction. Where a jury is discharged without a verdict, the proceeding is properly known as a mistrial. Consent of parties cannot help such a trial, when past. It is error to go to trial without a plea or issue, in the absence of counsel and without his consent, although an affidavit of defense be filed in the case, containing the substance of a plea, and the court has ordered the case on the calendar for trial. On an indictment for perjury, an infant under the age of 21 years, and not otherwise qualified, not having, in fact, been summoned, personated his father as a juror. Here was a mistrial, because the verdict in the case was the verdict of but 11 jurors. A mistrial leaves the parties to an action *in statu quo ante,* and in criminal cases the indicted person may be retried as at a mistrial such a person is not considered to have been placed in jeopardy. See TRIAL.

MISU, Nicholas, Rumanian diplomat, represented his country (with M. Bratiano) at the Peace Conference in Paris. By origin a Macedonian Rumane, M. Misu adopted Rumanian citizenship and served for many years in Balkan capitals. In London he carried on the negotiations with the British government relating to Rumania's entry into the war. He was called home when the conclusion of peace with Germany became inevitable to negotiate terms with the conquerors. He possesses a remarkable knowledge of European and Balkan languages.

MITANNIANS, a race dwelling in Mesopotamia in the 2d millenium B.C. and that came to light by the discovery of some cuneiform tablets found in the rock tombs of Tell-el-Amarna in Upper Egypt (between Memphis and Thebes) in 1887–88. These clay tablets contained Egyptian correspondence with Babylonia, Assyria and other ancient nations. In these tablets, through the scholarship of learned Orientalists, it was discovered that there was a kingdom of Mitanni in northern Mesopotamia which had important relations with Egypt. Moreover, this country was identified as Aram-Naharayim (Aram of the Two Rivers), called in Syriac, Beth-Nahrin, i.e., "the land of the rivers"—Euphrates and Tigris — and meaning particularly the northern portion of Mesopotamia. Aram-Naharayim, in other words Mitanni, was the home of Balaam and probably his famous animal, for in Deut. xxiii, 4 Balaam is called a native of Aram-Naharayim and Numbers xxiii, 7 reads that

Balaam was brought «from Aram out of the mountains of the east.»

The Mitannian kings whose names have been discovered seem to have belonged to the Hittites or Harri, whose capital was at Boghaz Keui, North Cappadocia, explored in 1907. One of these kings, Dushratta whose letters were discovered in the Tell-el-Amarna tablets, was the father-in-law of Amenhotep III of Egypt (1411–1389 B.C.). He was also a contemporary of Subbiluliuma, the Hittite monarch, who seems to have obtained lasting dominion in Syria by subduing Dushratta. Three kings of the same dynasty, Saushshatar, Artatama I and Sutarna I, preceded Dushratta and Ortatama II Artashshumara, Mattuaza and Sultarna II followed him. Some authorities think that this dynasty took possession of the native Mitannians; other authorities find grounds for believing the Mitannians to have been the Hittites, who in 1932 B.C. put an end to the Amoritish dynasty in Babylon and established themselves in Mesopotamia thereafter. Hittite hieroglyphics and cuneiform script were both used among the Mitannians. The gods of this race were the same as in the Babylonian and Assyrian pantheons.

«The discovery of the Tell-el-Amarna tablets revealed to us,» writes Dr. A. H. Sayce, «the existence of a new language, once spoken in northern Mesopotamia in the kingdom of Mitanni, the Aram-Naharayim of the Old Testament. One of the letters addressed to Dushratta, king of Mitanni, to the Egyptian Pharaohs is in the native language of his country and its length is such that a comparison of it with those of his letters which are written in Assyrian makes a partial decipherment of it possible. Shortly after the publication of the cuneiform text by Winckler and Abel in 'Mittheilungen aus den orientalischen Sammlungen' (I No. 27) attempts at the decipherment of the language by Professor Brünnow, Professor Jensen and myself appeared simultaneously in the *Zeitschrift für Assyriologie* (Vol. II and III, 1890.) The cuneiform text has recently been subjected to a very careful re-examination by Dr. Knudtzon and the result of his labors is given in the *Beiträge zur semitischen Sprachwissenschaft* (IV, pp. 134–153). In one of the letters of Dushratta one of his envoys is called Tunip-ipri» (Tell-el-Amarna Tablets in the British Museum, 9, 47) «the king of Tunip. This raises a presumption that the power of Mitanni extended as far as Tunip, the modern Tennip, and that the Mitannian language was spoken there. The presumption is confirmed by a letter sent to the Pharaoh by the people of Tunip in which the native words added to the Assyrian translation, where the latter did not seem quite clear or literal enough, all belong to the language of Mitanni. In the Mitannian letter of Dushratta itself the meaning of a few words and forms is cleared up by the ideographs attached to them.

«It is clear that Mitannian is in its general structure a Caucasian language. It resembles Georgian in its habit of piling suffix upon suffix, pronoun upon pronoun, until the verbal forms become almost impossible to analyze. Like Georgian, also, it occupies a middle position between inflection and agglutination. In this respect it resembles the ancient languages of Asia Minor, so far as we know them, though it is to be noticed that it illustrates the fact that, as we pass eastward, agglutination is more prominent, while westward, as in the case of Lycian, inflection is more pronounced.» See HITTITES. Consult Tell-el-Amarna Tablets in the British Museum (1892); Davies, 'Rock Tombs of Ell-Amarna' (1903); Bezold, C., 'Oriental Diplomacy: the transliterated text of the Cuneiform Despatches discovered at Tell-el-Amarna' (1893); 'The Tell-el-Amarna Letters,' English translation by M. Winckler (Berlin 1896); Knudtzon, J. A., 'Die El-Amarna Tafeln' (Leipzig 1907–09); Petrie, W. M. F., 'Syria and Egypt from the Tell-el-Amarna Letters' (1898); Bork, Ferdnand, 'Die Mitannis sprache' (Berlin 1909); Winckler, 'Vorderasien im zweiten Jahrtausend' (Leipzig 1913), and Sayce, A. H., 'The Language of Mitanni' in Proceedings of The Society of Biblical Archæology (June 1900).

MITAU, mē'tou (Lettic Jelgava), Latvia, town and capital of the district of Kurzeme, on the right bank of the river Aa, 26 miles southwest of Riga, on the Riga-Orel Railroad. The town is supposed to have received its name from the German *Mitte in der Aue* and is said to have been founded in 1266 by Conrad Mandern, grand-master of the Order of the Brethren of the Sword. When the Lithuanians plundered it in 1345, it had become an important town. In 1561 the Duke of Courland made it his residence and the palace became the seat of government. This castle, which was situated on an island in the river, was destroyed by Duke Biren, who erected in its place (1738–72), a fine palace, later the official residence. Mitau was captured three times by the Swedes in the 17th century and in 1795, when Russia annexed Courland, Mitau was included. The Duke of Provence (afterward Louis XVIII) made Mitau his home in 1798–1801 and again in 1804–07. Napoleon I captured it in 1812. Mitau is only 12 feet above sea-level and at high water the town is sometimes inundated. A canal surrounds the town in the place of the old fortifications. The streets are broad and regular and many contain handsome residences of the former nobility. Mitau possesses a museum with a library, a gymnasium and a theatre and is the home of the Lettish Literary Society. The chief manufactures are chocolate, oilcloth, ink, flour, iron products and hats; and the town also possesses saw-mills, tanneries and ironworks. The trade is large in grain, cattle and wood. Germans once outnumbered the other races, which include Poles, Letts, Russians and Jews. Most of the inhabitants are Protestant and a general superintendent of the Lutheran Church has his seat there. Pop. 33,048.

MITCHAM, England, a suburb of London, on the river Wandle in Surrey, four miles northwest of Croydon on the London, Brighton and South Coast Railway. It is 10 miles south of London Bridge. The neighborhood abounds in market-gardens and plantations of roses, lavender, peppermint and other herbs for the manufacture of perfumes and essences. Mitcham Common, covering 480 acres, has one of the best golf courses near London. Pop. 30,000.

MITCHEL, mĭch'ĕl, **John,** Irish patriot: b. Dungiven, County Derry, 3 Nov. 1815; d. Drumalane, 20 March 1875. He was graduated from Trinity College, Dublin, in 1836, and practised several years as an attorney at Banbridge. Soon after the starting of the *Nation* in 1842, Mitchell began to contribute to that journal and after the death of Thomas Davis, in 1845, became assistant editor. In 1848 he began the publication of the *United Irishman,* for his articles in which he was sentenced to 14 years' transportation for felony. He was sent to Bermuda, and next to Tasmania, whence he made his escape to the United States in the summer of 1853. Here he published a series of short-lived newspapers, the *Citizen* (at New York), the *Southern Citizen* (Knoxville, Tenn.), the *Inquirer* (Richmond, Va.) and the *Irish Citizen* (New York). An advocate of slavery, he favored the Confederates in the Civil War, on which side his three sons fought, and he was at one time under arrest by the Federal authorities. In 1874 he returned to Ireland. He was elected to Parliament from Tipperary, was declared ineligible, but was re-elected. Among his writings are 'Life of Hugh O'Neille' (1845); 'Jail Journal; or Five Years in British Prisons' (1854), and a 'History of Ireland from the Treaty of Limerick' (1868). Consult Dillon, W., 'John Mitchel' (London 1888).

MITCHEL, John Purroy, American public official: b. Fordham, N. Y., 19 July 1879; d. near Lake Charles, La., 6 July 1918. His grandfather was the Irish patriot, John Mitchel, who with his three sons fought in the Confederate army during the Civil War. John Purroy was educated at Fordham College (now Fordham University) and in 1899 was graduated at Columbia University. Two years later he was graduated at the New York Law School and was admitted to the bar the same year. One of his early cases involved a mining claim in South America. His work there in an unhealthy tropical region resulted in a fever and peculiar headaches, one of which is thought to have been responsible for the accident which resulted in his death several years later. His entrance into public life was his appointment by Mayor George B. McClellan as special counsel to the city of New York in December 1906. In April of the following year he was made commissioner of accounts and in this capacity he investigated the office of the borough president of Manhattan, John F. Ahearn. The latter was removed and many grafters were made to feel the heavy arm of the law. All advocates of good government in New York were pleased with the ability and integrity of Mitchel and in 1909 he was elected president of the board of aldermen on a fusion ticket, William J. Gaynor being elected mayor at the same time. In August-September 1910 Mitchel was acting mayor while Mayor Gaynor was recovering from a wound inflicted by a maniac. On 7 June 1913 President Wilson appointed Mr. Mitchel collector of the port of New York and in the autumn of the same year he became the fusion candidate for the mayoralty in opposition to C. S. Whitman, then district attorney of New York County. Mitchel won the nomination and after a bitter campaign defeated Judge Edward E. McCall, the regular Democratic nominee, at the November election of 1913. Mitchel's administration passed its first year in comparative peace, municipal markets were established, but on a wholly inadequate scale. Storms came in 1915, 1916 and 1917. On the whole the city administration did much to relieve the increasing number of the unemployed. Sections of the city press began to attack the administration for its failure to curtail expenditures, for its attempt to place the city public schools on an undemocratic basis, and above all for its supineness in dealing with certain railroad corporations who were seeking valuable franchise privileges. Other disclosures in regard to the Rockaway land deals and the Brooklyn terminal project further alienated popular support. Mitchel also angered a great and powerful section of his fellow-citizens through the alleged biased and unfair investigation of Catholic charitable institutions sponsored by him, and in which city officials resorted to the illegal method of wiretapping in an unsuccessful effort to involve certain Catholic clergymen and prominent laymen. As a result, at the close of his administration Mitchel found himself strongly supported by all corporation and big moneyed interests in the city, and heartily despised among the masses of the city's toilers. In 1917 he was again a candidate for mayor. By lavish expenditures of money at the primaries his friends endeavored to secure him the nomination but he was defeated by Bennett. Over 21 persons were indicted for fraud in connection with Mitchel's primary campaign. After defeat at the primaries he stood for re-election as an independent candidate, but at the November election he received 149,260 votes, while the Socialist Hillquit received 141,739, and Hylan, the regular Democratic candidate, received a grand total of 298,149 votes, the greatest plurality in New York's history and an emphatic repudiation of Mitchel's administration. On 11 Jan. 1918 Mr. Mitchel was commissioned major in the Aviation Corps of the United States army. He received his cadet training at San Diego, Cal., and soon became noted for his daring in the air. He was transferred to Gerstner Field, near Lake Charles, La., to receive the finishing stages of training necessary for service at the war front. On the morning of 6 July Mr. Mitchel fell from a single-seater scout plane at a height of about 500 feet and was killed. A few days later a public funeral was held from Saint Patrick's Cathedral.

MITCHEL, Ormsby McKnight, American astronomer: b. Morgansfield, Ky., 10 July 1810; d. Hilton Head, S. C., 30 Oct. 1862. He was graduated from West Point in 1829, and was made assistant professor of mathematics there, which post he held for two years. From 1832 to 1834 he was counsellor-at-law in Cincinnati, Ohio; from 1834 to 1844 professor of mathematics, philosophy and astronomy at Cincinnati College; and 1836–37 chief engineer of the Little Miami Railroad. He lectured in various parts of the United States on astronomy in 1842–48, raised funds for the building of an observatory at Cincinnati, the cornerstone of which was laid 9 Nov. 1843, and was its director in 1845–59. In 1859 he became director of the Dudley Observatory at Albany, N. Y. He was known as a popular lecturer on astronomy, and

scarcely less distinguished for his mechanical skill. He perfected a variety of apparatus of great use to astronomy. One of the most important of his constructions was an apparatus for recording right ascensions and declinations to within $\frac{1}{1000}$ of a second. He also invented an instrument for the measurement with great accuracy of large differences of declination, such as the ordinary method by micrometer was unable to reach. In 1861 he entered the Federal army as brigadier-general of Ohio volunteers, and on 11 April 1862 was promoted major-general. From 17 September he commanded the Department of the South and the Tenth corps, operating in South Carolina. He was known in the army as "Old Stars." He was a Fellow of the American Academy of Arts and Sciences and an associate of the Royal Astronomical Society of London. He published and edited *The Sidereal Messenger* (1848–58), and wrote 'The Planetary and Stellar Worlds' (1848); 'The Orbs of Heaven' (1851); 'Popular Astronomy'; 'A Concise Elementary Treatise of the Sun, Planets, Satellites and Comets' (1860), both republished (London 1892), and 'The Astronomy of the Bible' (1863). Consult Mitchel, F. A., 'Life of Ormsby McKnight Mitchel' (Boston 1887).

MITCHELL, mĭch'ĕl, **Anthony,** Scottish bishop: b. Aberdeen, Scotland, 24 Oct. 1868; d. there, 17 Jan. 1917. He was educated at Aberdeen University, where he won prizes for his ability in classic studies, and at Edinburgh University and the Episcopal Theological College, and was ordained in 1892. After serving as rector of Saint Mark's Church, Portobello, he became principal and Pantonian professor of theology at the Theological College of the Episcopal Church in Scotland in 1905. He was appointed canon of Saint Mary's Cathedral in 1905, and chancellor in 1912. He was well known in the United States, having come here in 1914 to deliver lectures on theology and on the history of Scotland. His published works are 'Tatters from a Student's Gown' (1890); 'History of the Episcopal Church in Scotland' (1907); 'Story of the Church in Scotland' (1908); 'Biographical Studies in Scottish Church History' (1914).

MITCHELL, Charles, English pugilist: b. Birmingham, 1861; d. Hove, near Brighton, April 1918. He first took to fencing, of which science he became a teacher before he was 20. Adding boxing to his repertory, he had passed through several successful bouts with amateurs until he distinguished himself in 1882 by winning a competition open to all English heavyweights. Although he was little more than a lightweight himself, he had already won a similar competition for middleweights. He was then brought to America to meet John L. Sullivan, who then weighed 204 pounds against Mitchell's 150 pounds. In the second round at Madison Square Garden the Englishman knocked his opponent off his feet, and at the close of the third round the fight was stopped by the police. Mitchell's two-handed blows were so accurate and severe that for a long time Sullivan declined his challenge to a contest under Prize Ring rules in a 24-foot arena. On 10 March 1888, however, they met at Chantilly in France, and after a struggle of 39 rounds, lasting 3 hours, 10 minutes, 55 seconds, the fight was declared a draw. Fought in the open air, in a pouring rain, that battle formed one of the strangest chapters in the annals of old-style pugilism. The rounds varied in duration from 7 minutes, 7 seconds to 10 seconds, Mitchell often going down at the slightest tap to economize his strength. In the earlier stages, Sullivan, with 42 pounds advantage in weight, had much the best of the fighting, but he could never really corner his elusive opponent, who seemed little the worse for the punishment he had received when the draw was mutually agreed to. Mitchell practically retired from the ring after the fight, but returned in 1894, past his prime and out of form, only to be knocked out in the third round by J. J. Corbett after an exciting contest. Mitchell had never been knocked out before. He was married to a daughter of George Washington Moore, popularly known as "Pony" Moore, formerly a circus rider and one of the founders of the Moore and Burgess Minstrels. In temperament Mitchell, though a most brilliant and courageous boxer, was extremely sensitive and quick to take offense.

MITCHELL, Clifford, American physician: b. Nantucket, Mass., 28 Jan. 1854. He was graduated at Harvard in 1875; studied medicine in the Chicago Medical College and the Chicago Homœopathic Medical College; began to practise in Chicago in 1878; and devoted himself to diseases of the kidneys. He was for many years professor of chemistry, toxicology, and renal diseases at the Chicago Homœopathic Medical College, and after 1905 of clinical urinology and renal diseases at Hahnemann Medical College, Chicago. He is associate editor of the *Clinique* and of the Phi Alpha Gamma *Quarterly*. Has established a diagnostic laboratory in the Marshall Field Annex, and invented a stain for urine sediments and a rapid test for albumin in urine. He is author of 'Student's Manual of Urinary Analysis' (1879); 'Physician's Chemistry' (1884); 'Dentist's Manual of Special Chemistry' (1887); 'Renal Therapeutics' (1898); 'Diseases of the Urinary Organs' (1903); 'Modern Urinology' (1912).

MITCHELL, Donald Grant, American author ("Ik Marvel"): b. Norwich, Conn., 12 April 1822; d. Edgewood, Conn., 15 Dec. 1908. He was graduated at Yale in 1841; studied law in New York; was United States consul to Venice in 1853; and in 1855 settled on his farm, "Edgewood," near New Haven. He wrote much, on various themes, and always with a genial charm and ease of style. His best-known works are the idyllic sketches called 'Reveries of a Bachelor' (1850), and 'Dream Life' (1851). He also wrote 'French Gleanings' (1847), descriptive of his first European trip, as 'The Battle Summer' (1850) was of his stay in Paris in 1848; 'The Lorgnette' (1850), a satiric novel of New York life in the forties; 'Fudge Doings' (1855), another New York society novel; 'The Seven Stories with Basement and Attic,' a series of tales of travel (1864); 'Dr. John' (1866), a religious story contrasting life in Connecticut and in the French Midi; and the more characteristic papers on men, books and outdoors, such as 'My Farm at Edgewood' (1863); 'Wet Days at Edgewood' (1865); 'Rural Studies' (1867);

'English Lands, Letters and Kings' (1889), and 'American Lands and Letters' (1897).

MITCHELL, Edward Page, American journalist: b. Bath, Me., 24 March 1852; d. New London, Conn., 22 Jan. 1927. He was graduated at Bowdoin College in 1871 and joined the staff of the Boston *Advertiser*. After 1875 he was engaged on the editorial staff of the New York *Sun*, of which he became editor in 1911. In 1913 he was special lecturer at the Columbia School of Journalism. In 1909-11 he was president and after that date vice-president of the Sun Printing and Publishing Company. Mr. Mitchell's writings on the editorial page of the *Sun* attracted wide attention for their brilliancy. He also contributed to magazines. He was an overseer of Bowdoin College and a member of numerous clubs. He wrote 'Memoirs of an Editor' (1924).

MITCHELL, Elisha, American scientist: b. Washington, Conn., 19 Aug. 1793; d. on Mount Mitchell, N. C., 27 June 1857. He was graduated at Yale in 1813; four years later became professor of mathematics in the University of North Carolina; and in 1826 was made professor of chemistry, mineralogy and geology in the same institution. The Olmsted-Mitchell Geological Survey (1824–28) did important work under his supervision. He discovered that a peak in North Carolina is the highest in the Eastern States and during a storm he was killed by a fall from this height. It is now called in his honor Mount Mitchell or Mitchell's High Peak, and on its summit he is buried.

MITCHELL, Henry, American civil engineer: b. Nantucket, Mass., 16 Sept. 1830, d. Boston, Mass. 11 Dec. 1902. He was a son of William Mitchell (q.v.), was educated at the Normal School in Bridgewater, Mass., and in 1851 was appointed to government service as a civil engineer under the United States Coast Survey. He acted as assistant to the commissioners on harbor encroachments in New York in 1859 and discovered the underflow of the Hudson. He was later engaged in Boston harbor and assisted in the improvement of the mouth of the Mississippi in 1874. He made an investigation of the Panama Canal scheme under De Lesseps and held many government commissions to investigate the principal harbors along the Atlantic Coast, including Portland, Me., Providence, R. I., Norfolk and Portsmouth, Va., and Philadelphia, Pa. He was appointed professor of physical hydrology at the Massachusetts Institute of Technology in 1869. In 1874 he was the representative of the United States Coast Survey on the board of engineers for the improvement of the mouth of the Mississippi, and later a member of the James B. Eads advisory board and of the Mississippi River Commission. In 1879 he visited the Suez Canal and inspected it under the authority of Ferdinand De Lesseps. He published many reports of surveys, etc.

MITCHELL, Hinckley Gilbert, American biblical scholar: b. Lee, Oneida County, N. Y., 22 Feb. 1846; d. 19 May 1920. He was graduated at Wesleyan University in 1873 and in the theological department of Boston University 1876, and Leipzig University 1879. From 1879 to 1880 he was pastor of the Methodist Episcopal Church at Fayette, N. Y. In 1880–83 he was instructor in Hebrew and Latin in Wesleyan University, and in 1883–1905 professor of Hebrew and biblical exegesis in Boston University; 1905–06 instructor in the Semitic languages in the same institution. Since 1910 he has been professor of Hebrew and Old Testament exegesis in Tufts College. In 1901–02 he served as director of the American School of Biblical Research in Jerusalem; in 1914 for the summer quarter he was supplying professor in the University of Chicago and lecturer at two sessions of the Summer School of Theology, Harvard University. His most important publications are 'Hebrew Lessons' (1884); 'Amos' (1893); 'The Theology of the Old Testament,' a translation from Piepenbring (1893); 'Isaiah, chapters i–xii' (1900); 'The World before Abraham' (1901); 'Tales Told in Palestine,' in collaboration with J. E. Hanauer (1904); 'Genesis' (1909); 'Haggai and Zechariah' (in the International Commentary 1912); 'The Ethics of the Old Testament' (1912), and numerous articles in *The Journal of Biblical Literature* and various theological publications.

MITCHELL, John, American labor leader: b. Braidwood, Will County, Ill., 4 Feb. 1870; d. New York, 9 Sept. 1919. He entered the mines at Braidwood at the age of 13, and in 1885 joined the Knights of Labor. The next few years he spent in the West and Southwest, and in 1890 settled at Spring Valley, continuing his work at his trade. He read and studied constantly and was a member of several debating societies and reform clubs; he was also active in the labor movement and was president of the Knights of Labor local at Spring Valley. On the formation of the United Mine Workers in 1890 he became a member of that organization, was frequently delegate to district conventions and in 1895 was elected secretary-treasurer of the northern Illinois subdistrict; in 1896 he was chairman of the Illinois mine workers' legislative committee, and in 1897 was made a national organizer of the United Mine Workers. In January 1898 he was elected vice-president of that organization and in September of the same year became acting president; he was elected president in 1899, but retired in March 1908; he was also a vice-president of the American Federation of Labor from 1898 to 1914. During his term of office as president of the United Mine Workers the union was enlarged, wages were increased and the eight-hour day extended; he conducted the strikes of the anthracite miners in 1900 and 1902, and brought the latter to a close by his offer in behalf of the miners to accept the decisions of a commission appointed by the President of the United States. After serving for nearly three years as active head of the Trade Agreement Department of the National Civic Federation, he spent two years on the lecture platform, speaking in all parts of the country. He served on the New York State Commission on Employers' Liability and Workmen's Compensation, which drafted the first compensation law enacted by the State of New York. In March 1914 he was appointed to membership on the Workmen's Compensation Commission of New York State, then created, and when in May 1915 this commission was merged with the State Department of Labor, under the administration of the Industrial Commission, he was made chairman of the Industrial Commission of the State of New York.

MITCHELL, John Ames, American editor, artist, and author: b. New York City, Jan. 17, 1845; d. Ridgefield, Conn., June 29, 1918. He was educated at Harvard, aiming toward an architectural career, and for a time studied at Paris. He was an architect in Boston from 1870 to 1876, after which he became interested in decorative art. He went to New York and engaged in journalism as artist, illustrator, and writer, and in 1883 founded and edited *Life,* an outstanding political-cartoon magazine. He was a member of the National Institute of Arts and Letters, and his published work includes: *Croquis de l'Exposition* (1879); *A Romance of the Moon* (1896); *The Last American* (1889); *Amos Judd* (1895); *The Pines of Lory* (1901); *The Villa Claudia* (1904); *The Silent War* (1906); and *Pandora's Box* (1911).

MITCHELL, John Hipple, American lawyer and senator: b. Washington County, Pa., June 22, 1835; d. Portland, Ore., Dec. 8, 1905. He was educated at Witherspoon Institute and was admitted to the bar of Pennsylvania. In 1860 he moved to California where he established a law practice for a few months, but removed to Oregon and engaged in practice there. He was state senator from 1862 to 1866 and president of the senate in 1864. From 1867 to 1871 he was professor at Willamette University, Salem, Ore. He was elected United States senator from Oregon in 1872, and Democratic opposition tried to prevent him from taking his seat by charges of an ignominious past. He was accused of financial dishonesty, desertion of his family in Pennsylvania, and bigamy, none of which merited investigation, according to the Senate committee on privileges and elections. He was constantly accused of being a corrupt politician and failed reelection in 1871. From 1885 to 1897 he served two more terms in the United States Senate and was returned to the Senate in 1901.

MITCHELL, John Kearsley, American physician: b. Shepherdstown, Va., May 12, 1793; d. Philadelphia, Pa., April 4, 1858. He studied medicine under Dr. Nathaniel Chapman and was graduated from the medical college of the University of Pennsylvania in 1819. He made three voyages to China and the East Indies as ship surgeon and then settled in Philadelphia as a general practitioner. In 1824 he lectured on medicine and physiology at the Philadelphia Medical Institute and in 1826 became professor of chemistry there. He was given the chair of chemistry at Franklin Institute in 1833 where he delivered lectures for five years. From 1841 till his death he was professor of the theory and practice of medicine at Jefferson Medical College. He was visiting physician to the Pennsylvania and City hospitals. In addition to numerous papers published in medical and scientific journals, he wrote *Saint Helena, a poem by a Yankee* (1821) and *Indecision, a Tale of the Far West and Other Poems* (1839), both of which show his interest in poetry. A volume, *Five Essays on Various Chemical and Medical Subjects* (1858), was published after his death.

MITCHELL, Langdon Elwyn (pseudonym JOHN PHILIP VARLEY), American author and playwright: b. Philadelphia, Pa., Feb. 17, 1862; d. there, Oct. 21, 1925. He was educated at St. Paul's School, Concord, N.H., and in Europe. He studied law at Harvard and Columbia universities and in 1886 was admitted to the New York bar. Through his interest in literature and drama he became a member of the National Institute of Arts and Letters and of the Players Club, New York. His most successful plays were *Becky Sharp* (1899), a dramatization of *Vanity Fair* (q.v.), and *The New York Idea* (1907); his other publications included *Sylvian and Other Poems* (1884), and *Poems* (1894).

MITCHELL, Margaret, American novelist: b. Atlanta, Ga., c. 1900; d. there, Aug. 16, 1949. A graduate of Washington Seminary in Atlanta, she lived in her native city with the exception of a year at Smith College. After a career of writing for the Atlanta *Journal,* she married John R. Marsh in 1925.

Her first and only novel, *Gone With the Wind* (q.v.), was published in June 1936 and overnight became one of the literary phenomena of the 20th century. This colorful, 1,000-page story of the Civil War was 10 years in the writing. It sold at the rate of several thousand copies a day, and was translated into 16 languages. Scarlet O'Hara and Rhett Butler, the heroine and hero of the book, immediately became stock characters in American fiction. Miss Mitchell received the Pulitzer Prize for fiction in 1937.

MITCHELL, Margaret Julia ("Maggie Mitchell"), American actress: b. New York City, June 14, 1832; d. there, March 22, 1918. She was first successful as Julia in *The Soldier's Daughter,* and the title role of *Fanchon, the Cricket* in 1860 made her famous. She was married to her manager, Henry Paddock, in 1868, and continued her career on the stage, playing many famous roles in *The Pearl of Savoy, Jane Eyre,* and *Mignon.* She was divorced in 1888 and married Charles Abbott, her leading man, in 1889. Her last public appearance was in April 1892.

MITCHELL, Maria, American astronomer and educator: b. Nantucket, Mass., Aug. 1, 1818; d. Lynn, Mass., June 28, 1889. She was the daughter of William Mitchell (q.v.), noted astronomer, and was educated in the private schools of Nantucket. She was librarian of the Nantucket Athenæum for 20 years and managed to carry on her astronomical studies and observations in her spare time. She first became known as an astronomer by her discovery of a comet in October 1847, and for this discovery she received a medal from the king of Denmark. She later discovered several nebulae and was engaged in computations for the *Nautical Almanac.* In 1848 she was elected an honorary member of the American Academy of Arts and Sciences, the first woman to receive this honor, and in 1857 went to Europe to visit the principal observatories. In 1865 she was appointed the first professor of astronomy and director of the observatory at Vassar College. In order to devote herself unselfisnly to the job of teaching, she gave up her research and observation work. She was a member of the American Association for the Advancement of Science and was given the degree of LL.B. by Hanover College in 1852 and by Columbia University in 1887. She resigned from her position at Vassar in 1888 and was made professor emeritus. After her death, a $50,000-fund to endow the chair of astronomy at Vassar College was completed, and in her honor it was named the Maria Mitchell Endowment Fund. She was a very firm believer

in woman's suffrage, but not active in the suffragist movement; she was, however, a member and for several years president of the American Association for the Advancement of Women. In 1908 the Maria Mitchell Observatory was dedicated at Nantucket. The Maria Mitchell Astronomical Society was named in her honor. Consult Babbitt, M. K., 'Maria Mitchell as Her Students Knew Her' (Poughkeepsie 1912); Kendall, P. M., 'Life, Letters, and Journals of Maria Mitchell' (Boston 1896); Mitchell, Henry, in 'Proceedings of the American Academy of Arts and Sciences' (Vol. XXV, Boston 1889–90); Whitney, M. W., 'In Memoriam' (Poughkeepsie 1889).

MITCHELL, Peter, Canadian statesman: b. Newcastle, New Brunswick, 4 Jan. 1824; d. Montreal, 25 Oct. 1899. He studied law and was admitted to the bar in 1848. Shipbuilding and other business pursuits soon engrossed his attention and he abandoned law, but in 1856 he entered political life as Liberal member in the provincial assembly of New Brunswick, and in 1860 was appointed to the legislative council, and five years later was appointed a life member of the legislative council and was premier 1865 to 1867. Mitchell was one of the foremost in the organization of the Canadian confederation, and was a delegate to the Charlottetown and Quebec conferences, and to London in 1866. He was appointed to the Canadian Senate in 1867, and resigned in 1873. He was Minister of Marine and Fisheries, 1867–74, and was chiefly instrumental in settling the negotiations between the United States and Canada over the Bering Sea fisheries. He sat in the House of Commons, 1874–78 and 1882–96. He purchased in 1885, and for some years edited, the Montreal *Herald.* In 1897 he was appointed inspector of fisheries for the Atlantic provinces. He was the author of a review of President Grant's message to Congress relative to the Canadian fisheries (1870).

MITCHELL, Samuel Alfred, American astronomer: b. Kingston, Ontario, Canada, 29 April 1874. He was graduated at Queen's University, Kingston, in 1894 and took his Ph.D. at Johns Hopkins in 1898. From 1899 to 1913 he was tutor, instructor and adjunct professor of astronomy at Columbia University. In the latter year he became professor of astronomy at the University of Virginia, and director of the McCormick Observatory there. He was a member of eclipse expeditions to George (1900); to Sumatra (1901); to Spain (1905); to Oregon (1918); to California (1923); to Connecticut (1925); and to Norway (1927). He frequently served as research associate at Yerkes Observatory, Chicago. His published works include 'Parallaxes of 260 Stars' (1921); 'Eclipses of the Sun' (1923); 'Parallaxes of 440 Stars' (1926). He is a member of numerous scientific bodies.

MITCHELL, Samuel Augustus, American geographer: b. Bristol, Conn., 30 March 1792; d. Philadelphia, 20 Dec. 1868. His early life was devoted to teaching in which he was very successful, but the inadequate treatment of geography by the textbooks then in use induced him to turn his attention to the making of satisfactory ones and he spent 40 years in Philadelphia in the preparation of textbooks on that subject. So general was their adoption that they reached a total sale of 400,000 annually. Besides his geographical textbooks, of which there were 24, he edited a new edition of John James Audubon's 'Birds of America' and wrote 'General View of the World, Physical, Political, and Statistical' (1846), and 'New Traveller's Guide through the United States' (1850).

MITCHELL, Silas Weir, American physician, inventor of the "rest cure," poet and novelist: b. Philadelphia, 15 Feb. 1829; d. 4 Jan. 1914. He studied at the University of Pennsylvania, was graduated from Jefferson Medical College in 1850, entered practice in Philadelphia, during the Civil War was in charge of the Turner's Lane United States hospital (Philadelphia) for diseases and injuries of the nervous system, and subsequently was president of the Philadelphia College of Physicians. In his professional capacity he became known for his researches in connection with nervous diseases, and in physiology and toxicology. A bibliography of his publications would supply the titles of some 150 medical papers, recounting investigations of high scientific importance. To a wider degree, however, he is known through his literary work, composed principally of poetry and fiction. He was elected to the American Academy of Arts and Sciences and the National Academy of Sciences, and was also made associate corresponding or honorary member of foreign scientific societies. His works in medical science include 'Researches on the Venom of the Rattlesnake' (1860); 'Gunshot Wounds and other Injuries of Nerves'; 'Reflex Paralysis' (1864); 'On Injuries of the Nerves and their Consequences' (1872); and 'Fat and Blood, and How to Make Them' (1877). Among his other writings are, in verse, 'The Hill of Stones' (1882); 'The Masque' (1887); 'The Psalm of Death' (1890), and 'The Wager' (1900); in fiction, 'Roland Blake' (1884); 'Far in the Forest' (1888); 'A Madeira Party' (1895); Hugh Wynne' (1897); 'The Adventures of François' (1899); 'The Autobiography of a Quack' (1900); 'Circumstance' (1901); 'Collected Poems' (1896); 'Memoir of Owen Jones' (1896); 'Constance Trescot' (1905); 'Doctor and Patient.' Consult Oberholtzer, E. P., 'Personal Memories of Weir Mitchell' (in the *Bookman,* Vol. XXXIX, New York 1914); the *Book News Monthly* (Vol. XXVI, Philadelphia 1907); Tucker, B. R., 'S. Weir Mitchell' (Boston 1914); Williams, Talcott, 'Dr. S. Weir Mitchell' (in the *Century Magazine,* Vol. LVII, New York 1898). Consult also 'A Catalogue of the Scientific and Literary Work of S. Weir Mitchell' (Philadelphia 1894).

MITCHELL, Sir Thomas Livingstone, Scottish explorer: b. Craigend, Stirlingshire, Scotland, 16 June 1792; d. Darling Point, Sydney, Australia, 5 Oct. 1855. He served in Wellington's army in the Peninsular War from 1808 until the end of the campaign, obtaining the rank of major in 1826, and was sent to survey the battlefields afterward. His map of the Lower Pyrenees is still valued. This led to his publishing 'Outlines of a System of Surveying for Geographical and Military Purposes' (1827) and the appointment of deputy surveyor-general of New South Wales (1828). Between 1831 and 1846 he made four exploring expeditions discovering the Peel, the Namoi, the Gwyder and other rivers and traced the

course of the Darling and the Glenelg. He was also the first to penetrate into the district that he named Australia Felix. His publications chiefly relate to his explorations: *Three Expeditions into the Interior of Eastern Australia,* 2 vols. (London 1838); *Journal of an Expedition into the Interior of Tropical Australia* (1848); *Australian Geography* (1850); and *The Lusiad of Camoens Closely Translated* (1854).

MITCHELL, William, United States aviation officer who became famous as General "Billy" Mitchell: b. of American parents temporarily residing in Nice, France, Dec. 29, 1879; d. New York City, Feb. 19, 1936. He was the son of Senator John L. Mitchell, and after attending Racine (Wis.) College, was graduated from George Washington University in 1899. He enlisted at the outbreak of the Spanish-American War as a private and eventually attained the rank of brigadier general. He graduated from the Army Staff College in 1909.

After the United States entered the First World War he served as chief of Air Service with, successively, the Zone of Advance, the 1st Corps, the First Army, and group of armies. Overseas he participated in 14 major engagements. After the war he was made director of military aviation, United States Army.

With a brilliant career behind him, and filled with enthusiasm for the airplane as a new instrument of warfare, he soon became an outspoken critic of the country's aviation policy, because of the government's failure to develop the air service. For months he figured in the newspaper headlines almost daily, and finally, because he had accused the high command of "incompetency, criminal negligence, and almost treasonal administration of national defense," he was court-martialed for having violated the 96th Article of War, found guilty, and suspended for five years without pay or allowances. Later President Calvin Coolidge, after reviewing the sentence, upheld the suspension, but restored the allowances and granted the general one half of his monthly pay. Two weeks later, General Mitchell resigned from the army; and continued his criticisms of the national aviation policy. He anticipated and helped demonstrate the ability of airplanes to sink battleships, predicted that planes would soon fly at more than 250 miles an hour, and in 1923 prophesied that planes would one day fly regularly from China to San Francisco.

General Mitchell received the Distinguished Service Cross, the Distinguished Service Medal, the Croix de Guerre with five palms; was made Commander of the French Legion of Honor, Companion of the Order of St. Michael and St. George, and Commendatore S. S. Mauricio e Lazzaro; received the Medal for Merit in War; and also was made Grand Officer of the Crown in Italy. He published *Our Air Force* (1921); *Winged Defense* (1925); *Skyways* (1930); and numerous pamphlets and magazine articles. After he retired from the army he became a farmer and stock raiser in Virginia.

MITCHELL, city, Indiana, in Lawrence County; 69 miles north of Louisville, Ky., on the Chicago, Indianapolis and Louisville; and Baltimore and Ohio railroads. Situated in a diversified farming area it has a brisk trade in fruits, corn and wheat. It has a cement plant, garment works and creamery. Pop. (1950) 3,245.

MITCHELL, S. Dak., city and Davison County seat, altitude 1,320 feet; on the Chicago, Milwaukee, St. Paul and Pacific, and the Chicago, St. Paul, Minneapolis and Omaha railroads; by rail, 73 miles west of Sioux Falls; has a municipal airport, and a regular scheduled airline service. Surrounding the city is an agricultural region, and Mitchell's basic industry is the processing of foods. Besides the public and parochial schools, there is a business college, and the city is the seat of Dakota Wesleyan University, a Methodist institution that was opened in 1885. It has a school of music. Besides a Carnegie library the city has a children's home, two hospitals, and 16 churches; a city museum; a thirteen-hundred acre park system, a municipal band, and a city athletic field. Mitchell was platted in 1879, and incorporated in 1881, with a board of trustees as the administrative body. The present system of government by mayor and council began with city incorporation in 1883. The water supply system is municipally owned and operated. Pop. (1940) 10,633; (1950) 12,123.

MITCHILL, mĭch'ĭl, **Samuel Latham,** American scientist: b. North Hempstead, L. I., Aug. 20, 1764; d. New York, Sept. 7, 1831. He was graduated M.D. at the University of Edinburgh in 1786, and in 1788 was a commissioner for treating with the Iroquois Indians for the purchase of land. In 1792 he was appointed professor of chemistry, natural history and philosophy in Columbia College, where he first introduced the system of nomenclature invented by Antoine L. Lavoisier. In 1797 he founded with Dr. Edward Miller and Elihu H. Smith the quarterly *Medical Repository,* the first scientific periodical published in the United States. In 1801 he became a representative in Congress, and in 1804 was chosen to the United States Senate. Though widely respected in his lifetime, he was occasionally satirized for certain eccentricities. He proposed to change the name of this country to "Fredonia," and wrote in 1804 *An Address to the Fredes, or People of the United States.* He was one of the early supporters of Robert Fulton, whom he accompanied in 1807 in the first steamboat journey on the Hudson. He was the author of *Observations on the Absorbent Tubes of Animal Bodies* (1787); *Nomenclature of the New Chemistry* (1794); *Life, Exploits, and Precepts of Tammany, the Famous Indian Chief,* a half historical, half fanciful address before the Tammany Society of New York (1795).

MITE, formerly a term applied to a very small coin worth about one mill. The name was used for a small coin current in Palestine in the time of Christ.

MITES AND TICKS, arthropods of the order Acari (or Acarina), including the smallest of all arachnids (class Arachnida), the most numerous and widely distributed, the most diversified in form and habits, are at the same time the most important from the medical and economic standpoint. The tiniest are gall mites one tenth of a millimeter long, the largest are female ticks engorged to nearly a full inch, and the average length for the whole group is probably only one millimeter. Among them are predators, herbivores and scavengers, and types that practice all grades

of symbiosis in roles from commensals to obligatory parasites. Much of the diversity in habits and body forms of mites may be attributed to the effects of the parasitic habit which has developed to different degrees along several distinct lines. The free living types, also numerous and varied, account for at least half of all mites and include many that, even though they may be found attached to insects, are not true parasites. Often only one stage lives as a parasite. A most unusual adaptation, for which no adequate explanation seems to have been advanced, is the possession of only three pairs of legs by the larval stage, whereas succeeding stages have the normal eight. An analogous six-legged stage is found in the Ricinulei, arachnids only distantly related to mites.

The ubiquitous mites occupy almost every conceivable habitat on the land areas of the world, occur in northern Greenland (83°N.) and other Arctic regions, and even are found on the Antarctic continent (77°S.). Common even at high altitudes, some live in the wool of mountain sheep at 15,000 feet above sea level. The land forms live in the soil and its detritus, on plants of all types, where many cause galls, spots and blemishes on the foliage, and on and in the bodies of both vertebrate and invertebrate hosts. *Acarapis woodi* inhabits the tracheal system of the domestic honeybee and is the causative agent of the well-known Isle of Wight disease which results in paralysis of the flight muscles. In the United States, *Locustacarus trachealis,* a strange species which retains only six legs in adults of both sexes, lives in the tracheae of grasshoppers, sucking the blood of the host through incisions in the tracheal wall and, when in numbers large enough to act as an obstruction, causing pathological changes in the vital organs. Others live in ant and termite nests, in the feathers of birds, in the tracheal passages of seals, in the lungs of monkeys, and in the skin of man. In favorable situations millions of individuals swarm within the limits of a few cubic inches. A large fauna lives in fresh waters and a modest number have become adapted for life in the seas.

The parasitic mites are of particular interest because of the annoyance and misery they deal out to man and his domestic animals. Some acarologists believe that an intensive survey would reveal that parasitic mites far outnumber the free living types. Furthermore some free living types seem even now to be becoming parasites. Many of our deadliest human diseases are transmitted by mites and ticks, and every year more species are being identified as important vectors. Furthermore, many are becoming established in new localities and bringing with them important diseases. Noteworthy is the fact that disease organisms (viruses, Rickettsiae, bacteria, protozoa, etc.) may be transferred casually from host to host, or may be a hereditary residue lying viable in dormant stages and then transmitted by an active, feeding stage to another victim at a much later date.

The small size of mites make them difficult subjects for study but admirable ones for dispersal. They float as aerial plankton at high altitudes, at 10,000 feet up and probably even higher, and are carried about by birds and flying insects. The term "phoresy" is applied to the habit of certain mites of clinging to the bodies of insects, notably the beetles, while they are transported by these active vehicles. The larva of *Uropoda* glues itself to the host by means of an adhesive cord of excrement. The strange nymphal stage of cheese mites known as the hypopus is also concerned with distribution. After transforming into a mouthless, quiescent creature, it attaches itself by means of ventral suckers to an insect, usually a fly, and is carried to a favorable breeding place, where it again assumes the form of a normal nymph.

Structure.—The body of mites is typically saclike with the cephalothorax and abdomen broadly joined and intimately coalesced. Almost all evidence of the original segmentation is absent except in a few primitive forms. In some the posterior legs are virtually terminal, indicating that the abdominal segments have assumed a very different location in the animal. The cephalothorax bears one or several pairs of small, simple eyes on each side, but they may be absent. The normal six pairs of appendages are present but they are often much changed. The pedipalpi, chelicerae, and accessory mouthparts are often formed into a distinct division called the beak or capitulum, which is sometimes completely retracted into a chamber known as the camerostoma. The mouthparts are adapted for piercing, sucking, biting and sawing. The legs are normally four pairs; but the first active stage is a six-legged larva. In *Locustacarus* the adults have only three pairs of legs; and in the Tetrapoli only two pairs are retained by all stages, including the adults. The body and appendages, in many hardened and grotesquely ornamented, are provided with setae of many types, often pointed, hooked, plumose, flattened, or modified into diverse forms.

Respiration is effected by breathing oxygen directly through the thin integument or by tubular tracheae which open through more or less distinct spiracles. Coxal glands opening on the cephalothorax, and Malpighian tubules opening into the gut are the excretory organs. The circulatory system is the usual open one of arachnids, consisting of a tubular heart and arteries which ramify and empty the blood into sinuses between the organs. Copulation is usually accomplished by direct apposition of the genital openings, which in typical arachnids open ventrally on the second abdominal somite in both sexes. The position is variable in mites even in the same species and in many the males have copulatory organs. That of the male *Demodex* is situated on the dorsal surface of the cephalothorax. The orifice of the female ticks is located far forward between the coxae in a position behind the mouth. Some water mites (Hydrachnidae) exhibit a curious mode of pairing analogous to that of the Ricinuleids. The third legs of the males are somewhat modified and used as hands to transfer the spermatophores to the genital opening of the female. Other members use the chelicerae in much the same way to effect the transfer as in the solpugids. In still another group of mites (Gamasidae) the pedipalp is used, a procedure analogous to that of spiders.

The development of mites is accompanied by a marked metamorphosis during which, depending on the group, five or even more distinct stages are undergone, each marked by the shedding of membranes. The major stages are egg, larva, nymph, and adult. In general, oviparity is the rule but ovoviviparity is credited to some (Oribatidae) which retain the developing egg within the body until an advanced stage is reached. Some mites

develop parthenogenetically. The eggs may be few, laid singly or in small groups, but in some (the ticks) the oviposition is a lengthy routine during which hundreds or thousands are laid in one batch, after which the female dies. In many only a single egg is matured and laid before the chorion is developed over the succeeding one. After a few days the egg shell breaks and reveals a developing embryonic stage called the deutovum, from which later hatches a hexapod larva. The six-legged larval stage is an active one during which many species find a suitable host, attach and engorge, and then drop off to change into the next stage. There then follows a quiescent period during which the body of the nymph develops within the changed, engorged larva, and then the nymph appears. This, the first eight-legged stage which resembles the adult except for smaller size and sexual immaturity, is an active one which feeds before changing to the final sexually active adult stage. The adults are active and, in the parasitic forms, voracious types that again attach to the host to feed, during which copulation often takes place. The length of life of adult stages is ordinarily not longer than a month or so. However, many mites and ticks are extremely resistant to desiccation and starvation and, particularly in the nymphal stages, are able to withstand their effects for very long periods, as long as two or three years in ticks which ordinarily live a much shorter total life span.

The mites are most closely allied to the harvestmen (order Opiliones) and differ in their respective primitive forms principally in having the abdomen distinctly segmented, in the position of the quite similar chelicerae, and in numerous minor details. More distant relatives are other broad waisted arachnids, such as the scorpions and solpugids. The oldest fossil mites come from the Old Red Sandstone of Scotland, which is of Devonian Age. They also occur in the Carboniferous where all the other arachnids are also represented and are known from numerous examples in Baltic amber and a few other deposits of Oligocene age.

The Kinds of Mites.—It is not possible to mention here more than a few of the principal groups of mites, which are divided by recent students into hundreds of families assigned to six principal suborders. The suborder Notostigmata is represented by a small group of brightly colored primitive mites with well marked segmentation of the abdomen as in ancestral forms. Another small group is the suborder Holothyroidea, comprising some of the largest of known mites, often exceeding one fourth inch, known only from Papua.

Some of the most atypical of all are the gall mites of the suborder Tetrapoli. These minute forms with elongate, annulate abdomens have only four legs in all stages and are responsible for galls on leaves of plants. These galls differ from those of insects in that there is an opening through which the young mites escape, whereas insect larvae are usually completely imprisoned.

The suborder Sarcoptiformes includes the beetle mites (Oribatidae), common, often shining black forms of little economic importance which live in soil detritus and feed on vegetable matter, and most of the parasitic atracheate mites (superfamily Sarcoptoidea). Most are parasitic during their whole life on the same host, where they infest the feathers, hairs or skin. The feather mites (family Analgesidae) are small, flattened types which frequent the feathers of birds. Itch mites (Sarcoptidae) live on the hoofs of horses, producing a disease known as foot-mange, infest the head, eyes and ears of dogs and cats, cause a disease of chickens called scaly-leg, and are responsible for serious and widespread scab diseases of sheep, cattle and rabbits. The various scabies mites (genus *Sarcoptes*) infest many domestic animals and include among them the itch mite of man (*Sarcoptes scabiei*). They burrow into the skin, usually between the fingers and toes, and cause distressing symptoms, but they have become a rarity in the United States and some other countries. The cheese mites and their allies are for the most part free living but a few are parasitic, sometimes causing mysterious outbreaks of dermatitis in houses and factories. Species of *Tyroglyphus* may be found in cheeses, grains, sugar and hay and on occasion are responsible for conjunctivitis and various itches in those who handle these products. This suborder also includes the curious *Acarapis*, previously mentioned as causing the Isle of Wight disease of bees.

The suborder Trombidiformes is another tremendous assemblage of mites, including many that are free living but others of great biologic interest and pressing medical importance. The louse mite (*Pediculoides ventricosus*) is remarkable in that it acts freely either as predator, scavenger, or parasite during its life history. An important pest on corn and crops, it also produces severe skin eruptions on hands and arms of workers. The numerous red spider mites (family Tetranychidae) are among the greatest enemies of the gardener, attack tomatoes, cucumbers and similar crops, defoliate fruit trees, and do serious damage to grass and clover crops. One of them (*Bryobia pratensis*) often enters houses in the fall, much to the distress of the housewife. A relatively innocuous member of this subfamily is *Demodex folliculorum* which lives in the hair follicles of man and is said to be quite common in the blackheads which form on his face. An elongate creature with tapering abdomen, *Demodex,* is harmless in man and extremely rare in the United States. Related species are more important, and one causes the red mange of dogs, a serious dermatitis. Living in freshwater ponds and streams, often in great numbers, are the extremely varied and beautiful water mites (family Hydrachnidae), forms of which are gaily dressed in bright reds and greens and which swim through the water with the aid of long hairs on the legs. The larval forms are sometimes parasitic on the gills of mollusks but the predaceous adults feed largely on minute aquatic creatures. The less common water mites of the family Halacaridae live in the sea. Among the most pestiferous of all mites are the six-legged larval forms of the harvest mites (Trombidiidae) well known to Americans as redbugs or chiggers. These tiny creatures attack a great variety of small hosts, such as birds, rabbits, snakes, turtles, and similar creatures. They swarm in grassland in the moist hot tropics and cause violent itching and irritation when they attack man. *Eutrombicula akamushi* is the vector of a Rickettsia organism which causes a febrile disease, frequently fatal to man in Japan and over much of the Oriental region and the major Pacific islands. In the United States, *Eutrombicula alfreddugesi* is the offensive species and causes a severe dermatitis following

attachment to the skin by means of their hooked chelicerae. They do not burrow in as often believed but the effects of even temporary attachment is burning and intolerable itching. Effective repellents are now available as a prophylaxis.

The final suborder, the Parasitiformes, includes the generalized gamasid mites (group Parasitoidea) and the ticks (Ixodoidea). Among the former are two tropical rat mites (*Liponyssus bacoti*), an Egyptian species now widely distributed over the world and the United States, which frequently attacks man, and *Allodermanyssus sanguineus,* the vector of a recently described new febrile disease of the United States. Most important of all the mites from the standpoint of human health are the ticks. As a source of annoyance in tropical countries they rank with the red bugs because of their vast numbers and their persistence in crawling over the body of man. Although they do not often cause serious local injury, many are known to carry deadly diseases. All are ectoparasites which suck blood during their active life stages. The ticks of the family Argasidae, which lack dorsal shields and have the capitulum ventral, are long lived and lurk in the nests and habitats of their hosts, feeding intermittently and then retreating to a hiding place. The spinose ear-tick of the American Southwest infests the ears of horses and occasionally attacks man. Species of *Ornithodorus,* some of which are essentially human parasites, live in native huts and around camp sites and transmit spirochaetes which cause relapsing fevers in Africa and the Orient. The ticks of the family Ixodidae, which have a dorsal scutum and terminal capitulum, are specialized parasites which may be limited to a single host but more often use several different ones to complete their life history. They feed slowly and when engorged drop off the host to change into the next stage. Important diseases transmitted by Ixodid ticks are Texas fever of cattle and Rocky Mountain Spotted Fever, a serious and widespread Rickettsial disease of man.

Recommended Reading.—Comstock, J. H., *The Spider Book* (Ithaca 1912 and 1948); Ewing, H. E., *A Manual of External Parasites* (Baltimore 1929); Savory, T. H., *The Arachnida* (London 1935); Herms, W. B., *Medical Entomology* (New York 1939).

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MITFORD, John, English clergyman and writer, friend of Charles Lamb and Samuel Rogers: b. Aug. 13, 1781; d. Benhall, Suffolk, April 27, 1859. He graduated from Oriel College, Oxford in 1804, and five years later he took orders in the English church. He was the editor of, and contributor to, *Gentleman's Magazine* (1834–1850).

In 1814 he edited the first accurate edition of the *Poems of Thomas Gray, with Critical Notes, a Life of the Author, and an Essay on his Poetry* and in 1816, he embodied this material into two large volumes which contained important additions to the published letters of the poet.

MITFORD, mĭt'fŏrd, **Mary Russell,** English writer: b. Alresford, Hampshire, England, Dec. 16, 1787; d. Swallowfield, near Reading, Berkshire, Jan. 10, 1855. Her education was obtained largely through her very wide reading. She won a lottery prize of £20,000 when three years old, with which her spendthrift father built a house at Reading. Owing to his extravagance, the family had to move to a laborer's cottage, and she to earning by her pen. Her first published work was *Miscellaneous Poems* (1810). With the sketches *Our Village,* descriptive of English rural life (first appeared in *Lady's Magazine,* 1819; collected 1824, 1826, 1828, 1830, 1832), she may be said to have originated a branch of literature. Among her dramatic works, five in number, *Rienzi* (1828) was most successful; in America it became popular with Charlotte Cushman as Claudia. Included in her further writings are *Recollections of a Literary Life* (1852), and the works of fiction *Belford Regis* (1835) and *Atherton* (1854), the latter highly praised by Ruskin. Her correspondence (published 1870) has been by some ranked almost with her books. Consult the *Life* by L'Estrange (1870); id., *The Friends of Mary Mitford as Revealed in Letters from her Literary Correspondents* (1882); the correspondence with Boner and Ruskin, edited by Elizabeth Lee (1915).

MITFORD, William, English historian: b. London, Feb. 10, 1744; d. Exbury, Feb. 10, 1827. He was educated at Oxford, and obtained a commission in the Hampshire militia, of which he became colonel. His early fondness for Greek led him to the study of Greek historians, and he was induced, partly through the advice of Gibbon, a fellow-officer in the same regiment, to undertake a *History of Greece.* The first volume appeared in 1784, the fifth and last, bringing the narrative down to the death of Alexander the Great, in 1818. With considerable critical acumen and diligent research he elucidated many obscure points, and until the appearance of the works of Thirlwall and Grote, his history was considered of the highest authority. A strong prejudice against democracy leads him to speak of the Athenians as a horde of treacherous miscreants, of Demosthenes as a malignant demagogue and of Philip as a perfect statesman, and warrior. Mitford was professor of ancient history in the Royal Academy, and member of Parliament for three boroughs in succession 1785–1818. Besides his principal work he published an *Essay on the Harmony of Language* (1774) and lesser works.

MITHRAS, mĭth'ras, in Perso-Iranic divinity, first the god of the heavenly light and the lord of all countries, afterward the sun, or the genius of the sun, which was worshiped as a deity by the Persians, and at a later period also in Rome. Mithras stands as a mediator between Ormuzd and the world, and was involved in the struggle with Ahriman, the evil power. He is commonly represented as a handsome youth, wearing the Phrygian cap, tunic and cloak, and kneeling on a bull, into whose throat he is plunging the sacrificial knife. The bull is at the same time attacked by a dog, a serpent and a scorpion. As the monuments of this worship were destroyed during the Mohammedan conquests, knowledge of its doctrines and rites is necessarily vague and uncertain; but it had some remarkable resemblances to Christianity. The worship of Mithras was formally suppressed in the 4th century. In Germany many tokens of its former existence are still to be found, as the monuments at

Hedernheim, near Frankfort-on-the-Main, and other places.

MITHRIDATES (mĭth-rĭ-dā'tēz) **VI,** surnamed EUPATOR, and also styled commonly THE GREAT, king of Pontus: b. Sinope, 134 B.C.; d. Pantacapaeum, 63 B.C. He ruled from 121 B.C. until his death. He early entered on his career of conquest, which ultimately involved him in war with Rome. He subjugated the peoples on the northern shore of the Euxine (Black) Sea, attacked Cappadocia and Bithynia, and since these were allies of Rome, there encountered Roman opposition. After the death of Sulla, 78 B.C., Mithridates levied another army to expel the Romans from Asia. Being defeated by Lucullus, appointed consul 74 B.C., he was followed by the victorious Romans into his own states, and driven to seek refuge in Armenia, then ruled by Tigranes, who refused to deliver him up. Here Mithridates raised a third great army, and in 67 B.C. completely defeated the Romans; and, following up his success, rapidly recovered the larger part of his dominions. The Romans now invested Pompey with absolute power in the East, and by him, in 66 B.C., the forces of Mithridates were completely routed near the Euphrates. The king retired to Bosporus (the Crimea), where his troops headed by his son Pharnaces, broke out in mutiny, and Mithridates killed himself. He was considered by Rome its most formidable enemy. See POMPEY; SULLA.

MITLA, mēt'lä ("the place of the dead"), Mexico, a village of the state of Oaxaca, on the Mixtecapan Plateau, 26 miles southeast of Oaxaca. It is celebrated for its extensive ancient ruins which comprise five great groups of temples, palaces, tombs and other edifices covering about 2,000 feet square. See MEXICO—*18. Architecture* (Valley of Oaxaca).

MITO, mē'tō, Japan, a town in the island of Hondo, seven miles from the east coast and 73 miles by rail northeast of Tokyo. It is a town of considerable antiquity. The manufactures include cloth, paper, for which it is famous, and cigarettes. Pop. 63,816.

MITO, Doctrine of, said to be the creed of the Mito school of Japan from the middle of the 17th century to the overthrow of absolute power in the 19th century. This doctrine rested on the revival of the old learning of Japan, the honoring of the emperor and the expulsion from the country of "the barbarians" or foreigners.

MITO, or **MYTHO,** French Indo-China. See MYTHO.

MITOSIS, or **KARYOKINESIS,** the process of indirect nuclear division of cells undergoing growth or beginning those changes in the egg which bring about the growth of an embryo. The first stages are characterized by a rearrangement of the nuclear network into a series of loops or V-shaped bodies. Meanwhile a minute body in the cytoplasm, or extranuclear cell contents, has divided into two, and the portions have arranged themselves at opposite poles, with the nucleus between them. Each of the two portions forms a starlike aggregation consisting of a centrosome with a radiating mass. The V-shaped bodies, or chromosomes, of the nucleus arrange themselves with their open ends outward and their closed ends near the center, and they then separate along the central or equatorial plane, one half proceeding to each centrosome, with whose rays it becomes incorporated and is firmly held. The cell then becomes constricted between the centrosomes, and in each of the two portions a new nucleus is developed by a process essentially the reverse of that just described. The final result is the formation of two daughter cells out of the original mother cell, each of which contains an exact half of the essential chromatin elements not only in respect to equal quantities, but in respect to those qualities, chemical or other, which constitute the inheritable individuality of the organism. For fuller information see CELL; EMBRYOLOGY.

MITRA, mē'tra (Sanskrit, meaning friend), an Indian god of light, belonging to the Vedic period. Mitra is the Friend, the personification of Daylight, a bright being beloved of man. His name is coupled with that of Varuna, another bright being. The association between them is so close that they present themselves to the mind as an inseparable pair—Varuna-Mitra or Mitra-Varuna—who drive the same golden chariot and think the same thoughts. Together they are the keepers of the Cosmic Order and the Law of Righteousness, and together they watch the deeds and hearts of men, equally all seeing and all knowing. The sun is often called the eye of Mitra-Varuna as well as Varuna's alone; and Light is the chariot on which these two inseparable gods ride through space on their appointed path. They are also avengers and forgivers of sin. It is Mitra's particular business to wake men and call them to the duties of a new day. Only one hymn is addressed to Mitra alone. The general character of the hymns of the Rig-Veda is as follows: "Mitra and Varuna, you mount your chariot, which is golden when the dawn bursts forth and has iron poles at the setting of the sun; from thence you see what is boundless and what is limited, what is yonder and what is here." Varuna and Mitra are both Adityas, that is, sons of Aditi, who in consequence, is called "Mother of the Gods." She probably designates boundless space (*aditi,* space). Varuna and Mitra are, therefore, Sons of Boundless Space, Sons of Eternity, Sons of Beauty and Brightness, forgivers of sin, guardians of purity and truth, givers of health. They are thoroughly practical and beautiful deities. Mitra is identical with the Iranian Mithra, or Mithras, also a solar diety and the central figure of a special cult. See MITHRAS; AVESTA; and VEDIC LITERATURE.

MITRA, Rajendra Lala, Indian Orientalist: b. near Calcutta, Feb. 15, 1824; d. Calcutta, July 26, 1891. He came of the writer caste of Bengal and studied particularly Sanskrit and Persian. In 1846 he was made librarian of the Asiatic Society and devoted the rest of his life to this body, working as philological secretary, vice president and president from 1885. He became raja in 1888. Besides numerous contributions to the *Journal of the Asiatic Society* and a series of Sanskrit texts entitled *Bibliotheca indica,* he published three important works: *The Antiquities of Orissa* (2 vols., 1875 and 1880); *Bodh Gaya, The hermitage of Sakya Muni* (1878); and *Indo-Aryans,* dealing with the man-

ners and customs of the people of India from Vedic times (2 vols., 1881).

MITRAL VALVE. See HEART, THE.

MITRE, mē'trā, **Bartolomé,** Argentine soldier, politician and author: b. Buenos Aires, June 26, 1821; d. there, Jan. 19, 1906. He became the leader in the movement in which Buenos Aires proclaimed itself independent, Sept. 11, 1852, and was successively minister of the interior and of war in the Buenos Aires government. The force commanded by him was defeated by Justo José Urquiza (q.v.) at Capeda, Oct. 23, 1859, but he defeated Urquiza at Pavon on Sept. 11, 1861. In 1862 he was elected president of Argentina for a six-year term. During 1865–70, in alliance with Brazil and Uruguay, he waged war successfully against Paraguay. He founded the newspaper *La Nacion,* and wrote *Historia de Belgrano* (1857) and *Historia de San Martin* (1884).

MITRE, in ecclesiastics, a sacerdotal headdress worn by bishops and certain other church dignitaries on solemn occasions, being a sort of cap pointed and cleft at top. Three kinds are worn in the Roman Catholic Church, namely, the precious mitre, of gold or silver and ornamented with jewels; the *mitra auriphrygiata* of gold cloth, without jewels (except pearls); and *mitra simplex* or plain mitre, of white silk or linen. Bishops and mitred abbots receive their mitres from the bishop who consecrates them. In the Church of England mitres fell into gradual disuse after the Reformation, disappearing in the 18th century, but were revived by some Anglican bishops after 1885. The English form is smaller than that worn by bishops of the Roman Catholic Church. The mitre of bishops of the Greek Church is a dome-shaped crown. See COSTUME, ECCLESIASTICAL.

MITRE SHELL, the shell of a gastropod mollusk of the genus *Mitra* and family *Mitridae,* closely allied to the *Muricidae,* so called because of its resemblance in form to a bishop's mitre. The shells are thick, somewhat fusiform, with the spire very high and acute, and a small aperture and operculum. The genus is a very large one, comprising several hundred species mostly from shallow, tropical seas and especially abundant in the Malayan region. *Mitra episcopalis* is abundant on the tidal flats of the Philippine Islands. During the day, especially at low water, they burrow beneath stones or hide in crevices, but are active at night. They secrete a purple fluid having a nauseating odor and act as scavengers.

MITROVICA, mē'trō-vĕt-sà, or **SREMSKA,** srĕm'skà, Yugoslavia, a town in the Federated Republic of Croatia, on the river Sava in the county of Syrmia, 43 miles west of Belgrade. Roman remains have been discovered in the neighborhood and the city occupies the site of Sirmium, or Syrmium, the chief city of lower Pannonia under the Roman rule. The Emperor Probus (232–282) was born and buried at Sirmium; and here, according to some authorities, the noble emperor, Marcus Aurelius (121–180), died. Ecclesiastical councils of importance met in 351, 357 and 358 at Sirmium, which became an episcopal see in 305. In 1773 it was united with the diocese of Bosnia. The Huns sacked Sirmium in 441 and the Turks ravaged Mitrowitz completely in 1396 and 1521, destroying all the old buildings. A few ruins of the ancient Roman city are still to be seen. The countryside produces fruit, wine and grain, and the industries are chiefly the culture of silk worms and tanning leather. Pop. (1931) 13,840.

MITSCHER, mĭch'ĕr, **Marc Andrew,** United States naval officer: b. Hillsboro, Wis., Jan. 26, 1887; d. Norfolk, Va., Feb. 3, 1947. Graduating at the United States Naval Academy in 1910, he advanced through the grades to admiral in December 1945. During World War I he served aboard the *Huntingdon* on convoy duty, and then returned to flying, which he had already chosen for his career. In 1913, in the "bamboo-and-wire crate" era of aviation, he had taken his flight training at the Naval Air Station, Pensacola, Fla., being the 33d pilot to receive his wings. After the war he held naval air station commands at Rockaway, Long Island, N.Y., and Miami, Fla., and when the first American carrier, the U.S.S. *Saratoga,* was commissioned in 1928, he became head of her air personnel. Thereafter he alternated between sea-air duty and service in the navy's Bureau of Aeronautics, and in the fall of 1941 he was appointed to command the U.S.S. *Hornet,* newest of the American carriers. His vessel, in April 1942, conveyed the army fliers of Gen. James Doolittle to within 800 nautical miles of Japan, whence they took off for the first bombing of Tokyo, and two months later it fought in the Battle of Midway. In April 1943 he was named air commander on Guadacanal, and for his achievements in that post he was awarded the Distinguished Service Medal. Appointed to command of Task Force 58 early in 1944, his carriers and their escorts covered the invasion of the Marianas in January, and attacked the enemy bases at Truk on Feb. 16–17 and at Tinian and Saipan, in the Marianas, on Feb. 23, 1944. During June 19–20 Task Force 58, by this time known as the First Carrier Task Force, took part in the Battle of the Philippine Sea, and through Oct. 20–27, as part of Admiral William Frederick Halsey's Third Fleet, it supported the landings in Leyte Gulf; among other damage inflicted during these latter operations, his planes sank the Japanese battleship *Musashi,* one of the two most powerful in the enemy navy. On March 19, 1945, Mitscher's aircraft attacked Kobe and Kure, in Japan itself, as well as naval vessels in the Inland Sea, and thereafter he was almost constantly in action against the enemy. His flagship, the U.S.S. *Bunker Hill,* was severely damaged by dive bombers off Okinawa on May 11, 373 crew members being killed and 264 wounded; he escaped uninjured and transferred his flag to another vessel when the *Bunker Hill* returned to the United States for repairs. He served as deputy chief of naval operations for air from July to December of 1945, when he was assigned to command of the Eighth Fleet.

MITSCHERLICH, mĭch'ĕr-lĭk, **Eilhardt,** German chemist: b. Neuende, near Jever, Oldenburg, Jan. 7, 1794; d. Schönberg, near Berlin, Aug. 28, 1863. He was the son of a clergyman and nephew of the celebrated scholar, Christophe Wilhelm Mitscherlich (1760–1854). Going to Heidelberg in 1811, he devoted him-

self to philology and more particularly to Persian. In 1813 he went to Paris, hoping to obtain permission to join the embassy which Napoleon I was about to send to Persia. Political changes frustrated this plan, and Mitscherlich determined to study medicine in order to have the privileges accorded to physicians traveling in the East. For this purpose he went to Göttingen, and while there compiled a history of Persia from manuscripts in the university library. Entitled *Mirchondi historia Thaheridarum historicis nostris huiusque incognitorum Persiae principum,* it was published in 1814 in both Latin and Persian.

While studying medicine at Göttingen, his attention was attracted to geology, chemistry, and physics, and he moved to Berlin in 1818 to work in the laboratory of the botanist Heinrich Friedrich Link. There his researches led him, in 1819, to the discovery of the principle of isomorphism (q.v.). He studied with Jöns Jakob Berzelius in Stockholm, Sweden, in 1820–1821 and then returned to Berlin to lecture in chemistry at the university. He later discovered the double crystalline form of sulphur, one of the first observed cases of dimorphism. His investigations in the production of artificial minerals, his paper on benzene and the formation of ether, and his discovery of permanganic and selenic acids were also important. His principal work is *Lehrbuch der Chemie* (2 vols., 1829–1830; 4th ed., 1844–1847). Shortly after his death in 1863, many of his previously unpublished notes and papers were recorded in the *Memoirs* of the Berlin Academy.

MITSUI, mē-tsōō-ē, and **MITSUBISHI,** mē-tsōō-bē-shē, Japanese financial and industrial combines. Before and during World War II, these two industrial trusts were the first and second respectively of the *zaibatsu,* the powerful, centralized Japanese commercial investment houses. Though in competition with each other and with other *zaibatsu* concerns, they collectively exercised a considerable measure of control over the economic life of Japan and were largely responsible for the country's quick rise to a position of competitive strength in the world market after the Meiji Restoration of 1868. They also provided the financial backbone of the nation's military might in the 1930's and 1940's.

The Mitsui organization, founded by Takatoshi Mitsui in the 17th century, had a long tradition of successful commercial and banking activity behind it when the government, attempting to industrialize Japan in the 1870's, began to shower the firm with subsidies, loans, and special privileges. The company expanded and prospered to the point at which its net worth was conservatively estimated in 1940 at a billion yen, but it remained primarily a family or clan-owned concern. Though in its later development it owed much to a succession of managers developed within the organization, many of these were absorbed into the Mitsui family by marriage or by adoption.

The *zaibatsu* firms were often able to influence the government and were sometimes represented in the cabinet itself. In 1932 the Mitsubishi concern aided financially in the creation of the Manchukuo government and was rewarded with lucrative business concessions in the conquered territories. There were close ties between the Mitsui concern and the Seiyukai Party, and between the house of Mitsubishi and the only other major political party, the Minseito. After World War II, the Allies ordered the dissolution of all the *zaibatsu* concerns in an effort to democratize the control and ownership of Japanese economic resources. In August 1955, however, a revival of the parent Mitsui Bussan Co., Ltd. was brought about by a merger of two of its most powerful subsidiaries.

MITTAG-LEFFLER, mĭt'täg lef'lĕr, **Magnus Gösta,** Swedish mathematician: b. Stockholm, Sweden, March 16, 1846; d. Djursholm, near Stockholm, July 7, 1927. From 1877 to 1881 he was professor of mathematics in Helsingfors (now Helsinki), Finland, and then went to the University of Stockholm where he taught mathematics until 1911, serving as rector of the university in 1886, 1891, and 1893. Shortly after his arrival in Stockholm he founded the journal *Acta Mathematica,* which became internationally known. In 1916 he and his wife founded a mathematical library at Uppsala. Among his contributions to mathematical theory is the theorem, known by his name, on the one-valued function. See also COMPLEX VARIABLE—*Weierstrass's and Mittag-Leffler's Theorems.*

MITTEN, mĭt"n, **Thomas Eugene,** American business executive: b. Brighton, Sussex, England, March 31, 1864; d. near Milford, Pa., Oct. 1, 1929. In 1877 he left England with his parents, who settled near Goodland, Ind. After working for several railroads, he began his connection with the street-railway business in 1896, first as an assistant superintendent at Milwaukee, Wis. By 1905 he was president of the Chicago City Railway Company, resigning in 1911 to become president of the Philadelphia Rapid Transit Company. There he established a cooperative plan which gave his employees a voice in all matters from general policy to wages and working conditions. He resigned as president in 1923, serving as chairman of the board until 1929. In the latter year the mayor of the city ordered an audit of the company's books because of its failure to submit annual reports to the city comptroller. This study showed that the company had incurred unjustifiably heavy expenses, and the comptroller filed suit on Dec. 1, 1929, for a financial accounting. Two months earlier, however, Mitten had drowned in a pond on his estate. In 1931 his company was ordered into receivership, and his management severely condemned.

MITTERMAIER, mĭt'ĕr-mī-ĕr, **Karl Joseph Anton,** German jurist: b. Munich, Germany, Aug. 5, 1787; d. Heidelberg, Aug. 28, 1867. He was educated at the universities of Landeshut and Heidelberg. After being appointed professor at Landeshut (1811) and Bonn (1819), he went to Heidelberg in 1821 as professor of law and jurisprudence, a post he held for the rest of his life His greatest work is a complete manual of criminal law, *Das deutsche Strafverfahren in der Fortbildung durch Gerichtsgebrauch und Partikulargesetzbücher* (1827). He also published a number of other books on important questions relating to jurisprudence, trial by jury, and the penal code, many of which were translated into other languages. He was a member of the Baden legislature from 1831, and for a time president of its lower chamber. He was also president of the Vorparlament at Frankfurt am Main in 1848, and a prominent member of the ensuing Frankfurt Assembly.

MITTIMUS, mĭt'ĭ-mŭs (Lat. we send), a written warrant issued after a criminal conviction by a court or magistrate, directing a proper officer to convey the body of a prisoner to jail, and ordering the jailer to keep the individual in custody until legal provision is made for his release.

MITTWEIDA, mĭt-vī'dä, town, eastern Germany, in Saxony, 11 miles north-northeast of Chemnitz and 34 miles south-southeast of Leipzig, on the river Zschopau. It manufactures a wide range of products, including paper and cotton, machines, precision instruments, glass, clothing, cigars, and leather. The town has a fine 15th century church, now Protestant. Pop. (1946) 22,794.

MITYLENE. See Lesbos.

MITZVAH, mĭts'vä, a Jewish religious commandment; also, more loosely, a good deed. The Torah contains over 600 *mitzvoth,* both positive and negative. Their varying importance and number were established by Maimonides (q.v.) and other scholars and rabbis.

MIVART, mī'värt, **St. George Jackson,** English biologist: b. London, England, Nov. 30, 1827; d. there, April 1, 1900. A prosperous hotelkeeper's son, he was educated at Harrow and King's College, London. Having been converted to the Roman Catholic Church in 1844, he was barred from attending Oxford, and received his higher academic training at St. Mary's College, Oscott. In 1851 he was called to the bar at Lincoln's Inn, but the possession of ample means enabled him to gratify his taste for natural history. He was appointed lecturer in comparative anatomy at St. Mary's Hospital medical school in 1862, and from 1874 until 1877 was professor of biology at University College, a Roman Catholic institution which functioned briefly in Kensington, London. On the invitation of the Belgian episcopate he served from 1890 to 1893 as professor of the philosophy of natural history in the University of Louvain. He was vice president of the Zoological Society twice, and secretary and vice president of the Linnaean Society. In 1876 Pope Pius IX awarded him a Ph.D.

Mivart's scientific specialties were the insectivora and carnivora, but he was drawn into controversy by the warfare raging over the evolutionary theories of Charles R. Darwin, a struggle which, as a Catholic, he felt acutely. In *The Genesis of Species* (1871), he admitted organic evolution, but argued against Darwin's theory of natural selection and tried to explain the production of new species as due to an innate plastic power of "individuation"; he also rigidly differentiated between human and animal mental faculties. Gradually his views estranged him from Darwin and Thomas Huxley, while his articles on religion and science, between which he had been anxious to play the role of mediator, brought the disfavor of his religious superiors. Articles by Mivart appearing in 1892 and 1893 were placed on the Index; further magazine articles appearing in January 1900 resulted in his excommunication by Cardinal Herbert Vaughan on Jan. 18, 1900. He died shortly thereafter, unreconciled to the church; but in 1904, persuaded that his final illness had unbalanced his judgment, Catholic authorities allowed Mivart's reburial in consecrated ground. Mivart's evolutionary stand is summed up in *Lessons from Nature* (1876) and *Contemporary Evolution* (1876); his greatest single monograph is probably *The Cat: an Introduction to the Study of Backboned Animals, especially Mammals* (1881).

MIWOK. See Moquelumnan.

MIXCOATL, mēks'kō-ä-t'l, in Aztec mythology, the Cloud Serpent, a star god and the god of the hunt; sometimes also identified with the god of war (Camaxtli), and the god of the wind (Tezcatlipoca). As Camaxtli, he was counted among the four gods who made the world. He created fire from sticks shortly before the creation of man. At the feast of Quecholli, an annual fall festival in his honor, a ceremonial hunt was conducted. It is possible his name was suggested by the Milky Way, but his star was a morning star, usually the planet Venus.

MIXE, mē'hä, a tribe of Mexican Indians dwelling on the Tehuantepec Isthmus, southern Mexico. They speak the Zoquean language. The Mixe were conquered by Pedro de Alvarado in 1521–1524 and proselytized by missionaries from 1526; however, they remained religious conservatives until very recent times. They are good farmers, and their women are capable weavers and potters. In 1940 there were 51,261 Mixe, including bilinguals; in 1950 there remained 21,005 who spoke only Zoquean.

MIXED MARRIAGE, *in theology,* a marriage between a Catholic and Protestant, or, more loosely, any non-Catholic. Anglicans also employ the term. The Roman Catholic Church insists that the non-Catholic partner agree in writing before the marriage that the worship of the Catholic spouse shall not be interfered with; that children be reared as Catholics; and that no non-Catholic wedding ceremony be performed. On acceptance of these conditions, and the granting of a dispensation, a valid ceremony may be performed by a priest.

In American law mixed marriage means marriage of a Caucasian to a person of designated colored race or races. Such marriages were in 1955 illegal in 29 states, in some of which these laws were reinforced by criminal sanctions. Judges in state courts generally sustained anti-miscegenation laws against challenges as to their constitutionality.

MIXED PROPERTY, neither real property such as a house and land, nor personal property such as clothing, but having the nature of both. Heirlooms, house keys, tombs, and title deeds, among other articles, are in law mixed property.

MIXITE, mĭk'sīt, in mineralogy, a green-to-whitish basic copper bismuth arsenate, named for A. Mixa, inspector of mines in Bohemia. Chemically it is Cu_2O,As_2O_3,xH_2O with 13 per cent Bi_2O_3.

MIXODECTES, mĭk-sō-dĕk'tēs, in paleontology, a genus of insectivores with very large incisors analogous to those of rodents, found in the Paleocene and Eocene of North America. It is the type of the family Mixodectidae.

MIXOSAURUS, mĭk-sō-sô'rŭs, a genus of

small fish-lizards (*Ichthyopterygia*) from the Triassic formations of Europe, differing from typical ichthyosaurs by their fewer teeth and some minor characters.

MIXTEC, mĭs'tĕk, or **MISTEK** ("cloud people"), an Indian people of southwestern Mexico inhabiting Oaxaca and part of Guerrero. They comprise one of the most important Indian groups of that country. Prior to the arrival of the Toltecs (q.v.) on the plateau of central Mexico in the late 7th century A.D., the Mixtec and Olmec appear to have been the representatives of the Highland culture. About the year 900 the Mixtec struck southward into the valley of Oaxaca and seized from the Zapotec their towns of Monte Alban and Mitla. This aggression initiated a period of warfare between the two peoples which continued until the end of the 15th century when they temporarily united in a campaign against the Aztecs. That war terminating successfully for the allies, they again became enemies, the Zapotec forming an alliance with the Aztec. In the early 16th century the Zapotec king concluded an alliance with the Spaniards of Cortés; but the Mixtec fought the white invaders until subdued by Pedro de Alvarado. The modern Mixtec are highly skilled in agriculture and the simpler arts. They are noted for their pottery and textiles.

MIXTURE (from the Latin *mixtura*), a product of mixing, that is, the amalgamation of different ingredients mutually diffused through one another. It also means the action of becoming mixed such as a mixing or blending of races. Mixture is, moreover, used to denote a preparation for medicinal purposes and in pharmacy is applied to potions of liquid medicine. Mixture is also used to denote "type-setting that calls for the use of two or more distinct faces, or faces and bodies of type." Mixture is the opposite of solution.

MIXTURE, an organ stop. It is ordinarily furnished with from three to six small metallic pipes to each key and is compounded of the higher sounding and therefore shorter members of the foundation and nutation classes of stops, combined or mixed and arranged to draw together as in practice they are seldom required to be used separately. "The mixture," writes an authority, "represents or corroborates the higher consonant harmonic sounds suggested by nature, and in the bass produces tones to the third or fourth octave above the major or chief foundation tone. As the musical scale ascends, the higher harmonics become weak and inaudible to the ear; hence in a mixture stop it is customary to discontinue the higher ranks as they ascend, one or more at a time, and insert in lieu a rank of a lower tone than was previously in the stop but appearing as a separate stop." This alteration is called a "break."

MIYAKO, mē-yä'kō, city, Japan, in northern Honshu, Iwate prefecture, 45 miles east of Morioka. A fishing port on the Pacific coast, it is a shipyard and lumbering center. Pop. (1947) 36,715.

MIZAR, mī'zär, the second magnitude star ζ in the constellation of Ursa Major (q.v.). Probably the first double star to be discovered (1650), Mizar has the fainter Alcor (q.v.) as companion. E. C. Pickering showed in 1889 that Mizar itself is a so-called spectroscopic binary, a phenomenon deduced from its alternate spectral lines. Later on it was established (1908) that Alcor and the close companion of Mizar are also spectroscopic binaries.

MIZON, mē-zôN', **Louis Alexandre Antoine,** French sailor, explorer and colonial administrator: b. Paris, France, 1853; d. at sea in the Indian Ocean, 1899. A naval officer, from 1880 to 1883 he helped Savorgnan de Brazza in his explorations of the French Congo. In 1890 he resigned his commission and devoted himself to the exploration of Equatorial Africa, backed by the Committee of French Africa. He made two expeditions up the Niger and its chief tributary, the Benue (Benoue River (1890–1892 and 1893). In the course of his second expedition his promotion of French commercial interests in the Niger country evoked British jealousy, especially after he had negotiated a treaty with the sultan of Hamarua. Great Britain thereupon declared Hamarua a British protectorate and forced Mizon's recall. He then entered the colonial service, served as resident at Majunga in Madagascar, administrator of Mayotte, one of the Comoro Islands, and had just been appointed governor of Jibuti in French Somaliland when he died at sea. He published *Cartes du fleuve Ogôoué* (1886).

MIZPAH, mĭz'pä, or **MIZPEH,** the name of several places in Palestine. The word signifies a high place or lookout mentioned in the Bible. Mizpeh of Gilead (Genesis 36:45) marks the site of the pillar and heap of stones put up by Jacob and his brethren in the mountains of Gilead in token of God being a witness to the covenant made between him and Laban. The "Mizpah ring" takes its name from this episode (see verse 49). The site is still pointed out with its group of rough stone monuments in the village of Sûf. —The Mizpeh of Benjamin (Joshua 18:26ff.) lay north of Jerusalem on an unknown site.—That of Judah (Joshua 15:38) stood north of Hebron and 20 miles south of Jerusalem. Nothing is positively known of the Mizpeh of Moab (1 Samuel 22:3).

MJOSA, myû-sä, **Lake** (Nor. MJØSA), Norway, in the southeastern part of the country in the Gudbrandsdal. Norway's largest lake, with an area of about 141 square miles in Opland and Hedmark counties, it has a length of 65 miles and a width of from one to nine miles. Its greatest depth is 1,435 feet. It contains the small island of Helgoy. Chief towns on its shores are Lillehammer, Gjovik, and Hamar. The Lagen River flows into it from the north. Its outlet is the 25-mile Vorma River, an affluent of the Glomma which empties into the Skagerrak.

MLADA BOLESLAV, mlä'dä bô'lĕs-läf (Ger. JUNGBUNZLAU), city, Czechoslovakia, in northern Bohemia on the Jizera River, 25 miles south-southwest of Liberec. The city has important manufactures of automobiles, electrical parts, and machines. There are also distilleries, textile mills, and soap and candle factories. The cathedral is of 15th century construction and there is a fine 18th century baroque church. The town has a museum and its old castle is now used as a barracks. The United Brethren (q.v.) at one time held their assemblies here. Pop. (1947) 19,573.

MLAVA, mlä'vä, river, Yugoslavia, in eastern Serbia. It rises in the Crni Vrh Mountain

near Zagubica and flows about 60 miles north-northwest past Petrovac, entering an arm of the Danube north of Kostolac.

MLAWA, mwä'vä (Pol. Mława), town, Poland, in Warszawa Province, northeast central Poland, 65 miles north-northwest of Warsaw. It has manufactures of cement, candy, and thread. Founded in 1429, it had become a wealthy city by the mid-17th century when, like so many other Polish cities, it was devastated by the Swedish invasion. Occupied by the Germans in both world wars, during World War II it was under East Prussia's administration and was called Mielau. Pop. (1946) 13,817.

MLJET, 'm-lyĕt (Ital. Meleda, ancient Melita), island, Yugoslavia, off the Dalmatian coast and in the Adriatic Sea, about 65 miles southeast of Split. Narrow and mountainous, it stretches for about 25 miles and covers an area of 38 square miles. It is believed by some to be identical with the Melita on which St. Paul was shipwrecked, though he probably was stranded on Malta.

MNASON OF CYPRUS, mentioned in Acts 21:16 as one who entertained Paul and his companions on their journey from Caesarea to Jerusalem. The Greek admits of two constructions to the passage rendered in the King James version of the Bible as "and brought with them one Mnason of Cyprus, an old disciple, with whom we should lodge." It may mean "brought with them one Mnason," or "bringing us to Mnason." Probably the home of this "old disciple" was in some village on the road between Caesarea and Jerusalem, and the distance of 60 or 70 miles made it convenient to break the journey there.

MNEME, nē'mē (Gr. Μνήμη, Memory), in Greek mythology the goddess of Memory and one of the three muses worshipped in early times on Mount Helicon in Boeotia, her sister muses being Aoide (Song) and Melete (Meditation). Later mythology increased the number of the muses to seven, and then to nine.

MNEMONICS, nē-mŏn'ĭks, a system of artificial aids for assisting the memory. Such methods have been in use for many years. They consist in the main of some mechanical scheme or framework which, by association, is linked with what one desires to memorize. One of the oldest forms of verbal mnemonics is contained in the familiar lines, "Thirty days hath September, April, June and November"; and many similar devices are known. The medical student has an unlimited number of mnemonic aids whereby to remember the names of the muscles, to call to mind the relation of important viscera and to determine accurately the order of the cranial nerves. Students of logic have for years made use of mnemotechnic devices to remember the parts of the syllogism. (See Logic.) Some of these devices are based on topical association, whereas others depend on number and letter relations, and a great many which have been in vogue in recent years are based upon sound and rhyme relations. A general criticism that can be made of most of these memory-schemes is that the processes are purely mechanical, and that one of the fundamental features in memory, that is, memorizing for the sake of idea-relation, is given up for the sake of word-relation. For certain classes of students and for certain lines of work these mechanical schemes may be of much service; for salesmen, for instance, who need to bear in mind immense quantities of goods with their wholesale, retail and discount prices. But as a process of general culture, improving mind-facilities, so called, mnemotechnics are mechanical. See also Memory and Its Disorders.

MNEMOSYNE, nē-mŏs'ĭ-nē, in Greek mythology, the goddess of memory; the mother of the nine muses of Zeus. She was a daughter of Uranus.

MNESICLES, nē'sĭ-klēz, Athenian artist of the age of Pericles. He was the architect of the gate-porches, called "Propylaea," to the Acropolis, which required five years for their construction (437–433 B.C.). Attic legend tells that he fell from the top of the Propylaea and was mortally injured. That night in a dream Athena came to Pericles and showed him an herb which would cure his artist; and the following day Mnesicles was restored to health.

MNESITHEUS, Athenian physician, probably of the 4th century B.C. Very little is known of him, but Galen and other early physicians often speak of him in praise. The comic poet Alexis quotes him.

MNESTER, celebrated Roman pantomime actor: d. 48 A.D. He attained his reputation as a mime in the reigns of Caligula and Claudius. When he failed to respond to the advances of Messalina she complained to Claudius that he had disobeyed her orders. The emperor had him flogged, and sternly commanded that he never again disobey the empress. Subsequently charged with participating in Messalina's orgies, he vainly pleaded that he had only obeyed the imperial command. He was executed.

MNEUIS, or **MNEVIS**, the name of Egypt's sacred bull worshipped at Heliopolis in the temple of Ra. His cult closely resembled that of Apis at Memphis where both cults were combined in the temple.

MNICHOVO HRADISTE, 'm-nyĭ'kô-vô hrà'dyĭsh-tyĕ, town, Czechoslovakia, in northern Bohemia, nine miles north-northeast of Mlada Boleslav, on the left bank of the Jizera River. Its industries include manufactures of footwear and textiles. Here the convention of Münchengrätz met on Sept. 28, 1833, and representatives of Austria, Prussia and Russia agreed to guarantee the integrity of the Turkish Empire. During the Austro-Prussian War of 1866 it was the scene of a Prussian victory over the allied Austrians and Saxons on June 28, 1866. Pop. (1947) 3,733.

MOA, one of a race of extinct ratite flightless birds of New Zealand, forming the family Dinornithidae and composed of several genera (see Dinornithes) ranked between the apteryx and the epiornis. They had comparatively small heads, small eyes, bills of varied form, great legs, wings almost or quite wanting, and the head and neck bare. The feathers of the body were rounded, loose in part, downy, with great aftershafts. Some of the feathers were black with red-brown bases and white, others blackish brown or yellowish. They varied in size from

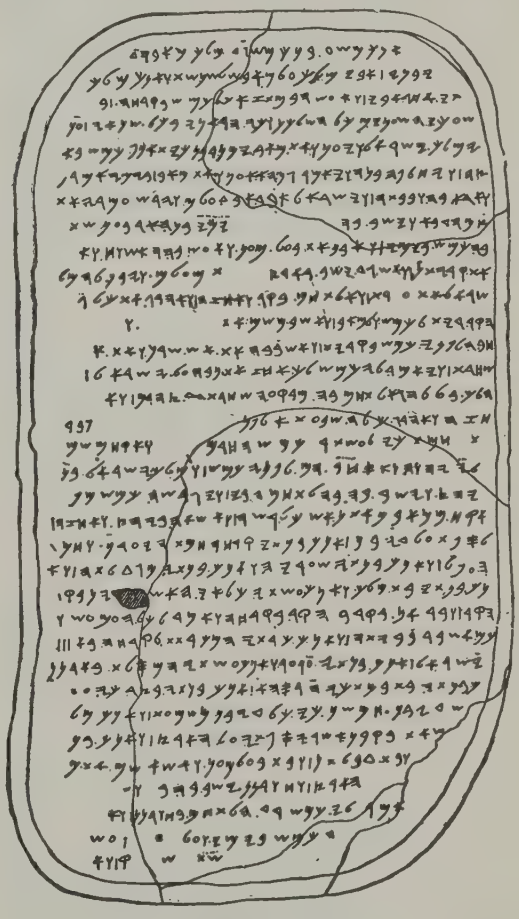
that of a turkey (*Anomalopteryx parva*) so that of the huge *Dinornis robustus*, 12 feet in height. The remains of these birds are found in dunes, bogs, caves and places where the aborigines had fed upon their flesh. Not only bones, but pieces of skin, ligaments, feathers and eggs have been recovered. It is probable, indeed, that these birds became extinct only four or five centuries ago. The Maori traditions recount the wars of extermination which their early ancestors waged against the moa; and the natives profess to show the spot where the last one was killed. Clearer traditions say that the habits of the birds were sluggish, but their disposition fierce. They lived in pairs, fed upon green shoots and fern roots and made rude nests on the ground. Their anatomy was elaborately described in a memoir by Sir Richard Owen, *Extinct Birds of New Zealand* (London 1879), and a general account of them may be found in Alfred Newton's *Dictionary of Birds* (London 1896); and Lionel Rothschild's *Extinct Birds* (London 1907).

MOAB, mō'ăb, the name of an ancient Semitic people who occupied a rugged tableland between the Dead Sea and the Arabian desert, about 3,000 feet above sea level, now forming the southwestern part of the Hashemite Kingdom of the Jordan. Their land was also called Moab. The Dead Sea and the Jordan River formed its boundary on the west, while its other boundaries varied with the successes or defeats of the Moabites in wars with other nations. The "plains of Moab" spoken of in the Bible (Numbers 22:1) are the hot plains of the Jordan valley. The origin and meaning of the name is not known. Some authorities accept Moab, the son of Lot, as the ancestor of the Moabites (Genesis 19:37); others maintain that the expression "children of Lot" (Deuteronomy 2:9, 19) comes from the earliest known name of the land, which was Lotan, or Lot. Some authorities believe the Moabites settled there as early as the 13th century B.C. They had reached a high degree of civilization by the 9th century B.C.

The Moabites were a pastoral people and their country was noted for its rich pasturage and its wine. The institution of monarchy was established among them much earlier than among the Israelites, but their language, religion, and customs were similar to those of the Israelites, who regarded them as kinsmen. Their supreme god was Chemosh, who held among them much the same position as Jehovah among the Hebrews. Moab was for a time tributary to Israel under David and Solomon, but regained its independence either during the latter part of Solomon's reign or during the subsequent reign of Rehoboam. Later the Moabites paid tribute to the Assyrians. They were eventually invaded by tribes from the Arabian desert and their national existence came to an end in the 6th century B.C.

MOAB, town, Utah, county seat of Grand County, on the Colorado River; altitude 4,000 feet; 100 miles southeast of Price. It is on federal and state highways. The town is an important trading center for the livestock, fruit, and agricultural products raised in the area. Vanadium and uranium mines are nearby. To the north is the Arches National Monument and to the east La Sal National Forest, both tourist attractions. Pop. (1950) 1,274.

MOABITE STONE, a block of black basalt, about 3 feet 8½ inches high, and 2 feet 3½ inches wide, and 1 foot 1¾ inches thick, with rounded top but square base, on which there is an inscription of 34 lines in Hebrew-Phoenician characters, discovered in 1868 by the Reverend F. A. Klein at Dhiban, the Dibon of ancient Moab, just north of the river Arnon. An attempt made to purchase it led to a quarrel among the Arabs of the district, who thought to make more money out of it by selling it in pieces, and the stone was destroyed partially by being heated and then by throwing water upon it, which caused it to break into three large and several small pieces. The larger pieces were secured for the Louvre by Charles Clermont-Ganneau, a French Orientalist, who was also fortunate in obtaining a paper impression of the inscription before the stone was broken. The inscription dates about 850 B.C., and is the oldest known in the Hebrew-



Moabite Stone.

Phoenician form of writing. It was erected by Mesha, king of Moab, and is a record of his wars with Omri, king of Israel, and his successors. The narrative also treats of Mesha's wars against the Edomites.

Consult Ginsburg, Christian David, *The Moabite Stone* (London 1871), and Bennett, W. H., *The Moabite Stone* (Edinburgh 1911).

MO'ALLAQAT, or **MU'ALLAQAT.** See Arabic Literature.

MOAT. See Fortifications.

MOBANGI. See Ubangi.

MOBERLY, mō'bĕr-lĭ, **George,** English prelate: b. St. Petersburg (now Leningrad), Russia, Oct. 10, 1803; d. Salisbury, Eng., July 6, 1885. He was educated at Winchester and Oxford. He was consecrated Bishop of Salisbury in 1869, and in 1872 urged omission of the damnatory clauses from the Athanasian Creed.

MOBERLY, Robert Campbell, English theologian: b. Winchester, July 26, 1845; d. Oxford, June 8, 1903. He was the son of George Moberly (q.v.). He was educated at Winchester and Oxford, and became regius professor of pastoral theology at Oxford in 1892. He was honorary chaplain to Queen Victoria (1898–1901) and chaplain in ordinary to Edward VII in 1902.

MOBERLY, city, Missouri, Randolph County, altitude 872 feet, is located 34 miles north of Columbia, on the Missouri, Kansas and Texas, and the Wabash railroads, in a grain-growing and dairy-farming region. Valuable deposits of fire clay and coal are nearby. The Wabash Railroad has machine and car repair shops here. Manufactured products include syrups, dairy products, shoes, hosiery, and farm implements and equipment. Moberly Junior College, coeducational, is here. Platted in 1866, on the watershed between the Missouri and Mississippi rivers, Moberly received a city charter in 1873. Pop. (1950) 13,115.

MOBILE, mō-bēl', city, Alabama, county seat of Mobile County, is situated in the southwestern part of the state on Mobile River at its entrance to Mobile Bay, 31 miles from the Gulf of Mexico, 179 miles from Montgomery, the capital of Alabama, and 139 miles by rail from New Orleans. The city is built on a level, sandy plain from six to 35 feet above the river and rising gradually to the tablelands, 200 to 300 feet above sea level, six miles west of the river.

Transportation Facilities.—Mobile is served by the Alabama; Tennessee and Northern; Frisco; Gulf, Mobile and Ohio; Louisville and Nashville; and the Southern railroads. Daily air service is provided by major air lines operating between New York and New Orleans, La., with connections for cities east, west and north of Mobile; and between Mobile and Jacksonville, Fla., with connections for the West Indies, Central and South America. The Port of Mobile has one of the largest and most complete systems of warehouses and docks on the Gulf of Mexico, and ocean-going vessels provide adequate service to all ports of the world as well as to ports on the Atlantic and Pacific coasts. The Alabama, the Tombigbee, the Black Warrior rivers and the Intracoastal Canal provide inland water routes over which barge lines are operated between Mobile and Demopolis, Selma, Montgomery and Birmingham. There is also an inland waterway between Mobile and West Florida cities, and to Louisiana and Texas ports. The ship channel is maintained by the United States Government at a minimum depth of 32 feet, and a minimum width of 300 feet. Across the outer bar the channel is 36 feet deep and 450 feet wide. Bates Field, the municipal airport, embraces 163 acres, and here too is the Army's Southeast Air Depot, Brookley Air Force Base.

Education.—Mobile and Mobile County jointly operate an excellent public school system. In 1950 there were 48 schools for white children in Mobile and Mobile County, with over 30,223 pupils enrolled, and 32 schools for colored children with about 13,827 pupils enrolled. The school buildings are of modern construction, most of them being built of brick or concrete and tile. One of the noteworthy buildings of the Mobile school system, from a historic standpoint, is Barton Academy, the first public school erected in the State of Alabama. It was completed in 1836. The building has been remodeled and is in use as an elementary school. Spring Hill College, established in 1830, is a senior college of arts and sciences offering courses leading to the degrees of bachelor of arts, bachelor of science, and bachelor of science in Commerce. Courses in law, medicine, and engineering also are offered.

Religion.—When the first settlement was established by the French in 1711, the "Church" was one of the original buildings, and one of the present churches stands nearly on the same site. There are in the city more than 150 churches for white and colored persons. They represent practically all religious denominations.

Public Parks.—Mobile has 13 public parks, including famous Bienville Square, in the heart of the city. In addition, there are several private parks that are open to visitors.

Places of Interest.—There are numerous attractions for tourists in Mobile. One of these is the home of Joseph Jefferson, famous actor, who created the role, *Rip Van Winkle.* Seasonal attractions include Azalea Trail, a 17-mile flower-lined drive over city and suburban streets, passing Bellingrath Gardens in Mobile County, one of the famous beauty spots of the South. The flowers along the Trail bloom in late winter and early spring and each year attract thousands of visitors. Another seasonal attraction is the Mardi Gras festival, observed each year for 10 days prior to Ash Wednesday, or the beginning of Lent. It was in Mobile that the first Mardi Gras was celebrated in this country. Another annual attraction is the Alabama Deep Sea Fishing Rodeo, held in the waters of lower Mobile Bay and the Gulf of Mexico. It attracts fishermen from all parts of America.

Mobile was the home of Admiral Raphael Semmes, Confederate naval officer; of Gen. Braxton Bragg of the Confederate Army; of Gen. William C. Gorgas, U.S.A., who rid the Panama Canal Zone of yellow fever; of William A. Alexander, who designed and built a submarine during the Civil War; of Rufus W. King, Vice-President of the United States, 1853–1857, and before that United States senator and minister to France.

Industries.—Mobile has experienced a remarkable industrial development within recent years. The city was selected by the federal government as a site for a United States Army air depot, which was constructed at an initial cost of $8,000,000. The output of Mobile factories in 1950 exceeded in value $250,000,000.

The leading industries include shipbuilding and repairing, the manufacture of paper and pulp, the reduction of bauxite, cotton manufactures, lumber, timber and related products, oil refining, clothing, the mixing of fertilizers, naval stores extraction, processing of food products, paint manufacture, steel fabrication, and the manufacture of asphalt and asbestos roofing The pulp and paper industry includes a large kraft paper

mill, bag plants, a plant for the manufacture of insulation board, and a boxboard plant. The textile industry operates two cotton cloth mills and a garment factory. There are hardwood lumber mills, pine wood saw mills, creosoting plants, veneer plants, millwork plants, and cabinet, cooperage, box, plywood, and panel plants.

Mobile is also the center of a large wholesale and retail business. In 1950, the jobbing business alone amounted to about $50,000,000 a year, and the retail business was estimated at $140,000,000 a year.

Commerce.—Mobile is one of the leading cotton markets and shipping points of the country, the natural center of the Alabama-Tombigbee cotton region, the nearest tidewater shipping port for the soft coal, iron, cement, lime, lumber, turpentine, resin and agricultural products of the southern, central and northern sections of Alabama and large amounts from upper Mississippi and lower Tennessee. It is the third largest tropical importing city in the United States; has steamship connection with Europe, Cuba, Central America, Mexico, Windward and all Caribbean Sea islands, Brazil, the Pacific Coast of the United States, western coast of South America, Australia, New Zealand, Hawaiian Islands, Japan and China, via the Panama Canal, to which Mobile is the nearest, deep, fresh water railroad-connected city in the United States. In 1928 the Alabama State Docks Commission completed a State ocean terminal occupying a site of 550 acres on the west bank of the harbor at a cost of $12,000,000. The accommodations of this ocean terminal are open to all shippers, shipping lines, and railroads. The principal units of the terminal are four piers, several cotton warehouses, a coal and bulk material handling plant, a terminal railway, and an industrial canal.

Mobile's commerce was further facilitated by the completion in 1927 at a cost of $2,500,000 of the Cochrane Bridge, stretching 10½ miles across the headwaters of Mobile Bay and spanning the widest gap on the entire route of the Old Spanish Trail (U.S. 90) from Florida to California. The one-half mile Bankhead tunnel under Mobile River, completed in 1941, the first underwater vehicular tunnel in the south, shortened the distance across the bay by nine miles. The Florida-Midwest, and federal highways No. 31, 43 and 45 also converge at Mobile.

Commerce statistics for the city of Mobile include for exports cotton and subsidiary products, coal, coal oil, crude oil and by-products, iron, iron pipe, cement and cement products, lime, whiting, fuller's earth, lumber and allied products, tar, turpentine, resin, livestock, canned foods and other canned products, flour, lard, salted and pickled pork, salt, soap, cotton goods and notions, gun shells and other ordnance stores, general foundry and machineshop products, agricultural and mill machinery, belting and other mill supplies, fire and burglar-proof safes, scales, typewriting, computing and other machines; also store and office furniture and fixtures, electrical supplies, hardware, cordage and ship supplies, hay, grain, garden, flower and field seed, household furniture, sewing machines, musical instruments. Among its imports, are Cuban magnetic iron ore, zinc, ammonia sulphate, sulphur ore, iron pyrites, sodium nitrate, fire brick, tropical fruits and other products, coffee, molasses, sugar, sisal grass, chicle gum, mahogany logs and lumber, iron, satin, sandal, lignum vitae woods, dye woods, cork, cigars, Cuban tobacco, Peruvian bark, opium and other drug materials, camphor, sponges, bird lime, dried bone, phosphate rock, asphalt, lemons, limes, olives and olive oil, raisins, currants, nuts, prunes, matting, bamboo poles and rods, together with a miscellaneous line of embroideries, laces, rugs, and toys. The importation of Cuban molasses or black strap, used in the making of stock feed and explosives, has increased to a greater extent than any other article of late years.

Hospitals.—There are six hospitals in Mobile, including City Hospital, operated by the Sisters of Charity for the city, and the United States Marine Hospital. Two new hospitals costing $4,000,000 each replaced Mobile Infirmary and Providence Hospital in 1951.

Government.—Mobile has a commissioner form of government, with three commissioners, including a mayor. One commissioner is elected every two years for a term of six years, and while in office each commissioner serves for two terms of one year each as mayor. All departments of the municipal government, except the Police and Fire departments, are housed in the City Hall, which was the Confederate Armory in Mobile during the Civil War, and which recently was remodeled. The County Court House, housing the offices of the county government, stands directly across the street from the City Hall.

Population.—In 1930 Mobile's population was 68,202. In 1940 it was 78,720 with about 101,000 in the metropolitan area. In 1950 the incorporated city of Mobile had a population of 129,009 with 228,835 in the metropolitan area. Sixty-one per cent of the population come within the classification of "native-born whites"; 3 per cent are foreign born; 36 per cent are colored.

Federal Buildings and Services.—The federal government has a court house and office building in Mobile. Besides the courts and the post office, the federal services maintained in the city include the Gulf Division headquarters of the United States Coast Guard; the district office of the Army Engineers; Customs Office; lighthouse depot for the Gulf Coast; a bureau of the Department of Commerce; an Immigration Bureau; Weather Bureau; branch of the Social Security Board; an Employment Service Office; Internal Revenue Office; Public Health Service Station; branch of the Steamboat Inspection Service, and other agencies.

Water Supply.—The water supply of Mobile is municipally owned and operated, and comes from springs, unfiltered, with gravity flow into the city. The total capacity is 20,000,000 gallons daily. There are two reservoirs with a capacity of 10,000,000 gallons each. The daily water consumption of the city is between 13 and 18 million gallons. A $7,000,000 industrial water supply system provides up to 50,000,000 gallons a day.

Utilities.—Natural gas is piped to Mobile from the Louisiana and Mississippi fields in high-pressure mains having a capacity of 160,000,000 cubic feet a day. Electricity is supplied by the Alabama Power Company.

History.—Twenty-seven years after Columbus discovered America, Spanish explorers mapped Mobile Bay, but it was not until 1699, nearly two centuries later, that adventurous Frenchmen under the leadership of Le Moyne d'Iberville landed on Dauphin Island at the entrance to the bay with the first colonial enterprise ever attempted on the shores of the Gulf of Mexico. In 1711, after

many vicissitudes, Jean Baptiste Le Moyne, Sieur de Bienville, the younger brother of d'Iberville, established a permanent colony on the present site of Mobile under the name of Fort Louis de la Mobile—the first part of the name honoring le Grande Monarque Louis XIV and the last part for the Mauvilla tribe of Indians who lived in the vicinity. France ceded Mobile and the territory east of the Mississippi to Great Britain in 1763. The practical British explored the rivers and sounded the bay, leaving excellent maps for historians. They improved the fort and built up a good trade with the Indians.

In 1779 Spain declared war on Great Britain. Hostilities spread to the American Colonies. The Spanish under young Bernardo Galvez captured the fort at Mobile after burning a large part of the town and the banner of St. George was lowered. The colony remained under the rule of Spain for 33 years, and enjoyed a good trade with Europe. During this period the Spanish king favored many of his subjects with large grants of land and consequently many titles to property in Mobile today date back to the Spanish occupation.

In 1800 Napoleon forced Spain to cede to France the province of Louisiana, then in 1803 President Thomas Jefferson purchased Louisiana from France. The treaties were not clear and although the United States from then on claimed Mobile, Spain insisted that Mobile was in Florida and not in Louisiana and Spanish officers remained in authority. The population in 1803 was 810 people.

When the war of 1812 broke out between the United States and England, the Spanish ports were being used by the English. President James Madison directed General James Wilkinson to capture Mobile, and the community came under the American flag in April, 1813. Gen. Andrew Jackson made his headquarters in Mobile in several of his Indian campaigns and for a large part of the time during the war with England in 1812 and 1813.

After the War of 1812 was over, the community grew rapidly and was incorporated as a city in 1819. The first newspaper was published in 1812; Spring Hill College was built in 1830. America's first Mardi Gras was staged here in 1830. Gas lighting was introduced in 1835. Barton Academy was completed in 1836. In 1836 the Cedar Point Railroad was started to parallel the bay to Dog River. In 1848 a charter was granted for building a railroad from Mobile to the Ohio River. Construction of the Custom House was started in 1852. Street railways were laid in 1861. The population of Mobile at that time was nearly 15,000 people.

When the clouds of civil war gathered over the Nation, Alabama seceded from the Union and in January, 1861 the flag of the Republic of Alabama was unfurled over the state capitol.

Alabama became one of the Confederate States of America in March, 1861. Mobile was one of the most important Confederate ports and one of the famous naval battles of American history was fought in Mobile Bay by Federal and Confederate fleets in August, 1864. In that battle Federal forces took command of Mobile Bay but the city did not fall into the hands of the Union troops until April 12, 1865, three days after General Robert E. Lee surrendered at Appomattox.

Then followed the difficult reconstruction period, but the city soon renewed its march of progress. Railroads pushed their lines into the city, the harbor was further improved and in 1870 an appropriation of $50,000 was made to survey the channel from Mobile to deep water. The first project was for a channel 13 feet deep and 200 feet wide. The present channel is 32 feet deep by 300 feet wide and 31½ miles long.

Mobile took an active part in the World Wars. Large shipbuilding plants were operated here and the port was very active in shipping supplies to American forces overseas.

Consult Powell, L. P., ed., *Historic Towns of the Southern States* (New York 1900); Hamilton, P. J., *Colonial Mobile* (Boston 1910); id., *The Founding of Mobile 1702–18* (Mobile, 1911).

MOBILE, river, Alabama, the name given to the western stream or mouth of the river formed by the junction of the Alabama and Tombigbee rivers. The eastern stream or mouth is called the Tensaw. From this junction of the rivers to the head of Mobile Bay is, in direct line, about 25 miles, but the winding of the stream makes its course about 50 miles long. The Mobile and Tensaw communicate at several points, but the two streams enter Mobile Bay at the city of Mobile by the same delta. With its tributaries the Mobile River drains an area of about 42,300 square miles. There is a large river traffic between Mobile and the Birmingham area via the Black Warrior River, and with Montgomery via the Alabama River.

MOBILE BAY, a bay on the southwest coast of Alabama, forming an estuary into which, through the deltaic mouths of the Mobile and Tensaw branches, flow the waters of the Tombigbee and the Alabama rivers. That part of the estuary to which the name of Mobile Bay is applied is about 30 miles long and from 9 to 12 miles wide. At the entrance to the bay are long narrow strips of land, almost obstructing the entrance. On the east, at Mobile Point, is a revolving light; on the west, on Dauphin Island, are Forts Morgan and Gaines. Between Dauphin and the mainland is Grant's Pass, a strait connecting Mobile Bay with Mississippi Sound. The United States government has improved the harbor, and from a shallow entrance, which was a hindrance to navigation, there is now a channel through which vessels drawing 30 feet and over can enter and ascend to the wharves of Mobile city.

MOBILE BAY, Battle of, a battle of the Civil War fought Aug. 5, 1864. Mobile Bay is divided from the Gulf of Mexico by Mobile Point east and Dauphin Island west, about three miles apart; but the ship channel of less than 2,000 yards, narrowing to 750 outside, closely skirts Mobile Point. The latter was defended by Fort Morgan; the island by Fort Gaines, too far from the channels to be very formidable. Between them stretched a line of piles and torpedoes, but leaving a narrow channel for blockade-runners. Within was the Confederacy's most powerful ram, the *Tennessee,* and three small unarmored paddle-wheel gunboats. Commander David Farragut's Federal fleet comprised the monitors *Tecumseh, Manhattan, Winnebago* and *Chickasaw,* forming an inshore column; and the wooden sloops of war *Brooklyn, Hartford* (flagship), *Richmond, Lackawanna, Monongahela, Ossipee* and *Oneida,* forming an

outer one, each with a smaller mate lashed to the port side, to ensure passage through if the starboard vessel's machinery should be disabled. Farragut would have led in the *Hartford,* but the *Brooklyn* had machinery for picking up torpedoes. The advance began at 5.30 A.M., and firing at 7.05; the instructions were to keep east of the red buoy, but the *Tecumseh* went west and was sunk by a torpedo. The *Brooklyn* stopped in fear of a like disaster, and the *Hartford* with Farragut passed her and led the fleet into the bay. Each vessel received much damage from Fort Morgan, but they silenced its guns by destructive fire, and all succeeded in anchoring three miles up. One Confederate gunboat was then sunk, one was captured, and one took refuge next the fort; the *Tennessee* was to be attacked after dark, but itself assailed the flagship, and after a desperate fight was disabled, and surrendered. The *Lackawanna* collided with the *Hartford* and nearly sank her. The Union fleet lost 52 killed, 170 wounded, and 113 drowned in the *Tecumseh;* the Confederates 10 killed, 16 wounded, and 280 prisoners, besides the casualties in the fort. Both forts surrendered a few days later. The Union fleet carried 159 guns, and the officers and crews numbered 3,000 men. The Confederate fleet carried 22 guns and 470 officers and men.

MOBILES, mō'bēlz, in art, three-dimensional abstract compositions made of metal, wood, plastic, glass, cardboard, wire, thread, or any combination of these. The composition is essentially a combination of two-dimensional shapes, together with the light and space between them. The mobile differs from abstract sculpture, first, in that it is not a continuous solid form, although the work of some modern sculptors like Henry Moore resembles the mobile in this respect; and, second, in that it is intended to move in certain predetermined ways. Its characteristic movement is, in fact, the most distinctive feature of the mobile (hence the name).

In order that the construction may move, it must be suspended freely in space. This is generally done by hanging it from a ceiling, although some mobiles are mounted on pedestals or stands in such a way as to allow freedom of movement. The possibility of movement is derived from the fact that the component parts of the composition are held together by thin wire (or thread), which allows them to swing in response to the circulation of air, the only motive force involved.

Aesthetically as well as mechanically, the most important element in a mobile is balance. Although the composition moves, it must also be in dynamic equilibrium. Balance is secured by the skillful handling of shapes and space relationships, and by the proper use of color, which can add to or reduce the apparent massiveness of the component forms. The artistic problem is to secure balance without sacrificing variety or complexity of design.

Although mobiles are usually composed of abstract shapes, realistic forms like leaves, fish, or birds are sometimes employed as well, without necessarily being combined to constitute a realistic whole. A related art form called the *stabile* retains the airy spatial quality of the mobile but lacks its power of movement.

The mobile as an art form is a very modern development. Its creator is Alexander Calder (1898–), an American artist, who began working in wire sculpture about 1930 and had his first one-man show in Paris in 1931. From the beginning, his aim was to suggest movement in his abstract constructions; not satisfied with this, he went on to install mechanisms and motors which actually moved the parts. The next step was the creation of forms that would move "naturally," without mechanical aids—that is, mobiles.

Since their origin in the 1930's, mobiles have won widespread acceptance as genuine art forms, and the work of Calder and others in this genre has received international recognition. Mobiles have become increasingly popular as decorations in homes and places of business. They have also been put to more pragmatic use as a means of displaying small articles of merchandise in shop windows and on counters. Since no elaborate technical training is required, the creation of original mobiles has become a popular hobby as well. Schools have found them an excellent way to introduce children to the excitement of artistic creation.

Consult Sweeney, James J., *Alexander Calder,* rev. ed. (New York 1951); Lynch, John, *How to Make Mobiles* (New York 1953); id., *Mobile Design* (New York 1955).

MOBILIER, Crédit. See CRÉDIT MOBILIER OF AMERICA.

MOBIUS, mû'bî-o͝os, **August Ferdinand,** German mathematician: b. Schulpforte, Germany, Nov. 17, 1790; d. Leipzig, Sept. 26, 1868. He was educated at Leipzig University, and became professor of astronomy there in 1816. He also studied at Göttingen under the eminent mathematician and astronomer Karl Friedrich Gauss. From 1844 Möbius was director of the Leipzig observatory. His writings in pure mathematics —and in particular his chief work *Der barycentrische Kalkul* (1827)—were of importance to the development of analytic projective geometry, especially in the use of homogeneous equations and the geometric principle of duality (of which he was an independent discoverer). His son THEODOR MÖBIUS (1865–1890), an authority on Old Norse philology, was professor of Scandinavian languages and literature at the University of Kiel (1865–1889).

MOBY-DICK, mō'bĭ dĭk, Herman Melville's greatest novel, was published in London and New York in 1851. The English edition, somewhat bowdlerized, appeared under the title of *The Whale* and was presented to the public ostensibly as a description of whales and the whale fisheries. The work is really made up of three elements. One of these is a fairly full and accurate account of American whaling customs in the 1840's and the natural history of the sperm whale. The second is an exciting narrative depicting the hunt for a particular white whale, Moby-Dick, by mad Captain Ahab, who has previously lost one leg to its ferocious jaws. The third element is philosophical commentary upon human life and fate. This last has been variously interpreted. Some find the book an involved allegory representing the revolt of Satanic Ahab against his God. To others the white whale symbolizes evil, and Ahab is a Promethean figure who courageously struggles against it. Melville, however, leaves little doubt of his intention to show Ahab as a rebel protesting against fate and as one who considers the individual capable of warring

against the forces of nature which limit his powers. Whatever he symbolizes, Ahab's final failure reveals the tragedy of unconquerable pride. So rich in symbolism is the style of the book that every reader can interpret the underlying philosophy according to his own prejudices. Some even read the book as pure adventure, though there can be no question of its author's desire to present moral and philosophical ideas as well as entertainment. *Moby-Dick* has been called "the one undoubted classic" of American literature.

TYRUS HILLWAY,
Associate Professor, Colorado State College of Education.

MOCCASIN, mŏk'ă-sĭn, among American Indians (the word is of Algonquian origin), a one-piece, heelless shoe formed of undressed soft leather, usually deerskin, seamed at the instep and heel. The Plains Indians added a hard sole of rawhide. Moccasins were decorated with porcupine quills until white traders made beads available. Sturdy and comfortable, moccasins have become popular as house shoes in soft leather and as outdoor shoes in heavy leather. The usual type has the vamp gathered to the edge of a U-shaped tongue over the instep. They are often lined.

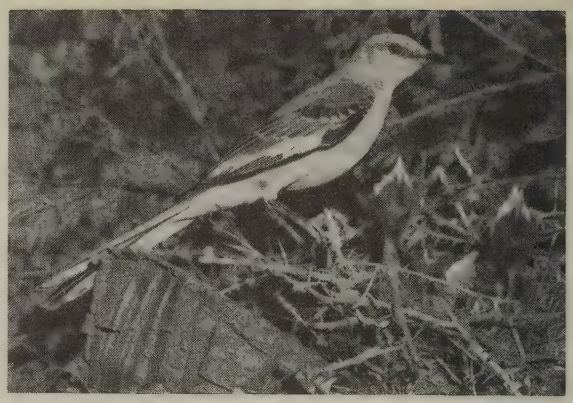
MOCCASIN-FLOWER. See LADY'S-SLIPPER.

MOCHA, mō'kȧ (Arabian MUKHA, mŏŏ-kä'), town, Yemen, in Taiz Province, on the Red Sea, 45 miles north of Bab el Mandeb Strait and 105 miles south of Hodeida. During the 16th and 17th centuries it was a flourishing port from which was shipped the fine Arabian coffee that became known by its name. The town declined steadily in the 19th century. Pop. (1948) 600.

MOCHA STONE. See AGATE.

MOCK ORANGE, a name commonly applied to any shrub of the genus *Philadelphus,* family Saxifragaceae (saxifrage). In the United States the name is also applied to the southern buckthorn (*Bumelia lyciodes*), the cherry laurel, the Osage orange, and several other shrubs and trees. In Australia it is the common name for the native laurel (*Pittosporum undulatum*). See also SYRINGA.

MOCKINGBIRD, mŏk'ĭng-bûrd, an American bird, *Mimus polyglottos polyglottos,* the eastern species in the United States ranging from Maryland through Ohio, Illinois, Iowa, Nebraska, and south to the Gulf of Mexico, with a few found as far north as Massachusetts and the Great Lakes; the western species ranging through central California south to Vera Cruz, Mexico. The bird is about the size of a robin, though more slender. Its average adult length is about 10 inches, with a wing spread to 15 inches. Its plumage is a pale brownish gray above, grayish white below, with white wing and tail patches. It has a beautiful and exuberant song of its own, a long sequence of notes in great variety, each phrase repeated several times in succession, and it is also able to imitate the calls of many other birds. The mockingbird often sings at night, especially on bright moonlight nights. In the South, it begins to sing in February and continues



Allan D. Cruickshank from National Audubon Society

A mockingbird at her nest.

singing throughout the spring. It makes its nest of coarse twigs lined with roots and grasses, in thickets and low trees; its eggs, 3 to 6, are pale bluish green in color, flecked with brown, and take 14 days to hatch. There are two or three annual broods. The bird shows great courage in defending its nest from enemies, especially snakes. During the spring and summer its food consists largely of insects, such as grasshoppers, ants, flies, boll weevils, wasps, even spiders and caterpillars. In autumn it eats the berries of wild trees and shrubs, such as sumac, wild grape, Virginia creeper, barberry, and bittersweet. It is the state bird of Arkansas, Florida, Mississippi, Tennessee, and Texas.

MOCQUEREAU, mô-krō', **Dom André,** French musicologist: b. Tessoualle, near Cholet, France, June 6, 1849; d. Solesmes, Jan. 18, 1930. He was educated in Paris and while still very young appeared as a cellist in Jean Charles Dancla's chamber music concerts. He entered the Benedictine Order at Solesmes in 1875, and under Dom Joseph Pothier made a special study of Gregorian chant, in which he became an acknowledged authority. In 1889 he founded the *Paléographie musicale,* a publication devoted to bringing out, in quarterly fasicles, studies and facsimiles of Gregorian manuscripts; he remained its editor until 1928.

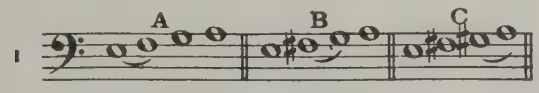
His studies in the rhythmical interpretation of Gregorian music are contained in *Le nombre musical grégorien ou rythmique grégorienne* (vol. 1, 1908; vol. 2, 1927). Unlike his teacher, Dom Pothier, he discarded the textual accent and divided the melody accentually according to what he believed to be guides to rhythmical nuances found on early plainsong manuscripts. This method, which allows accents to fall on weak text syllables, has not gone unchallenged, and, when the Solesmes monks were entrusted with the preparation of the new *Editio Vaticana* by Pope Pius X in 1904, his rhythmical signs were omitted.

Dom Mocquereau was also a founder of the *Revue grégorienne* in 1911 and, in the summers during the 1920's, taught at the Pope Pius X School of Liturgical Music in Manhattanville, N.Y.

MODDER, mŏd'ĕr, river, Union of South Africa, in Orange Free State. It rises northeast of Bloemfontein and flows west for about 225 miles to join the Riet River, a tributary of the Vaal, about 22 miles southwest of Kimberley. It came into con-

siderable prominence during the Boer War of 1899–1902; along its banks at Maagersfontein the British were driven back with great loss in 1899, and at Paardeberg the Boer general, Cronje, surrendered in 1900.

MODE, *in music,* (1) the manner of arranging the tones and half-tones in a scale, this general designation being always accompanied by a qualifying adjective, as Dorian mode, minor mode. Greek music, from which our modern music has been evolved, had an elaborate system of nine modes, which were afterward extended to 15. Authorities vary considerably as to the differences between the modes; it is certain, however, that they were the outgrowth of an earlier Greek music, the basis of which was the tetrachord. A tetrachord is a short scale of four notes, one of the intervals being a half-tone and the others whole tones, for example:

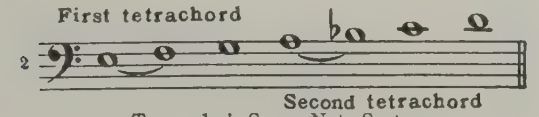


(A) Dorian tetrachord, half-tone, 1/2; (B) Phrygian tetrachord, half-tone, 1/2; (C) Lydian tetrachord, half-tone, 1/2. The slur indicates the half-tone.

The tetrachords were probably named after the people that originated them.

Until the time of Terpander (7th century B.C.) all Greek music seems to have been confined to the limits of a tetrachord. The lyre, which was then used merely to give the singer the pitch, had but four strings, each capable of sounding but one note. It was tuned in one of the ways shown above, though the notes written should be understood to be merely relative, each singer tuning his lyre to suit his own voice.

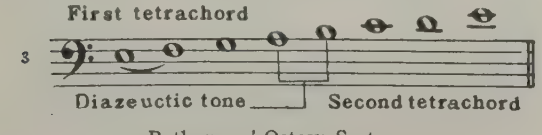
Terpander increased the compass of the lyre by adding a second tetrachord to the first, using the highest note of the first for the lowest of the second, thus making an incomplete scale of seven notes.



Terpander's Seven Note System.

The middle note, A, belonging to both tetrachords, was called *Mese* (middle) and had somewhat the function of our modern keynote. It will be noted that the two tetrachords are both Dorian, which was the characteristic and favorite Greek tetrachord rather than the foreign Phrygian or Lydian.

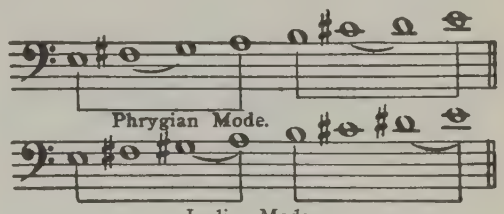
Pythagoras (582 B.C.) is the reputed author of the octave system (the foundation of our modern system). He probably learned it during his visit to Egypt, where it is said to have been in use for many centuries before. By this system the two tetrachords, instead of having a note in common, were separated by a whole tone, called the diazeuctic tone or tone of disjunction.



Pythagoras' Octave System.

A was still the keynote or Mese, though no longer the middle or connecting note. Terpander's was called the conjunct system and Pythagoras' the disjunct system. The latter as above printed constituted the Dorian mode, which may be defined as two Dorian tetrachords separated by the diazeuctic tone, embracing the compass of an octave. Terpander's system, not having this compass, cannot strictly be called a mode. Music seems to have developed on both these systems simultaneously in Greece, though finally that of Pythagoras supplanted Terpander's and became universal.

By replacing the two Dorian tetrachords with two Phrygian or two Lydian the modes of the same name were formed.



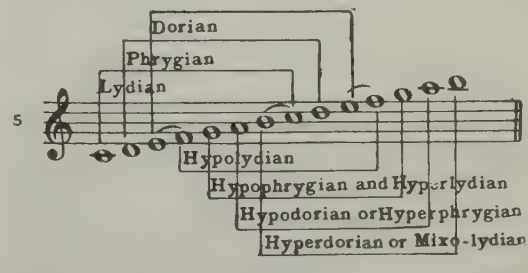
Lydian Mode.

These three were the principal modes. Each had two auxiliary modes, one commencing a fourth below and distinguished by the prefix *hypo,* the other commencing a fourth above with the prefix *hyper.* The complete list of the nine original modes is as follows:

I. Dorian.
II. Phrygian.
III. Lydian.
IV. Hypodorian or Æolian.
V. Hypophrygian, or Ionian.
VI. Hypolydian.
VII. Hyperdorian or Mixolydian.
VIII. Hyperphrygian or Locrian.
IX. Hyperlydian.

A convenient way to remember them is to imagine a series of scales, all of natural notes, and an octave in compass, beginning on each of the seven natural notes. It should be remembered that the pitch is entirely relative; each of these modes might begin on the same actual sound. The Mese or Keynote is the fourth note of each scale.

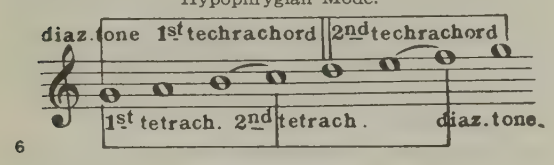
On examination it will be seen that the three Dorian modes are each formed of two Dorian tetrachords, the three Phrygian modes of two Phrygian tetrachords and the three Lydian modes of two Lydian tetrachords. In the three principal modes the diazeuctic tone separates the tetrachords. In the hypo-modes it is the



lowest note and in the hyper modes it is the highest note. In all the hypo and hyper modes the tetrachords are conjunct like those of Terpander. It will be seen that two of the hypos

correspond exactly with two hypers, namely, the hypophrygian and the hypodorian are the same as the hyperlydian and the hyperphrygian. It will be observed, however, that the arrangement of the tetrachords and the diazeuctic tone are not the same.

Hypophrygian Mode.



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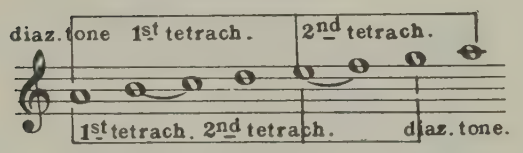
Hyperlydian Mode.

Hypodorian Mode.



Hyperphrygian Mode.

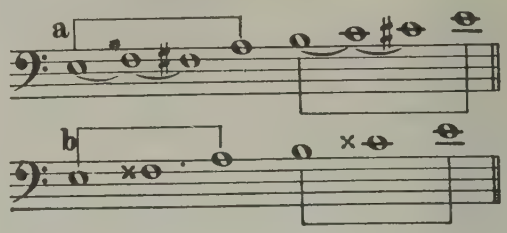
Each mode was said to have its characteristic quality or sentiment; the Dorian seems to have been the favorite one for heroic utterance, while the Lydian was said to be languishing and erotic.

The modes were afterward increased to 15, at least three of which were mere transpositions by octaves of earlier modes. In fact some theorists hold that the later development of the Greek modes completely changed their original significance and that instead of their being different arrangements of whole and half tones in a scale they were all identical in formation and were in fact merely Dorian modes of different pitch. If this is so they should not be called modes at all, but keys, as in modern music. The modern system of equal or even temperament (see TEMPERAMENT) adopted and developed by Johann Sebastian Bach early in the 18th century and in general use since the middle of the 19th century, would thus appear to have been known to some extent among the ancient Greeks. The titles of the modes seem to contradict this theory, but the subject is so confused and the different theories so difficult of proof that wide differences of opinion will probably always exist. The complete list of the 15 modes is as follows, the pitch given being said to be the accepted one for each mode (or key):

Fourths below	Originals	Fourths above
Hypodorian (A)	Dorian (D)	Hyperdorian or Mixolydian (G)
Hypoionian (B♭)	Ionian or Iastion (E♭)	Hyperionian (A♭)
Hypophrygian (B)	Phrygian (E)	Hyperphrygian or Locrian (A)
Hypoæolian (C)	Æolian (F)	Hyperæolian (B♭)
Hypolydian (C♯)	Lydian (F♯)	Hyperlydian (B♯)

The Greeks had in addition three kinds of chromatic modes and an enharmonic mode. They were all modifications of one or both of the interior tones of the tetrachord, the outer tones of which were never allowed to change their relative pitch. These modes had no significance in the history of music and were not adopted by the Romans.

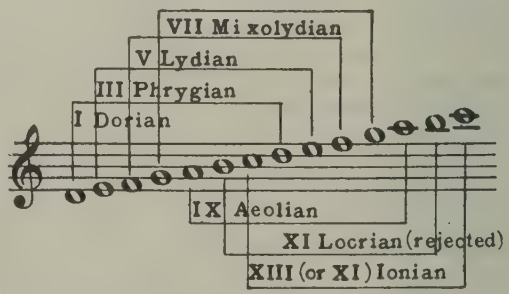
The following are examples of Pythagoras' original Dorian mode changed to (a) chromatic and (b) enharmonic:



The X is used to represent a sound one-quarter of a tone higher than the one preceding it.

The Gregorian or ecclesiastical modes are based on the Greek modes, though many errors and changes of names were made in arranging the system. Saint Ambrose, bishop of Milan, chose four of the ancient modes which he named Authentic. Gregory the Great is said to have added four others called Plagal. Six more were afterward added, making 14, two of which were declared imperfect and rejected. There are two kinds of Gregorian modes, the Authentic and the Plagal. The final or keynote of the authentic modes is the lowest note of its scale. Each authentic mode has an attending plagal mode, a fourth below it, the keynote of which is the same as that of the authentic mode. The plagal modes are therefore similar in this sense to the Greek modes, the fourth notes of which were said to be keynotes. The Gregorian modes are numbered, the authentic receiving the odd and the plagal the even numbers. In addition, the old Greek names are used, the plagal modes receiving the prefix hypo, but unfortunately the Gregorian and Greek titles do not correspond, causing great confusion in all references to the modes. Thus, the Gregorian Hypophrygian is the same as the Greek Hyperdorian and the Gregorian Hypomixolydian with the Greek Phrygian.

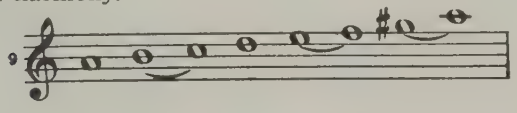
As in the Greek modes it is convenient to remember the Gregorian modes by imagining a series of scales, all of natural notes and an octave in compass, beginning on each of the seven notes. These are the authentic modes from which the plagal with their prefix hypo can be readily counted. (It should be remembered that the pitch is entirely relative as in the Greek scales).



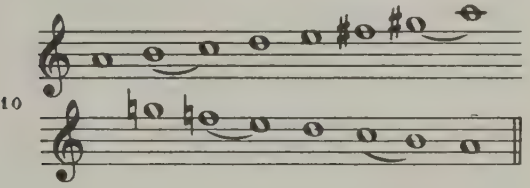
The Gregorian modes are still in use in the Roman Catholic Church, to the services of which it adds a remarkable effect of antiquity and solemnity.

In modern music but two of the old modes remain; the major, equivalent to the Greek Hypophrygian (or Hyperlydian) and the Gregorian Ionian, and the minor, equivalent to the Greek Dorian and the Gregorian Æolian.

The choice of these two modes took many centuries and must have been made by entirely unconscious perception of their greater value, especially of that of the major scale. A comparison of the major scale with the favorite Dorian mode of the Greeks shows that the modern ear desires the half tone at the top of a tetrachord instead of the bottom, as they did. Whether the favor in which the Dorian tetrachord was held by the Greeks is a proof that they thought their music *downward* and were therefore doing just the same as we do when we think ours *upward* is very doubtful, though a well-known theorist has advanced this clever idea. It is much more likely that the introduction of harmony caused a greatly increased recognition of the true function of the keynote, which, as we understand it, was unknown to the ancients. To us the keynote (in any octave) is the only rest point to the ear; all other notes of the scale trend toward it more or less strongly, and in the instance of an ascending major scale the seventh note (the so-called leading note) demands it more than any other note. This quality of motion and rest led to the greater importance of the major mode over the minor, the seventh note of which, being a whole tone distant from the keynote, lacked the great desire to progress these which is so important a characteristic of the major. Finally, probably by accident at first, the seventh note of the minor was raised so as to be but a half tone below the keynote; this form of the minor key is now known as the «harmonic minor,» and is the only one recognized in harmony.



But the distance from the sixth to the seventh being thus made a tone and a half, a very difficult interval to sing or treat melodically, the sixth was raised to secure smoother and easier passage upward and as the double change had made the upper part of the minor mode identical with the major it was argued that neither leading note nor raised sixth was necessary in descending, so both were restored to their original position in descending. This is known as the «melodic minor.»



(2) A term used in mediæval music to indicate the relative value of the Large, the Long and the Breve. Two kinds of mode existed, great and less, the first deciding the relation of the large to the long and the second that of the long to the breve. Both kinds could be perfect or imperfect. In great mode perfect the large is equal to three longs. In great mode imperfect it was worth but two longs. In less mode perfect the long was equal to three breves, in less mode imperfect it was equal to two breves. During the end of the 15th century and the beginning of the 16th musicians made extraordinary difficulties in their compositions by means of mode and prolation. See Greek Music; Meantone; Diazeutic Tone; Temperament.

George Gordon Thunder,
Revised by C. Leonard Stuart, *Editorial Staff of The Americana.*

MODELING. The production of a temporary plastic form to be later executed in permanent condition copying this original, or the forming of a facsimile of an original shape. Modeling can be done in reduced, enlarged or true proportions (*to scale*) according to their purpose. Modeling is usually done in clay, plaster of paris, wax, wood or other plastic material. The sculptor almost invariably makes a model of his creation before treating it in the permanent medium. Gold and silver smiths and jewelers reduce their conceptions to plastic models before going to the expense of evolving the design in the precious metals. The shipbuilder usually works from a reduced facsimile or model of the desired construction. The artist, in producing the effect of relief or solidity in a plane (flat) surface, terms his shading and perspective manipulation «modeling.»

MODENA, mō′dĕ-nä, Italy, a city and province, part of a former duchy now comprised partly in the compartimenti of Emilia and Tuscany.

The city, capital of the province, pleasantly situated in a fertile plain, between the Secchia and the Panaro, 25 miles northwest of Bologna, is built with great regularity, and has spacious streets and fine promenades on the site of its former ramparts. It consists of three parts — the citadel, the old town and the new town. The most remarkable edifices and establishments are the cathedral, a fine specimen of Romanesque, adorned in front with numerous curious sculptures; the Campanile, erected in 1224–1319, 335 feet high, and one of the finest in North Italy; the church of San Francisco, a handsome Gothic structure, containing a fine terra cotta group of the Descent from the Cross, by Begarelli; several other churches; the ducal palace, begun in the 17th century, but enlarged by numerous modern additions, and forming a splendid structure, now used as a military school; the Albergo Arti or building containing the municipal collections, especially the Estense Library of over 150,000 works, including several thousand MSS., and the picture-gallery embracing a large collection of paintings, several of them by the first masters; the theatre, the baths, the university, several other important educational institutions and charitable endowments. The manufactures consist chiefly of silk goods, silk twist, woolen and hempen cloths, leather and glass; the trade, however, is unimportant. Modena is the see of an archbishop, and possesses various important public offices. It existed under the Etruscans, and as Mutina rose to great splendor under the Romans. It afterward was repeatedly sacked by the northern invaders, whose ravages left few vestiges of its ancient grandeur. Pop. 91,416.

The former duchy bordering on Tuscany, Lucca, Bologna, Mantua and Parma, had an area of 2,573 square miles which in 1901 contained a population of 785,930. It is now divided into the provinces of Modena and Reggio in the compartimento of Emilia, and the province

of Massa e Carrara in the compartimento of Tuscany. Modena was made a duchy in 1452, the ruler being Duke Borso of the house of Este, to which noble family Modena had belonged since 1288. In 1796 the French took possession of the country and Modena afterward was included in the Cisalpine Republic. By the Treaty of Vienna in 1815 it was restored to the Este family. The duchy took an important part in the turbulent proceedings of the 19th century, which led to the consolidation of the Italian kingdom in 1860, when Modena proper was formed into a separate province with an area of 1,002 square miles. Pop. 421,022.

MODERN INSTANCE, A, by Mr. William Dean Howells, was published in 1882. The action takes place in Maine and in Boston, with one scene in Indiana, and the time is fixed by reference to events of the Hayes-Tilden presidential campaign of 1876. The story is one of domestic infelicity, and the tracing out of the gradual coarsening, physical and moral, of the husband, Bartley Hubbard, is a masterly piece of character delineation. The social and business life of a small town and the every-day experiences of a provincial couple embarking on life in Boston are presented with the author's happiest realism, and save the book from gloom or morbidness. Indeed, it is only after the reader has finished with the story, and finds himself impelled to reflect upon it, that he realizes how great a moral tragedy it portrays. 'A Modern Instance' raises more ethical questions than do most of Mr. Howells' novels, but the author is in no sense a propagandist. It may be his disinclination to commit himself on one of these questions that leads him to leave unsettled the fate of two of the chief characters. This indeterminate ending is condemned by those readers who complain that Mr. Howells' novels get nowhere, and the limitations and unheroic qualities of Marcia Hubbard are disapproved by those women who maintain that the author is never fair to their sex; but his kindly, photographic reproduction of the little things of modern life and his insight into social conditions lead those who sympathize with his ideas of fiction to rank this novel among his best.

William B. Cairns.

MODERN LANGUAGE ASSOCIATION OF AMERICA. A society for the advancement of the study of modern languages and their literatures, through the promotion of friendly relations among scholars, the presentation and discussion of papers at meetings and the publication of results of investigations by members. It was incorporated in Baltimore in 1883, and membership is open to all persons on payment of $5 annual dues. For geographical reasons a central association was incorporated in 1903, which holds meetings in the Western States independently of the parent body. The association issues an annual volume of publications in quarterly instalments. There are about 4,000 members, these including university professors, college libraries, and foreign scholars.

MODERN MACCABEES, Knights of the. See Maccabees, The.

MODERN PAINTERS, by John Ruskin (5 vols., 1843, 1846, 1856, 1860), was begun in order to vindicate the landscape painting of J. M. W. Turner against adverse criticism. For this purpose Ruskin set forth systematically and extensively what he conceived to be the æsthetics of visual art — not of landscape painting only, but of painting in general and sculpture as well, with lengthy illustrations from their supposed analogues in literature — the whole in an elaborate a priori analysis of the "Ideas Conveyed by Art" and of the several "Faculties" which produce or appreciate them. Incidental to the defense of Turner, however, come appraisals of other painters, and refutations of critics, which confuse the theoretical treatment; this, as the work goes on, becomes more and more arbitrary, digressive, desultory, and wilful, at the same time that it retires more and more from the reader's attention; until, though formally preserved throughout, it has lost, long before the end, all effectiveness as an organization of the subject.

The key to 'Modern Painters' lies much less in its systematic structure than in its theory — pervasive across all divisions and subdivisions, and persistent throughout Ruskin's 17 years of conscientious modification of opinion by study — concerning the general relation of man and art to nature. The notion that art can improve upon nature seemed to Ruskin presumptuous — a part of the pagan and Renaissance tendency to magnify man and his works. His own faith taught that man is depraved and fallen, and that there is no good in him. Hence Ruskin would minimize man's function in art; he is definitely opposed to human tradition, and is ready, with Wordsworth, to throw away the books and discard the schools. Greatness in art, moreover, commonly assumed to be an effect of human powers, is nothing of the sort; it is a divine gift. "Composition," "imagination," "idealization," and the like — which rearrange actuality to the ends of art — are not achievable by any amount of conscious effort; given humble labor, these things may, perhaps, be added unto it by God; they are a grace vouchsafed to the elect. Such is the evangelical tinge given by Ruskin to the ancient theory of the artist's divine inspiration, and to the modern preoccupation with the functioning of the subconscious. This Calvinism as regards man is supplemented, as regards nature, by that strange "natural religion" — Platonistic rather than Platonic — which so fascinated impulsive hearts in the late 18th and early 19th centuries. Nature, never having fallen, is sinless, pure and perfect; nature is the copy of a divine pattern; let man, then, follow nature; for

> . . . . every prospect pleases,
> And only man is vile.

Marking the belated arrival in art criticism of the naturalistic revolt against the humanistic tradition of the Renaissance, 'Modern Painters' is to the criticism of painting very much what Wordsworth's 'Prefaces' and many of his poems — which Ruskin quotes continually — are to the criticism of poetry.

So understood, it becomes, historically, a document in that romantic anti-humanistic "return to nature" which, for thoughtful persons of the newer generation, was ended by the publication of Darwin's 'Origin of Species' in 1859. We know now that nature is perfectly wasteful and unintelligent, perfectly cruel and unmoral, that her beauties cover up a million

festering murders; and that to the human demand for ethical values her answer is silence. Moreover, even could nature be held to be a copy of divine ideas, many modern readers would yet believe, with the Aristotelian æsthetics of classicism and the Renaissance, that art, embodying human concepts of perfection, can shape things actually nearer to their ideal than they ever occur in nature. But Ruskin had grown up in the old «natural religion,» and he never shook it off, though he long survived Darwin's exposure of nature's ways. His books are probably the last great monument to the belief — which Butler, Paley, Wordsworth, Emerson, and the Bridgewater Treatises illustrate in various modes — that nature, being the copy of a divine archetype, is always right; that all her phenomena are intended by God to teach man something; hence, that she is full of symbols, providential adaptations, and final causes, is analogous to morals and religion, exists for man's ethical discipline, and is his monitress and preceptress, ever lessoning him for his good. The worship of nature is with Ruskin literally a part of religion; and he feels that the whole duty of art is to praise God by recording nature's works with the utmost possible fidelity to their supposed ethical ends.

Ruskin's criticism of art thus treats almost exclusively the representation of natural objects — a representation unmodified except upon considerations moral or religious. In the place of æsthetic standards he unblushingly substitutes on the one hand religious or ethical standards, and on the other hand standards which may be called «physical.» In accordance with the first, he looks to art for a didactic content, for assertions or statements as explicit as those of literature; commends this «literary» quality in pictures like Tintoretto's, whose real excellence lies elsewhere; and makes many excursions into the field of poetics and literary criticism: discussing at length, for example, that distinction which had exercised the romantic school of literary critics in the early 19th century — the distinction between *Imagination* and *Fancy;* discussing, again, in a celebrated passage, the «Pathetic Fallacy» of the poets, based as it is upon the assumption that men's moods have a sympathetic analogue and symbol in nature. Again, from Ruskin's assumption that nature is morally perfect arise his impatience of classical and Renaissance attempts to improve upon her by «idealization» or «generalization,» and his inconsistent condemnation of Salvator Rosa and of the Dutch and Flemish realists because when they might have painted to edification, they chose to record «ugly» or «base» things.

In fact, ultimately even the religious and ethical standards fail to modify Ruskin's insistence upon representation; he uses them rather, as in the cases just noted, to confirm his preferences, glorifying as accordant with the divine scheme whatever art appeals to him, and denouncing whatever art does not as tainted with sin. Likewise, though in his theoretical analysis he allows a considerable place to «idealization» and «imagination» — once even speaking of «over-fidelity» — yet practically he is always minimizing their functions and explaining them away. It is with distinct relief, and with a certain unction and fervor, that he always returns to representation pure and simple, detailed and loving and humble, which after all is his religion of art.

This ultimate triumph of the «physical» criterion has several interesting results. Engrossed in representation, Ruskin disregards or contemns abstract design and spatial pattern, and is almost insensible to Oriental art, which so largely depends upon these. Hence his later disparagement of Whistler and of «le Japonisme.» Hence also his commendation of the Pre-Raphaelite movement, whose mediævalist revolt against the Renaissance, and whose love of detailed naturalistic representation («foreground»), coincided with his own, but which he rather reinforced and championed than originated or even decisively influenced. Hence, finally, the net historical effect of 'Modern Painters' in making for sincerity and humility against the sentimentality, cockiness, prettiness, and *emphase* of contemporary British art.

These evils, thought Ruskin, were traceable, as has been suggested, to the Post-Raphaelites of the Renaissance tradition, with their supposed tricks and insincerities and «rules of composition» and «practice of the schools.» He must clear all that away, old masters and all — especially the Bolognese eclectics, and Claude, Poussin, and Hobbema — and establish in their place nature and Turner. The underlying assumptions of his method have been shown; its most important and most bulky actual product remains to be mentioned: the remarkable collection of observations of natural phenomena which Ruskin adduces to illustrate Turner's rich and various fidelity to nature. Large portions of the first, third, fourth, and fifth volumes, are given to description, in word and in picture, of nature's endless phases — the effects of wind and mist, the structure of rocks and the radiation of light, the organization and appearance of mountains, of clouds, of tree-trunks, boughs, and leaves, of waves and foam and reflections in water.

The reader who is interested in 'Modern Painters' for its place in Ruskin's life or for its own evolution in time as a piece of writing will of course read it as it was written; but if he approach it for pleasure he will be well advised to begin with the third volume. The first two volumes, to be sure, contain some of its most gorgeous passages — like the celebrated word-pictures of Aricia and of Turner's 'Slave-Ship.' Yet these, after all, are purple patches; and the body of the text is undistinguished, or distinguished chiefly by a crude parallel structure in couplets — a parallelism often both forced in thought and actually bungled in execution. Ruskin's early fondness for inordinately long sentences, again here, too often leads him to jumble into a single perfervid period the material that should have formed a paragraph: instead of ordering it from sentence to sentence into separate articulated stages of thought, he pours it all volubly out into one heavy lump of a sentence loosely glued together by *and, but, for, only, as, so* and *so that.*

But in the 10 years between the publication of the second and the publication of the third and the fourth volumes Ruskin's style underwent a sobering and clarifying change. He had had much practice in writing — had meanwhile published 'Seven Lamps of Architecture' (1849), 'The Stones of Venice' (1851–53), 'Pre-Raphaelitism' (1851), and 'Lectures on

Architecture and Painting (1854); and his ideas having gained acceptance, he now spoke with more of authority and plainness, and less of the hot rhetoric of controversy. Here also he virtually abandoned the dreary scholasticism of the aesthetic system he had so aridly set forth in the second volume. The reader, then, who plunges *in medias res* is more likely to reach at once the heart of *Modern Painters*. He will feel at once the essential nobility of a book which, often wilful and mistaken, is never mean and is often tonic. He will realize it as the outcome of many years' disinterested study both of nature and of painting, as a wholehearted appreciation of Turner, who would be great upon any theory however arid, and as a valuable collection of natural facts and appearances, recorded by a loving observer, indefatigable students, and exquisite draughtsman, whose wilfulness vanishes when he is face to face with nature. Here lie its real strength and lasting value; it will probably stand as a great appreciation of a very great painter and, as a veritable treasury of things observed.

SAMUEL LEE WOLFF.

MODERN SCHOOLS OF DRAMA. See SCHOOLS OF DRAMA, MODERN.

MODERNISM, the designation applied to the advanced opinion of publicists and lecturers which in recent times were at variance with traditional orthodox doctrines. Official restraint was laid on them when Pope Pius X during his pontificate (1903–1914) enunciated the following doctrines in his famous encyclical *Pascendi gregis* issued in 1907. Dealing with the "modernist" movement and propaganda, and, speaking of it he laid down the following conditions and regulations, which he ordered Roman Catholics to follow. He said in part:

"In the first place, as regard to studies, we shall not ordain that scholastic philosophy be made the basis of the sacred sciences. It goes without saying that if anything is met with among the scholastic doctors which may be regarded as an excess of subtlety, or too carelessly stated; if there is anything which does not square with later discoveries, or which is altogether destitute of probability, we have no desire whatever to propose it for the imitation of present generations. And let it be clearly understood above all things that the scholastic philosophy we prescribe is that which the angelic doctor has bequeathed to us. . . . In the vast and varied abundance of studies opening before the mind desirous of truth, everybody knows how the old maxim describes theology as so far in front of all others that every science and art should serve it and be to it as handmaidens. . . . Anyone who in any way is found to be imbued with modernism is to be excluded without compunction from these offices, and those who already occupy them are to be removed. . . . Equal diligence and severity are to be used in examining and selecting candidates for holy orders. . . . It is also the duty of the bishops to prevent writings infected with modernism, or favorable to it, from being read when they have been published, and to hinder their publication when they have not. No book or paper or periodical of this kind must ever be permitted to seminarists or university students. . . . The Holy See neglects no means to put down writings of this kind, but the number of them has now grown to such an extent that it is impossible to censure them all. . . . It is forbidden to secular priests, without the previous consent of the ordinary, to undertake the direction of papers or periodicals. . . . Let priests hold as sacred the authority of their prelates, let them take it for certain that the sacerdotal ministry, if not exercised under the guidance of the bishops, can never be either holy, or very fruitful or without blemish. . . . It is impossible to approve in Roman Catholic publications of a style inspired by unsound novelty which seems to deride the piety of the faithful and dwells on the introduction of a new order of Christian life."

Consult Marchesan, A., *The Program of Modernism: Reply to the Encyclical of Pius X* (New York 1908); Walshe, T. J., *Principles of Catholic Apologetics* (St. Louis 1927); Vidler, A. R., *The Modernists Movement in the Roman Church: Its Origins and Outcome* (New York 1934); Burtt, E., *Types of Religious Philosophy* (New York 1939).

MODESTO, mō-dĕs'tō, city, California, and Stanislaus County seat, altitude 90 feet, on the Tuolumne River, 80 miles southeast of Sacramento. It is served by the Southern Pacific and Tidewater Southern railroads and United Air Lines.

Modesto is primarily an agricultural community with several large canneries and a large refrigeration plant for processing frozen food. Meat, poultry, dairy products, olive oil, crates, chemicals, beer, wine, and paint are other industries employing from five to twenty persons.

The city was first settled in 1870, became the county seat in 1871, and was incorporated in 1884. It has a council-manager form of government. Pop. (1950) 17,389.

MODICA, mō'dē-kȧ (ancient MOTYCA) commune, Italy, in Ragusa Province, Sicily, five miles south-southeast of Ragusa. It has a beautiful 17th century church, an ancient castle, a monastery with 15th century ruins of a church. Five miles east is the Cava d'Ispica, a noted limestone ravine with numerous grottoes, containing cave dwellings and early Christian tombs.

The area is chiefly agricultural. Important industries are olive oil, wine, cheese, macaroni, and candy. Pop. (1936) 27,928.

MODJESKA, mō-jĕs'kȧ, **Helena,** Polish actress: b. Kraków, Oct. 12, 1844; d. Bay City, Calif., April 8, 1909. Her father was a musician. In 1861 she married an impresario, Gustave S. Modrzejewski, and after playing some years on tour, she made her début at Kraków in 1865 and in Warsaw in 1868. Her husband died in 1868 and in September of that year she married Count Bozenta Chlapowski with whom she came to America in 1876. She had already become famous in her rendering of Shakespearean and other heroines of tragedy, and in 1877 she appeared at San Francisco, in *Adrienne Lecouvreur,* in which for the first time she acted in English. In Great Britain she made her particular success as Mary Stuart, Lady Macbeth, and La Dame aux Camélias.

Consult her autobiography (published after her death), *Memories and Impressions* (New York 1910).

MODJESKI, Ralph, Polish-American civil engineer: b. Kraków, Poland, Jan. 27, 1861; d. Los Angeles, Calif., June 26, 1940. He

came to the United States with his mother in 1876 and, for American naturalization, he changed his name to Modjeski, his mother being the celebrated tragedienne, Helena Modjeska. He was graduated at the College des Ponts et Chaussées, Paris, at the head of the class and with honors. He designed and built many bridges in the United States, the largest among them being the government bridge at Rock Island over the Mississippi; the Mississippi River bridge at Thebes, Ill.; the McKinley bridge at Saint Louis; the new Bismarck bridge over the Missouri; bridges over the Columbia River at Vancouver, Wash., and Celilo, Ore.; two bridges over the Willamette River at Portland, Ore. He also constructed two bridges over the Mississippi River,—one at Memphis, Tenn., and one at Keokuk, Iowa, and was consulting engineer on the design and construction of the Ohio River bridge at Metropolis, Ill., for the Chicago, Burlington and Quincy Railroad and of the Thames River bridge at New Haven, Conn., for the New York, New Haven and Hartford Railroad. He was one of the three members of the commission on the Quebec bridge. He was chief engineer of the Delaware River Bridge, Philadelphia. He received an honorary degree of doctor of engineering at the University of Illinois in 1911; was a past director and member of the American Society of Civil Engineers; member of the British Institute of Civil Engineers and of the American Institute of Consulting Engineers; past president and member of the Western Society of Civil Engineers; member of the Franklin Institute and of the American Railway Engineering Association. He died at Los Angeles, Calif., 26 June 1940.

MODLING, mĕd'lĭng, Austria, a town located at the foot of the Wienerwald, Lower Austria, to the south of Vienna, on the Mödling stream, and junction of two railways. On account of the cool summers it is a favored summer resort and has three Catholic churches, among them the Early Gothic Saint-Othmar Church, dating from 1454, with its Romanesque baptistry, a Protestant church, town-hall, city park with theatre and Kurhaus, a military academy, high school and Obergymnasium, agricultural school with curricula in brewing, horticulture, etc.; also an orphan asylum with its church, chalybeate baths, sanatorium, etc. Its chief industries are wine growing, manufactures of iron and metal wares, tubular boilers, sash and door works, varnish and lacquer works. Pop. 18,677.

MODOC (mō'dŏk) **INDIANS,** a tribe of northern California, which in 1872, after firing on the United States forces, retreated to the neighboring lava beds, and there defended themselves desperately till June 1873, murdering two peace commissioners sent to them and killing or wounding 132 of the troops. Their chief, Kintupash, commonly known as Captain Jack, and three others, were hanged in October; about 100 who had not followed him were permitted to remain in California, the rest (145) were transferred to Indian Territory. The Modocs originally made their home on the shores of Lost River and Klamath Lake. They called themselves the *Maklaks,* or "the people." They were always a warlike tribe, and when not fighting immigrants and settlers in the early days were warring with other tribes in their neighborhood. Of the surviving Modocs, about 200 reside at the Klamath Reservation in Oregon.

MODULATION, *in music,* the act of moving through the sounds in the harmony of any particular key to those of another, or the transition from one key to another. The simplest form is the change from a given key to one nearly related to it, namely, its fifth (dominant), fourth (subdominant), its relative minor, or the relative minor of its fifth. Modulation into the dominant is effected by introducing in any of the parts (rarely in the bass, however) the sharp fourth, which becomes the seventh of the new key; thus, in the key of C, F would be sharpened to effect the transition into the key of G; to pass from that key into that of D it would be necessary to sharpen the C, and so on. In modulating into the subdominant the flat seventh is used, which becomes the fourth of the new key; thus, in passing from the key of C to that of F, the flat B is introduced, and from the key of F to that of B the E is flattened, and so on. The modulation into the relative minor is generally effected by employing the sharp fifth, which becomes the seventh or leading note of the new key; thus in changing from C to A minor the G should be sharpened. As almost every piece ends on the key in which it begins, a second modulation becomes necessary; this is effected by flattening the fifth of the new key if the first modulation is into the dominant and sharpening the fourth if in the subdominant. When a composer aims at a striking effect he may change from some given key to one quite unrelated, from C to E for instance; but such transitions should be sparingly employed. Modulation is generally resorted to in long compositions to please the ear with a fresh succession of chords. (See also Mode; Music; Temperament). Consult Groves, 'Dictionary of Music and Musicians' (Vol. III, pp. 232–240, New York 1910).

MODULE, from the Latin *modulus,* a small measure. A term used in architecture to designate an arbitrary unit of measurement on which to base the proportions of an order or the entire edifice. Architects have usually accepted either the diameter or half-diameter of a column at the base of a shaft as a unit or module for the order. This unit they divide into a graduated scale in minutes or parts according to individual selection. Vignola took a semi-diameter as his module and divided it into 12 parts for the Tuscan and Doric and into 18 for the other orders. Talladio, Cambria, Desgodetz, Le Clerc and others accepted a module in 30 divisions or minutes for all orders. Others have taken the entire height of the column and divided it into 20 parts for the Doric, 22½ for the Ionic, 25 for the Corinthian, and so on, one of which is taken for the module by which to regulate the other parts. Perrault's module was a third part of the diameter of shaft at base, to avoid a fraction. See Orders of Architecture.

MODULUS, *in mathematics,* a constant referring to properties of matter in certain equations. As stress is proportional to strain within the elastic limits, some constant quantity may be introduced, making this proportionality into an equality. In dealing with strength of mate-

rials, such a constant is called a modulus. Thus in Hooke's law, which says that extension, as of a bar, is proportional to the extending force, the constant which converts this proportionality into an equality is called the modulus of elasticity, or Young's modulus, and is denoted by E. Where the elastic limits are not exceeded, the transverse strain—the contraction per unit of transverse dimension—is from one third to one fourth the longitudinal strain. The symbol denoting the modulus of elasticity of bulk is K. It denotes the lessening of bulk per unit cube, usually per cubic inch, under hydrostatic stress. See also ELASTICITY; STRENGTH OF MATERIALS—*Laws of Elasticity.*

MOE, mō'ė, **Jørgen Engebretsen,** Norwegian poet: b. Hole, Ringerike, Norway, April 4, 1813; d. Kristiansand, March 27, 1882. Though a clergyman and eventually bishop of Kristiansand, he is best known for his collection of Norse folklore made in collaboration with Peter Christian Asbjørnsen and published as *Norske folkeeventyr* (1842–1844; 1852; 1871). English translations of these tales were made by Sir George Dasent and others. Some of Moe's poems and children's stories have become Norwegian classics. His works other than the folk stories were published in a two-volume collection, *Samlede skrifter,* in 1877.

His son (INGEBRET) MOLTKE MOE (1859–1913) was also a folklorist, edited collections of folk songs and tales made by his father and Asbjørnsen, and from 1899 was professor at Oslo University.

MOELLER, mûl'ẽr, **Henry,** American Roman Catholic prelate: b. Cincinnati, Ohio, Dec. 11, 1849; d. there, Jan. 5, 1925. His elementary studies were pursued at St. Joseph's parochial school and he afterward attended St. Francis Xavier's College. In 1869 he went to the American College at Rome, where he followed a seven years' course in philosophy and theology. He was ordained priest in the church of St. John Lateran, Rome, June 10, 1876, and after his return to Cincinnati was assigned to St. Patrick's Church, Bellfontaine, Ohio, and later appointed to a profesorship in Mount St. Mary's Seminary, remaining there until 1879. In 1880 Archbishop William Henry Elder named him chancellor of the diocese of Cincinnati, and on Aug. 25, 1900, he was consecrated bishop of Columbus, Ohio. On April 27, 1903 the Holy See appointed him titular archbishop of Areopolis and coadjutor archbishop of Cincinnati with right of succession, and on the death of Archbishop Elder, Oct. 31, 1904, he assumed charge of the archdiocese, the pallium being conferred upon him by Cardinal Gibbons Feb. 15, 1905.

MOELLER, Louis Charles, American genre painter: b. New York, N. Y., Aug. 5, 1855; d. Weehawken, N. J., Nov. 11, 1930. He worked for three years with his father, a decorative painter, studied art at Cooper Institute and the National Academy of Design, New York, and in Munich, Germany, with Frank Duveneck. In 1883 he established his studio in New York. He received First Hallgarten Prize (1884), and was elected associate (1894) and member (1895) of the National Academy. He is represented at the Corcoran Gallery, Washington, D.C., by the painting *Disagreement.*

MOELLER VAN DEN BRUCK, mûl'ẽr fän dĕn brōōk', **Arthur,** German writer: b. Solingen, Germany, April 23, 1876; d. 1925. He edited the works of Edgar Allen Poe in German (1901–1904), and was coeditor with Dmitri Merezhkovsky of the first German edition of the works of Fyodor Mikhailovich Dostoyevsky (1906–1915). The Nazis took their name for Germany, the Third Reich, from his book *Das Dritte Reich.*

MOERIS, Lake, mē'rĭs, Egypt, an ancient artificial body of water which formerly lay north of El Faiyum, and was described by Herodotus as constructed entirely by human industry. He reported it to be 350 miles in circumference and more than 250 feet deep, and said that the fishing was important and profitable. Moeris was connected by canal with the natural lake of Birket Qârûn and also by canal with the Nile. At the site of ancient Crocodilopolis (site of modern El Faiyum), near the entrance to the latter canal, two huge statues (mentioned by Herodotus) were unearthed late in the 19th century.

MOERITHERIUM, mē-rĭ-thē'rĭ-ŭm, a genus of primitive proboscidean mammals occurring in the Upper Eocene and early Oligocene of Egypt. Their remains have been found in the vicinity of ancient Lake Moeris. These mammals were about the size of tapirs and had a short proboscis and simple mastodont teeth. Later specializations led to the mastodons and elephants. See also ELEPHANT.

MOESIA, mē'shĭ-ȧ, a province of the ancient Roman Empire lying north of Thrace and Macedonia, extending to the Danube and the Black Sea, and corresponding in the main to modern Serbia and Bulgaria. Strabo described its original inhabitants as Thracians. The Romans first invaded it in 75 B.C., penetrating as far as the Danube, but it was not until 29 B.C., that it was finally subjugated.

MOFFAT, mŏf'ăt, **David Halliday,** American capitalist: b. Washingtonville, N. Y., July 22, 1839; d. en route to New York, N. Y., March 18, 1911. He began work in 1854 as messenger for the New York Exchange Bank, and in 1855 went to Des Moines, Iowa, to join his brother. He worked for a year there as clerk in the bank of A. J. Stevens and Company, then became teller of the Bank of Nebraska at Omaha. After that bank closed in 1860, he joined a partner in operating a stationery and general store in Denver, Colo. The store also contained the post office and was the agency for the Western Union Telegraph Company. In 1861 Moffat returned East to marry his boyhood sweetheart Fannie A. Buckhout of Mechanicsville, N. Y., and with her made his permanent home in Denver. He became cashier of the First National Bank there in 1865, and later its president. He was closely identified with the development of Denver and with the mining and railroad interests of Colorado. He was president of the Denver and Rio Grande Railroad in 1884–1891, financed the building of the Florence and Cripple Creek line, and promoted building of the Denver, Northwestern and Pacific (later the Denver and Salt Lake), still known as "the Moffat road." He died while on a trip to New York to finance its building. Moffat Tunnel under James Peak in the Rockies is named for him.

MOFFAT, mŏf'ăt, **Robert,** Scottish Congregationalist missionary to South Africa: b. Ormiston, Haddingtonshire, Dec. 21, 1795; d. Leigh, near Tunbridge Wells, Kent, Aug. 8, 1883. In early life a gardener, the London Missionary Society sent him in 1816 to Namaqualand, where he converted a local chief. At Capetown, in 1819, he married Mary Smith, daughter of a former employer, who aided him in establishing a mission station at Kuruman, in Bechuanaland, in 1825. He visited England during 1839–1843, and returned there for good in 1870. Besides pursuing his work in Bechuanaland, he frequently journeyed northward to visit the Matabele and other tribes. He translated the Bible, many hymns, and *Pilgrim's Progress* into Sechuana, the language of the Bechuanas, and wrote the notable *Missionary Labours and Scenes in South Africa* (1842). One of his daughters married David Livingstone (q.v.). John S. Moffat, a son, published *The Lives of Robert and Mary Moffat* (1885).

MOFFATT, James, Scottish theologian: b. Glasgow, July 4, 1870; d. New York City, June 27, 1944. He was educated at Glasgow University, and from 1896 to 1912 he was a minister of the United Free Church of Scotland. During 1911–1915 he served as Yates professor of Greek at Mansfield College, Oxford University, then returning to Glasgow to become professor of church history at the United Free Church College. In 1927 he relinquished this chair to go to the United States to assume the post of Washburn professor of church history at Union Theological Seminary, New York City. He made a notable translation of the Bible which bears his name. His numerous books include *Historical New Testament* (1901); *The Bible in Scots Literature* (1925); *Presbyterianism* (1928); *The Books of the Prophets* (1939).

MOFFETT, Cleveland Langston, American author and dramatist: b. Boonville, N. Y., April 27, 1863; d. Paris, Oct. 14, 1926. For many years he was a journalist in New York City, notably with the New York *Herald,* but from 1909 was a contributor to magazines. He published numerous books of adventure and some prose poems, among the latter being *A Vision of Christmas* (1917). The best of his plays were *Money Talks* (1906), *For Better or Worse* (1910), and *Greater Than the Law* (1912).

MOGADISCIO, mō-gȧ-dē'shō, East Africa, capital and chief seaport of Somalia (Italian Somaliland). Motor highways connect it with Kenya Colony, on the south, and Ethiopia, on the northwest. The town was captured by the Portuguese in the 16th century, and subsequently was held by the imams of Muscat. In the 19th century it became part of the domains of the sultanate of Zanzibar; and it was ceded to Italy in 1905. Pop. 55,000.

MOGADOR, mŏg-ȧ-dōr', Morocco, most southern port on the Moroccan Atlantic coast, 130 miles west of Marrakech. It is known to the Moors as Suera, and to the Berbers as Tassart. There is a considerable Jewish population. The town is situated on a projecting cliff which is separated from the mainland by a region of dunes. Leather goods and copper utensils are made. Mogador was built during 1770–1776. Pop. (1946) 32,000.

MOGILEV, mŏ-gē-lyôf', Soviet Union, city of the White Russian Soviet Socialist Republic, administrative center of a region of the same name, situated on both banks of the Dnepr (Dnieper) east of Minsk. The city is famous for its leather, bristles, and flint stone. Smelting is an important industry, and tobacco is manufactured. Mogilev was founded in the 13th century. At one time subject to the Poles, it was plundered by the Cossacks and the Swedes and several times was held by Russian forces prior to 1772, when it was annexed to Russia. Pop. (1939) 99,440.

MOGILEV PODOLSKI, mŏ-gē-lyôf' pŏ-dôl'yskĕ, Soviet Union, town of the Ukrainian Soviet Socialist Republic, on the left bank of the Dnestr (Dniester) southwest of Vinnitsa. There are flour mills and sugar refineries, and metal products are manufactured. In the Middle Ages, when it was an important center of the caravan trade, the town was inhabited largely by Moldavians, Armenians, and Greeks. Subsequently it was occupied by the Cossacks, Poles, and Turks, and was regarded as Polish territory in 1795, when it was annexed by Russia. Pop. 22,992.

MOGOLLON, mō-gŏ-yōn', **MESA,** the southern edge of the high plateau of Arizona, in the extreme south of Coconino County. The average altitude is some 8,000 feet. The mesa, which consists of limestone in part covered by lava, bears considerable pine forest.

MOGOLLON MOUNTAINS, a range in the southern part of Catron County, N. Mex., constituting the divide between the San Francisco and Gila rivers. It is over 30 miles long. The highest summits are Whitewater Baldy (10,892 feet), Mogollon Peak (10,778 feet), and Grouse Mountain (10,132 feet). The range consists of a thick succession of Tertiary volcanic rocks. Veins of silver and other ores are mined. It is largely forested, and has been included in Gila National Forest.

MOGUL, mō-gŭl, or **MUGHUL,** mo͝o'go͝ol, name applied to the dynasty of Mongol rulers of India. It was founded in 1526 by Baber (Babur, Babar), a descendant of Tamerlane and Genghis Khan. Under his grandson, Akbar the Great, the Mogul empire embraced central and northern India, and much of Afghanistan. On the death of Aurangzeb in 1707 the empire declined; and Bahadur Shah II, last of the Mogul emperors, was deposed by the British in 1857.

MOHACS, mo'hăch, Hungary, town on the right bank of the Danube, near the Yugoslav frontier and southeast of Pecs. It is the trading center of a rich agricultural region. Two noteworthy battles against the Turks were fought in the vicinity. In the first, Aug. 29, 1526, King Louis II was killed when the Hungarians were defeated by the forces of Sultan Suleiman I (or II), who captured most of Hungary. In the second, Aug. 12, 1687, Duke Charles of Lorraine won a bloody battle which hastened the end of Turkish rule over Hungary. Pop. 17,369.

MOHAIR, the commercial and technical name of the fleece of the Angora goat. The word comes to the English through the Old French *mohere,* from the Arabic *mukhayyar,* meaning mohair cloth. In color mohair is pure

white, except in rare cases, and grows in ringlets. The hairs composing a fleece are of varying lengths, but the average annual growth of the long hairs, which largely predominate, is about 10 inches. The hairs are not composed of epithelia, as is the case with wool, and therefore the felting property characteristic of wool is wanting. In fineness, mohair is variable with the individual animals, and is placed between the fine and coarse wools; in luster, durability, and strength it has no equal among fibers.

The only vitiating feature of mohair as it comes from the animal is the intermixture of an undercoat of lusterless, chalky white hairs; the hairs vary in length from one to three inches, and vary in total amount according to the breeding of the animal. This undercoat is known technically as "kemp," and the principal objection to it is that it does not take the fast dyes. It becomes necessary, therefore, to remove the kemp from the mohair used in the finest fabrics, and this work is done by a comb which, in removing the kemp, also takes out every mohair fiber of equal length or shorter than the kemp. This entails a loss ranging from 10 to 30 per cent, but the average loss lessens as better goats are developed.

The luster of mohair is very pronounced, and no amount of washing, dyeing, or other manipulation will dull it. Its durability is remarkable, and because of this fact it enters largely into goods of fine quality which are subjected to hard usage. Fast dyes have such an affinity for it that sunshine and storms have no effect on its brilliancy.

The uses of mohair are many. It is used in the manufacture of plush, and enters into such fabrics as alpaca, cashmere, and astrakhan. A high grade of mohair is derived from the goat ranches of Turkey, South Africa, and the southwestern United States.

MOHAIR GOAT, the Angora goat. See GOAT.

MOHAMMED. Mohammed was the founder of a religious system of belief, Islam (q.v.), which is now professed by some 300 million people scattered all over Asia, Africa, and southeastern Europe. Though born within the full light of history, his early life is but dimly known. The earliest record of it was not composed until over a century after his death and has not been preserved except in a recension, that of ibn-Hisham, who died two centuries after Mohammed. The exact date of Mohammed's birth is not certain; it must have fallen sometime between A.D. 570 and 580. Even of the name his mother gave him we cannot be positively sure. The one by which he is universally known, *Muḥammad* (highly praised), sounds like an honorific one. Once in the Koran (61:6) it takes another form, *Aḥmad* (more praiseworthy). His fellow citizens at times called him *al-Amīn* (the trustworthy).

Early Career.—From casual references in the Koran, however, and from a critical study of the traditional material that has accumulated around the name of Mohammed, we can arrive at a number of reasonably certain facts in his career prior to the call to prophecy. His birthplace was Mecca, located in the words of the Koran (14:40) in "an uncultivable valley." The tribe to which he belonged was the Koreish (Quraysh), a noble tribe in charge of the sanctuary in that city and interested in caravan trade; but the immediate family of the boy was humble. His father, Abdullah, died before his birth; his mother, Aminah, when he was about six years old. Tradition asserts that as an infant he was entrusted to the care of a Bedouin family in which he found a foster mother. The Koran has preserved a clear reference to Mohammed's lowly childhood: "Did He not find thee an orphan and protect thee?" etc. (93:6-8).

The fatherless and motherless boy found home with his parental grandfather, Abd-al-Muttalib, who died two years later leaving a son, abu-Talib, in charge of his protégé. The story that at the age of 12 Mohammed accompanied his uncle to Syria with a trade caravan has been embellished with so many legends as to cast doubt on its veracity. Besides, no passage in the Koran suggests any familiarity on the part of Mohammed with Syria. One of those legends is that on his Syrian trip Mohammed met at Busra, south of Damascus, a Christian monk Bahira, who recognized in him the future great prophet and identified on his body certain significant signs, including the seal of the prophetic office between his shoulders.

His Call.—At the age of 25 Mohammed married a wealthy, energetic, and resolute widow of the Koreish, named Khadija, who was 15 years his senior. Before she became his wife the lady merchant was his employer. That the marriage proved successful may be inferred from the fact that only after her death in 620 did Mohammed practice polygamy and gradually increased the number of his wives to about a dozen. By Khadija he had the only child who survived, Fatima, who married his cousin Ali and became the mother of all those descended from the Prophet.

With the greater economic competence which came through his first marriage, Mohammed was now able to pursue his own tastes. He was then often seen in solitude, wandering on mountain paths and seeking opportunities for contemplation in out-of-the-way places and ravines. He must have been inoculated with certain effective ideas of Judaeo-Christian sources relating to God, man, and their interrelationship. Evidently he had been impressed by the fact he observed that the few Jews and Christians with whom he had come in contact had a "book" and were prosperous and advanced, whereas his own people, the heathen of Arabia, had no "book" and were backward.

It was supposedly in the course of one of these contemplative moods in a cave outside of Mecca, called Hira, that Mohammed one day heard a strange voice commanding: "Read in the name of thy Lord, who created." Puzzled, the unlettered Mohammed hesitated. But the assuring voice reiterated: "Read, for thy Lord is the most bounteous, who teacheth man that which he knew not" (96:1-5). Then and there the Prophet received his first call. The exact time of the occasion was later fixed toward the end of the fasting month of Ramadan, year 610. The night was named "the night of power" (97:1) and is still celebrated in Turkey and other parts of the Moslem world with deep reverence and special ritual. The voice which to Mohammed first sounded like the "reverberating of bells" was soon identified as that of Gabriel.

The Message.—The early utterances of Mohammed as a prophet took the form of rhymed prose, the type used by oracles, soothsayers, and pagan priests. The fact that he, an *ummi* (un-

schooled man), could produce such exquisite prose was adduced by him and his followers as the only proof of his prophethood. He performed no other miracles and claimed none. His first teachings revolved around the unity of God, his attributes, and future life. The doctrine of a judgment day involving reward for the righteous and punishment for the iniquitous was stressed as people failed to respond, and was used as an inducement or deterrent depending upon the nature of the response.

Early Followers.—His early followers, as to be expected from the nature of his message, largely came from the socially insignificant and economically discontent. On the higher level, the first to believe in him were his wife, Khadija, his cousin Ali (son of abu-Talib), and his future successor, abu-Bakr. All these were of the Koreish, but the bulk of the tribe were not only hesitant but actually hostile. That their hostility had economic motivation cannot be doubted. As custodians of the Kaaba, the pagan shrine and pilgrimage object, they could not afford to be indifferent to the inroads of a new faith.

About 615 some of the small band of Mohammed's followers fled the country to Christian Abyssinia (Ethiopia) because of persecution. Their choice of place of refuge shows that they looked upon Christianity as the religion most closely related to their own. A deputation sent by the Meccans to demand the extradition of the refugees returned empty handed. Meantime Mohammed and those who stayed with him were practically put under siege in a Meccan quarter with the expectation of being starved to submission. It was at this juncture that a revelation came acknowledging the genuineness of the three Meccan goddesses—together with Allah, who had hitherto been declared as the only one—and the siege was thereupon raised. The exiles returned, and Mohammed later withdrew the revelation as coming from the devil. The verses were expunged from the Koranic text.

The Hegira.—The truce between the Prophet and his aristocratic kinsmen was but a temporary one. After a brief sojourn in Taif (al-Tā'if), an oasis in the mountains southeast of Mecca, Mohammed sought a more secure abode in a farther place, Yathrib. Some citizens of this town had met Mohammed at a pilgrimage festival outside of Mecca and evidently encouraged him in the belief that Yathribites would be predisposed to receive him as a prophet because some of them were Jews, expecting the advent of such a leader. A number of Mohammed's followers preceded him to Yathrib, on July 16, 622. He himself, accompanied by abu-Bakr and Ali, followed, arriving there September 24, 622. Yathrib was hence called Medina (al-Madīnah, the city [of the Prophet]). The migration was termed Hegira (*hijrah*). It constituted a turning point in the career of Mohammed, indeed in the history of Islam.

This date, July 16, 622, became the earliest fixed point in Moslem chronology, and was chosen as the starting point of the new calendar. According to this calendar the Moslem year is a lunar one, consisting of six months of 29 days each and six other months of 30 days each. This makes the entire year 354 days, with a discrepancy amounting to a little over three years in a century.

Medinese Period.—With the Hegira, the Medinese period in Mohammed's career begins. In Medina he entered upon a period of success which made him more of a politician and less of a prophet. Here he contracted many marriages, some for political purposes, others with a view to having an heir, including one with the infant Aisha (A'ishah), daughter of abu-Bakr, and Hafsah, daughter of Umar. Gifted with ambition and astuteness, Aisha maintained her influence over her husband and priority over all other wives. Many of the traditions ascribed to him were transmitted through her.

Battle of Badr.—Mohammed felt the responsibility for providing sustenance for his followers from Mecca, now called Emigrants (*muhājirūn*), as well as for the new converts in Medina, termed Helpers (*anṣār*). Under the pressure of this new necessity he considered it legitimate to intercept a Meccan caravan on its way back from Syria in 624, and that in Ramadan, a holy month in which fighting was prohibited. The battlefield was Badr, some 20 miles southwest of Medina. The Moslem army counted 300, the Meccan 1,000. Abu-Sufyan, head of the Koreishite aristocracy, led the Meccans. The outcome was a complete victory for the Prophet and, in the eyes of his followers, a divine sanction of his new creed. This victory of Badr laid the basis of the temporal power of Islam. Ever since then Islam has remained a militant polity.

The following year (625) at another encounter with the Meccans, at Uhud, abu-Sufyan won the day. The Prophet himself suffered a wound, but his prestige was not impaired. Two years later he successfully defended Medina, by digging a trench around it, against a more serious attack on the part of Meccans, Bedouins, and other confederates. This trench method of warfare, said to have been suggested by a Persian in Mohammed's camp, was an innovation the like of which the Arabians never saw before. His converts increased in direct proportion to his victories.

Mohammed hereafter felt secure in the leadership of Medina. Having failed in his attempt to secure alliance with the Jews of Medina, he turned against them and chased them from their plantations. Gradually he divorced his system from both Judaism and Christianity, and Arabicized it. Thereby Islam's independence was asserted. Mohammed ordered his followers henceforth to turn their faces toward Mecca and not Jerusalem as before (2:139). The Kaaba, the cube-like sanctuary which housed the heathen idols in the city, became the new kiblah (*qiblah*). Pilgrimage to Mecca was authorized, and so was the kissing of the Black Stone in the Kaaba. The religious laws governing fasting, almsgiving, and prayer were enjoined and incorporated in the Koran. Social and political ordinances relating to marriage, divorce, inheritance, and treatment of slaves and prisoners of war were likewise promulgated in this period.

The laws for the small Medinese congregation became the laws of Islam as a world religion and a world empire. From Medina the Islamic theocracy spread into the rest of Arabia, and thence into the rest of the world. The congregation was conceived of as a religious brotherhood: "The believers are naught else but brothers" (49:10). The extraordinary subsequent conquests of Moslem arms testify to the success the Arabian Prophet had in welding his unwieldy followers into a unified, devoted organization.

Mecca, Religious Capital.—In 628 Mohammed made a truce with his Meccan adversaries guaranteeing for his followers the right of performing the pilgrimage. Mecca thus became the religious capital, while Medina remained the political capital. In the course of the pilgrimage in the following year, Khalid ibn-al-Walid and Amr ibn-al-As, both of the Koreish and destined to play brilliant roles in the military career of Islam, were recruited to the new cause.

Early in 630 Mohammed found an excuse for attacking Mecca. He entered it as a conqueror, and with his own hands smashed the 360 idols in its sanctuary exclaiming: "Truth hath come and falsehood hath vanished." Scarcely was there another victor who exploited his victory with more restraint and moderation. Only ten of his old Meccan enemies were proscribed. It was about that time that Mohammed proclaimed the territory around the Kaaba *haram* (forbidden, sacred). The passage itself is not very clear: "O ye who believe! The idolaters are certainly unclean. So let them not come near the forbidden Mosque after this their year" (9:28). The early Moslems, however, put a generous interpretation on it, extended the forbidden area to include both Mecca and Medina with their environs, and considered even Christians and Jews as intended in the prohibition. Since then no non-Moslem could enter the sacred area and escape with his life. The few Christian-born Europeans who managed to do so professed Islam and practiced it while there.

Mohammed's Death.—On June 8, 632, Mohammed fell suddenly ill, and passed away complaining of a severe headache. He was buried where he died in the apartment of his favorite wife Aisha, later annexed to an adjoining mosque and made an object of pilgrimage to all future Moslem generations. The man, whose main strength lay in his unwavering belief that he was called in person by God to execute His will, had succeeded in establishing a religion, creating a nation, and laying the foundations of an empire. All members of his politico-religious community were to be brothers with no distinction among them except in their degree of piety (9:11; 49:13). Two years before his death he had dispatched an expedition against Syria which proved to be the first act in a struggle that did not cease until the empire of Islam had encompassed a large part of the then civilized world.

The traditional description of Mohammed makes him a man of medium height, with a large head, large eyes, heavy eyelashes, thick beard, broad shoulders, and hair neither straight nor curly. While his physical features may not be exactly known, his mental traits are clear. The impact of his personality, the trust he engendered in his followers, the enthusiasm he awakened in those with whom he came in contact, are all unmistakable. The devotion and loyalty of such unusually able men as abu-Bakr, Umar, and others indicate a strong character. Even at the height of his glory Mohammed lived a simple, unpretentious life. His behavior has been imitated by millions upon millions of men and women, in different places and times, who looked upon him as the perfect man.

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MOHAMMED, the name of six sultans of Turkey. MOHAMMED I (b. 1387; d. 1421), son of Bajazet I, succeeded Prince Musa in 1413. He extended Turkey's boundaries to the Danube, established friendly relations with Greece, and fostered literature, arts, and sciences. MOHAMMED II (b. Adrianople, 1430; d. 1481) succeeded his father, Murad II, in 1451. Styled "the Conqueror" or "the Great," he captured Constantinople in 1453, making it his capital; conquered Serbia in 1456–1458; and took Scutari from the Venetians and Kaffa from the Genoese. He also acquired the Crimea, and in 1481 seized Otranto with a view to making war on Naples. MOHAMMED III (b. 1566; d. 1603) succeeded his father, Murad III, in 1595, executing 19 brothers to assure himself the throne. In 1596 he captured Erlau, in Hungary, but his campaign against Abbas I, shah of Persia, proved unsuccessful. MOHAMMED IV (b. 1641; d. 1691) succeeded his father, Ibrahim, in 1648, the nominal regency of his grandmother soon being exchanged for actual control by the Kuprili (grand viziers). The Turks were defeated before Vienna in 1683, and subsequently met many reverses inflicted by a league of Poland, Russia, Venice, and Leopold I, Holy Roman emperor. Seized and imprisoned by the Turkish Army in 1687, he was succeeded by his brother, Suleiman II (or III), and languished in chains until his death. MOHAMMED V (b. Topqapu, Nov. 3, 1844; d. Yildiz, July 3, 1918). A son of Abdul-Medjid I, in 1909 he succeeded Abdul-Hamid II, his brother, who was deposed and exiled. Until placed on the throne at the age of 65, he had been held a state prisoner in close palace confinement. Poorly educated and ignorant of the world, he was a quiescent tool of the leaders of the Committee of Union and Progress. These men involved the country in World War I as ally of Germany, and he died as Turkish resistance was collapsing. MOHAMMED VI (b. Constantinople, Jan. 12, 1861; d. San Remo, Italy, May 16, 1926), brother of his three immediate predecessors, found the country exhausted from war when he succeeded in 1918. He opposed the reforms sought by the Turkish Nationalists led by Mustafa Kemal (later, Kemal Atatürk). The latter organized a provisional government, and after they defeated the Greeks in Asia Minor in 1922 they deposed Mohammed. He fled to Malta aboard a British battleship, and thence went into exile in Italy.

MOHAMMED AHMED, mŏŏ-hăm'măd ă'măd (called the *Mahdi,* mä'dē), Sudanese agitator: b. Dongola, 1843?; d. Omdurman, June 22, 1885. A leader of the Moslems in the Sudan, about 1880 he proclaimed himself the mahdi (guided one), the messiah who would free the people from their oppressors. At the head of thousands of his followers, he defeated an Egyptian army in Kordofan in 1882, and the next year, at Kashgil, an Anglo-Egyptian force led by Gen. William Hicks (Hicks Pasha), who was killed. In 1884 he routed another Anglo-Egyptian force commanded by Gen. Valentine Baker (Baker Pasha), and in 1885 he besieged and captured Khartoum, where Gen. Charles George Gordon was killed. He died five months later.

MOHAMMED ALI. See MEHEMET ALI.

MOHAMMED RIZA PAHLAVI, mŏ-hăm'măd rĭ-zä' pä'lä-vē, shah of Iran (Persia): b. Oct. 29, 1919. He succeeded to the throne on Sept. 16, 1941, following the abdication of his father, Riza Shah Pahlavi. The early years of his reign were marked by continual unrest, due both to internal dissensions and the designs of rival great powers. In 1939 the shah married Princess Fawzieh, eldest sister of King Faruk I of Egypt; she bore him a daughter but no sons, and as a consequence he divorced her in 1949.

MOHAMMEDAN ART. The Mohammedan or Moslem culture, which from insignificant beginnings developed its military power with such extraordinary rapidity in the 7th century of our era, by subjugating nearly all western Asia, northern Africa, Spain, and later Sicily and Sardinia, was at the outset almost wholly destitute of art. It was the Arabs who led in these conquests; the Moors who overran Spain were largely of Arabic blood, and the Arabs were not at first artistically gifted. Like the Mongols and the Turks, who were later concerned in the advance of Islam (as the Moslems call their faith), the Arabs and Moors were at first wholly dependent on the peoples they conquered for their art, and especially for their architecture; upon the Syrians, Assyrians, Armenians, Persians, Byzantine Greeks, the Copts of Egypt, the Christians of North Africa, the Spaniards, and Sicilians, all of them Christians except the Persians. But the conquerors imposed upon their Christian and Persian builders and artists special programs and requirements due to their faith, and in the course of centuries developed predilections and aptitudes wholly their own, which gave to all their arts an Oriental character wholly unlike that of the Western arts from which they were derived. The name "Saracenic," frequently applied to all Moslem art, is an unscientific inheritance from the age of the Crusades.

The development of this art took place during the early Middle Ages, when European culture was slowly and painfully emerging from the chaos of the centuries following the fall of Rome. It produced a civilization and an art that flourished with extraordinary brilliance. Baghdad, Cairo, Cordoba, Granada, Toledo, Kairouan (Cyrene), and other cities of Arabia, Persia, Spain, and North Africa, were for some centuries more splendid than any European city outside of Constantinople (Istanbul). Moslem universities were great centers of learning; the Arabs cultivated mathematics and philosophy with enthusiasm; and the textile arts, ceramics, and metalwork were carried to so high a degree of perfection that they powerfully affected European art as late as the 16th century.

Historical Development.—During the first century after the Hegira (622–722 A.D.); the Arabs conquered Syria (634–642 A.D.); the Sassanian empire of Persia in 642; Armenia and Mesopotamia in 644, and part of northern Africa in 645–692. Sicily was occupied early in the 9th century. The Ommiad (Omayyad) dynasty of caliphs subdued the rest of North Africa during the 7th century and extended their conquest into Spain (710–713), where they established an independent Moorish emirate at Cordoba, as a rival to the Abbassid dynasty of Baghdad. The 9th and 10th centuries were a period of exceptional brilliancy in Moslem history: the age of Harun al-Rashid, of al-Mansur, of an almost fabulous splendor in Baghdad, of conquests in Sardinia and Malta, and of widespread architectural activity. During the 7th and 8th centuries the original mosque of Omar at Jerusalem (of which the present so-called "Mosque of Omar" is a much later successor), and that called El Aksah in the same city; the mosques of Amr at Cairo and of al-Walid at Damascus, and the Great Mosque at Cordoba had been built; during the 9th and 10th centuries the celebrated mosque at Kairouan, the mosques of ibn-Tûlûn and of al-Azhar at Cairo were built and that of Cordoba greatly enlarged. Under the Fatimid (Fatimite) dynasty, whose rule commenced in 969, there began the practice of erecting domes over tombs and sepulchral chambers, and the earliest minaret was built in Cairo. But the greatest architectural activity in that city occurred under the Ayyubid (Ayubite) dynasty, of the 12th and 13th centuries, and the Mameluke sultans, who followed. To this period belong the splendid mosques of Kalaûn (1284), Hassan (1356–1379), Barkûk (1384), Muayyad (1415) and Kaït Bey (1465), and the remarkable group of domed and minareted tombs of the Karafah quarter, commonly known as the tombs of the Khalifs and of the Mamelukes.

The culmination of Hispano-Moresque architecture came somewhat earlier—singularly enough during the period of the disintegration of the Moorish power in Spain. The famous Giralda tower at Seville (1160), the Alcazars or castle-palaces of Seville and Malaga (1181–1310), and the Alhambra at Granada (1248–1306) are the most noted extant products of this age.

Although Persia was so early subdued by the Arabs, and by the artistic proclivities of the people became the parent of Mohammedan art in Baghdad and Mesopotamia, and later in Turkestan, nearly all the early monuments of Persian architecture were destroyed in the Mongol invasions of the 11th–13th centuries. The recovery in architecture was slow until the accession of the Safawid (Safavid) dynasty at the close of the 15th century, when there ensued a remarkable revival of all the arts in the Persian cities, with the building of great mosques, bazaars, caravanseries, and bridges, and with a great development of decorative art in rugs, printed fabrics, ceramics, and manuscript-illumination.

The conquest of the Indian states by the Moslems was late, gradual, and incomplete, and neither the Hindu religion nor the native Hindu art was ever extinguished, even in those regions longest subject to Islam. Northern India was conquered in part in 1192, and developed a style in which Persian and Hindu forms are inseparably blended, as in old Delhi and Ajmer. In other areas of India, during the next three centuries Mohammedan mosques and palaces were built in various local styles; but it was the Mogul emperors who, in India as in Persia, developed the arts, including architecture, with the greatest splendor, especially in the magnificent mosques, palaces, and tombs of Bijapûr, Allahabad, Secunderabad, Delhi, and Agra, and their suburbs. In this period Persian conceptions and influences are dominant, but the Hindu traditions are also plainly manifest.

Turkey was the latest of the Moslem empires to develop a characteristic art. The

Seljûk Turks who had settled in Asia Minor in the 11th century, and had built up a notable capital at Iconium (Konya) under the influence of Persian art, were superseded by the Ottoman Turks in 1299 under Osman, the founder of the dynasty. By the capture of Constantinople in 1453 (having captured Adrianople nearly a century earlier), the Turks became masters of the Byzantine Empire. The resulting development in the arts shows a mingling of Arabic, Persian, and Byzantine elements, the latter predominating in the architecture of the mosques.

In China, the Moslem element has been too feeble to produce any vital and characteristic Mohammedan art.

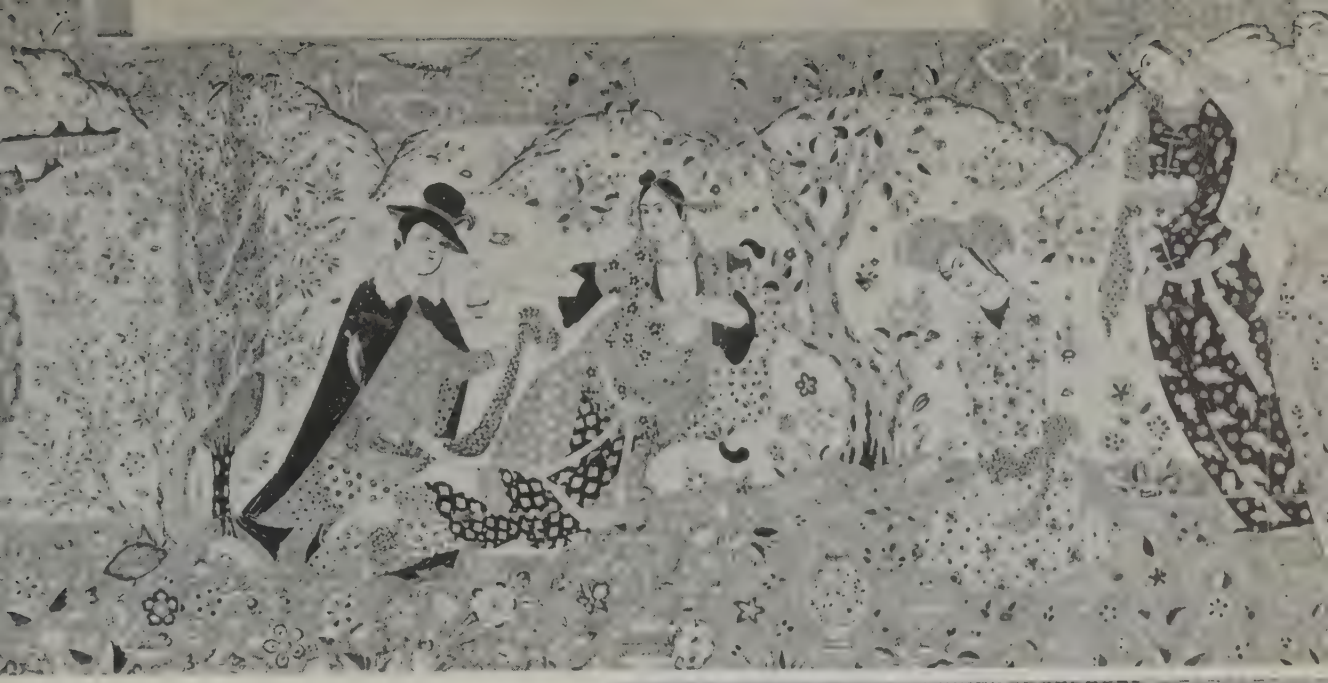
General Characteristics.—While in Mohammedan art five distinct style developments are easily recognized—the Arabic, Moorish, Persian, Indo-Moslem, and Turkish—certain common characteristics run through them all, due in part to the religion, in part to the Asiatic source of all the Moslem peoples. The Koran forbids all representation of living beings, and sculpture in all its forms is rigidly proscribed, while pictorial art, and even the use of pure nature forms in ornament, are equally rejected except by the Persians, who belong to the Shi'ite sect, and by the Moslems of India. Everywhere else decorative art has been restricted to purely conventional motives, or to nature forms so conventionalized as to be hardly recognizable. In spite of this restriction, it is in the arts of decoration that the Moslems have always been the strongest. In these arts the Asiatic love of color and of surface ornament is everywhere evident, in contrast to the European predilection for plastic decoration based on structure. In all Moslem styles minuteness of detail and intricacy of composition are preferred to the clarity and repose of the European styles, and brilliant color, broken up into minute elements and covering broad surfaces, is preferred to those effects of light and shade produced by sculpture and carving in varied relief. In the wall decoration of the architecture the traditions of rug design seem to dominate. Common to all the architectural styles are certain motives; the interlaced star ("star of Solomon"), the honeycomb or stalactite motive, and decorative inscriptions in the Cufic, Persian, or Arabic forms of lettering. Arches, of whatever form, are almost invariably enclosed in rectangular panels or decorative frames.

Architectural Styles and Monuments.—As Gothic architecture received form in the building of cathedrals, so the Moslems developed theirs in the building of mosques. A mosque is primarily a prayer hall, the ceremonial prayer of adoration of Allah being the chief element in the Islamic worship. And since all prayer must be made toward Mecca, the holy city, the one prime essential of the mosque is the *mihrab* or niche in the side of the hall toward Mecca, indicating the *kiblah* or ritual direction of worship. To the right of this, in the *jami* (principal) mosques, is a *mimbar* (high narrow pulpit) from which the Koran is read on Fridays. There is usually in front of the mosque an open court surrounded by arcades, entered by one or more lofty gates, and having in the center a fountain for the ceremonial ablutions without which the worshiper is deemed unfit for prayer. To nearly all mosques are attached one or more minarets, from whose exterior galleries the *muezzin* chants daily at the appointed hours the far-sounding call to prayer. These requirements permit of the utmost variety in plans and detailed arrangements, which differ widely in the five principal styles.

Of these five styles, the *Arabic* has less unity than any of the others. It may, indeed, be divided into three substyles: the Syrian, based upon the Syrian-Byzantine architecture and later influenced by the Romanesque works of the Crusaders; the Mesopotamian, dominated by Persian influence, as at Baghdad; and the Egypto-Arabic or Cairene, springing from Coptic prototypes, and by far the most distinctive of the three. It is characterized by the pointed arch, the ovoid or pointed dome decorated in relief, with or without a drum; minarets square below, with two or more diminishing stages and much surface ornament; the use of stalactite corbeling, of marble veneering internally, and of carved and painted beamed ceilings. The buildings are seldom large in scale, even when covering large areas; height and spaciousness are not sought after, as a rule. The material of construction is usually brick, faced externally with stone or with stucco. The entrance doorway is made impressive by setting it in a deep and lofty niche. Vaulting is chiefly confined to the domes over sepulchral chambers, a feature introduced in the Fatimid period from Mesopotamia, whence also came the minaret. The early mosques in Cairo, as generally elsewhere also, consisted of a court surrounded by arcades, and the prayer hall was simply a multiplication of these arcades on the side toward Mecca. But the Hassan mosque (1356) is exceptional in its prayer hall covered by a huge barrel vault of 70 feet span; and the "Mosque of Omar" at Jerusalem, in its concentric circular plan and vast wooden dome. Later it became customary to incorporate in the mosque not only one or more sepulchral chambers, but also hospitals, and rooms for priests and for schools and other purposes. After the Turkish conquest by Selim I in 1517, mosques were sometimes erected in Cairo after the Constantinople type, with broad domes over the prayer hall (Boulak, 1520; Mehemet Ali, 1821). The Arab houses of Cairo, built on the street, are noted for their fronts of *moucharaby* latticework. Woodwork of intricate star-paneling inlaid with mother-of-pearl and ivory appears in doors and *mimbars,* and decorative tilework is freely used in interiors—an art imported from Persia.

The *Moorish* style, of which the Hispano-Moresque is simply the Spanish development, employs the horseshoe arch, often cusped; slender columns with carved capitals, often of cubical form, above a high necking; massive square towers for minarets, and a system of wall decoration in stucco, stamped or molded in intricate surface patterns, brilliantly colored, above a wainscot of colored tiles. Domes and vaults are rare. Both stone and brick are used in construction, and external patterning in relief is a frequent feature of external brickwork, as on the Giralda at Seville. Both in Africa and Spain the decorative element predominates over the structural. The most noted monuments have been mentioned; others at Fez, Tangiers, Algiers, Tlemcen, both mosques and palaces, are of interest.

The *Persian* monuments differ in style from the Arabic and Moorish, alike in plan, construction, form, and decoration. The bûlbous dome, the round minaret with a roofed gallery and bulbous top, the four-centered pointed arch, portal niches of huge size, and the veneering of the



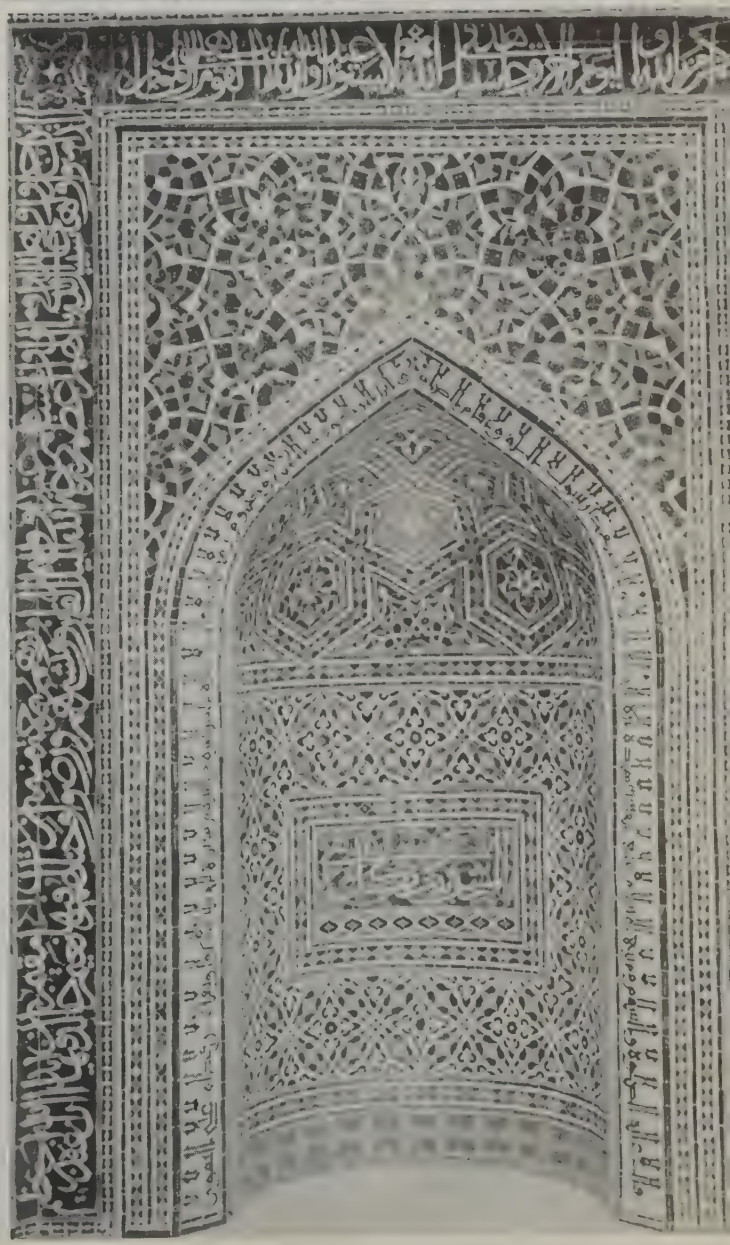
Above: Graceful human figures and delicate naturalistic details decorate this tile wall panel, probably from a palace built by Shah Abbas I between 1600 and 1629 in Isfahan, Persia.

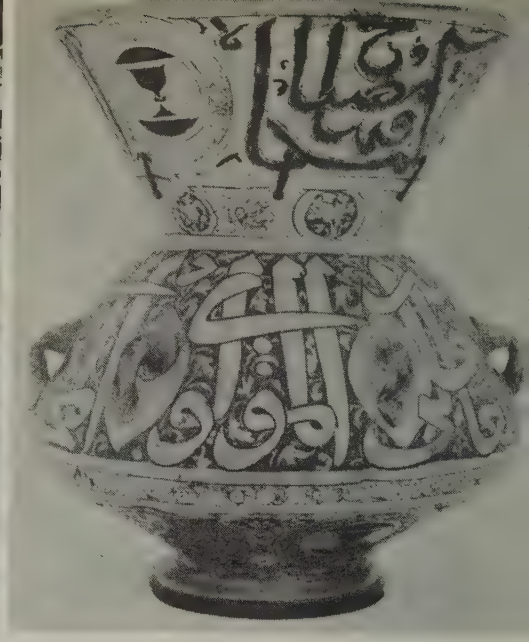
MOHAMMEDAN ART

Right: In Isfahan, Iran, is this prayer niche (1354) covered with a colorful mosaic of brightly glazed earthenware set in plaster.

The Metropolitan Museum of Art, New York

Below: From Persia under the Umayyad dynasty comes this 8th century bronze ewer.



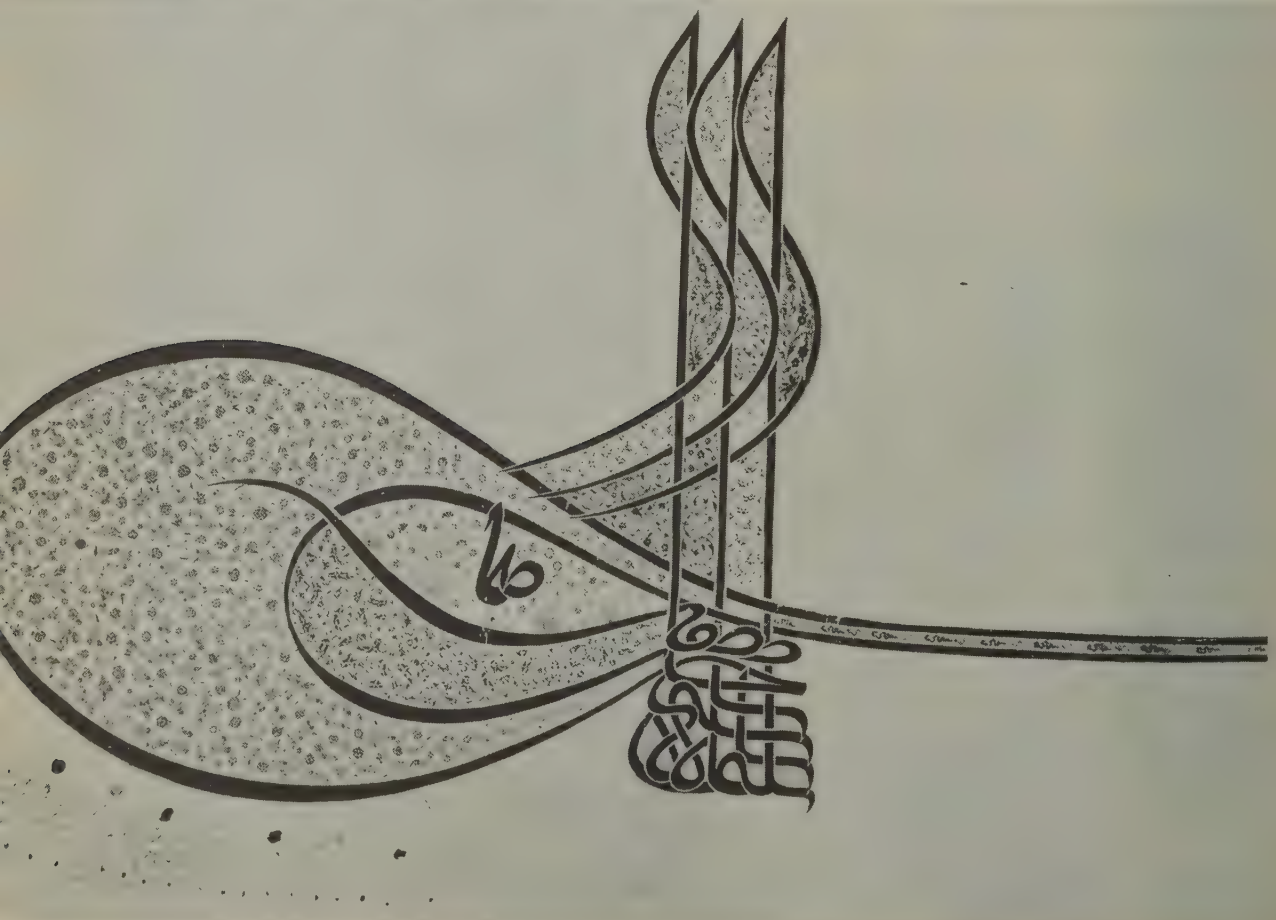


Above right: Syrian mosque lamp of enameled glass, made between 1300 and 1350.

Left: Panel of wall tiles in a glazed faïence, from the first half of the 17th century.

(Above right and left) The Metropolitan Museum of Art; (below) Ewing Galloway

Below: This tughra, or calligraphic emblem much in the nature of a monogram, was used as an official signature by Suleiman the Magnificent of Turkey (r. 1520–1566).



whole exterior with figured tiles in brilliant colors, give the Persian mosques an aspect nowhere else encountered. Brick is the universal material of construction, and vaulting of great intricacy is everywhere used, alike in mosques and in secular buildings. In palaces, wooden posts and wooden ceilings are common, brilliantly painted; but otherwise columns are infrequent. The principal mosques belong to the Safawid period, though the ruined mosque at Tabriz and the tomb of Khodabendeh at Sultaniye are of the early 14th century. The great square (Maidan), the mosque and college, and the Palace of the Mirrors, all at Isfahan, the caravansary at Aminabad, and bazaars, bridges, and mosques at Shiraz and Hamadan, are notable examples of the style, to which may also be credited the fine though ruined mosques at Bukhara and Samarkand.

The various pre-Mogul *Indian* styles show a mixture of Hindu and Persian forms (for example, the mosque, gate, and tomb of Altamsh at Delhi, mosques at Ajmer, Ahmedabad, and Gujarat). The Mogul conquest introduced an entirely new architecture, Persian as to its forms, which include the bulbous dome, round minaret, great niche portals, and the four-centered arch. But it is an architecture of sandstone and marble, not of brick and tile, and is superior to the Persian in the scale, dignity, and setting of its monuments. Among the most important of these are the mosques at Bijapûr, Agra (Muti Musjid or Pearl Mosque), Delhi (Jumma Musjid), and Fatehpur Sikri; the great palace groups at Delhi and Fatehpur Sikri; the tombs of Akbar at Sikandra and of Humayûn at Agra, and the incomparable Taj Mahal near Agra (the tomb of Shah Jahan and of his favorite wife, Mumtaz Mahall).

The earliest *Turkish* architecture, the Seljûkian, was an offshoot of the Persian. When the Ottoman Turks established their new capital at Brusa (1300), they employed at first the Seljûk style, as in the "Green Mosque"; but after the capture of Constantinople in 1453 the Byzantine influence became paramount in the plan and construction of mosques, while the details betray mingled Arab and Persian origins. Of all the Mohammedan styles this is the most purely structural in masses and conception, and the most imposing in scale. The great mosques follow the prototype of Santa Sophia (q.v.), covering vast interiors with a lofty central dome and a combination of half domes and cupolas; the minarets are round, with one or more galleries and a slender lead-covered spire. The Turks employ the simple pointed arch with alternating voussoirs of light and dark marble, enclosed in a rectangular panel; marble columns with stalactite capitals; stalactite corbeling and cornices, and a combination of tiles and painted ornament for interior decoration. All their finest buildings are of white marble; they include the Mosque of Mohammed II (1460), the Mosque of Sultan Suleiman and tombs and the Shah Zadé Mosque (1556), the Validé and Ahmed I mosques (17th century) and the Nouri Osmaniyé (1756), all at Constantinople, and the Mosque of Selim II, at Adrianople. Many fountains, and several palaces built in the 19th century are of a showy but inferior type.

The Decorative Arts.—The Asiatic races have always excelled in surface decoration, especially in the use of color. Among them the Moslem nations have displayed great skill, not only in the application of surface decoration to buildings but also in many forms of textile and ceramic art, and in certain kinds of woodwork and metalwork and even stained glass. In textiles, the place of honor belongs to the rug weavers of Turkey, Persia, and India, whose art in this field is descended from very ancient times when Babylonia led the world in decorative weaving. The Turkish rugs, including those from Mesopotamia and Turkestan, are distinguished by their purely conventional patterns, composed almost entirely of rectilinear and angular motives. The Persian and Indian rugs are esteemed the finest; in these the patterns are in flowing lines, with liberal use of leaf and floral forms seminaturalistic in treatment. The Persians also produce remarkable hangings printed in colors by hand from engraved wooden blocks on cotton or linen. Both India and Turkey have produced remarkable needlework in colored silk on broadcloth or cotton; but this art has nearly disappeared in Turkey. The Armenian and Syrian laces are of great beauty, but they are mostly the work of Christians, not Moslems. In *ceramics,* the Persians have been from a remote antiquity the leaders among the Moslem nations. They inherited the art from the ancient Babylonians, and in turn taught it to the Arabs of Egypt and the Moors of Spain, and later to the Turks of Asia Minor. (See CERAMICS). Their use of patterned tiles for veneering the exteriors of their buildings has been already mentioned. In all the Persian ceramics, both tiles and glazed pottery, floral patterns are freely used; the cypress tree, the rose, carnation or pink, peony, and other flowers appearing frequently, as well as birds, gazelles, and other animals. The Arabs and Moors, on the other hand, avoided, as far as possible, such naturalistic representations. The Turkish tiles and pottery approach more nearly the Persian types. In *metalwork,* the Moslems of India excel, especially in chased and perforated brass vessels, and in niello work—the incrusting of patterns in gold or silver in or upon iron or bronze; but it is not possible to distinguish the Moslem from the Hindu handiwork, except where the chasing or incrusting of Hindu emblems betrays its non-Moslem origin. The kindred art of damascening, or the insertion of gold, silver, or brass wire into grooves cut in iron or steel, originated, as its name implies, in Damascus; it was carried to great perfection by the Arabs, especially in the decoration of armor and weapons. The *woodwork* of doors and of *mimbars* (pulpits) in Cairo and in Turkey and the *moucharaby* of houses in Cairo have been previously mentioned. A similar treatment of intricately framed paneling and of spindle latticework is employed for both fixed and movable furniture. The Moslems of India also excel in perforated and carved woodwork for interior decoration. The art of *stained glass* was developed in Cairo, perhaps as early as the 14th century, and spread thence to Turkey in the 16th. The patterns are perforated in cement, and the perforations stopped with bits of colored glass, combined in harmonies of line and color.

In some respects the decoration of manuscripts is the most distinctive of all the Moslem arts, and it is hard to decide which nation produced the finest works, though the palm would perhaps go to the Persians. The beauty of the Arabic lettering (of which the Turkish and Persian characters are mere variants) lends itself

to decorative calligraphy in an eminent degree, while each of these nations has developed an art of supplementary adornments in color and gold, in borders, decorative panels, and other forms of ornament, that rival the finest manuscripts of western Europe. To these embellishments the artists of Persia and India add the resource of pictorial illustration in color, which the Arab and Turkish illuminators allow only in the rarest instances.

The decorative arts of Islam generally reached their highest attainment in the 15th–17th centuries, since when there has been a long and slow decline, though they are still practiced with success in many parts of Turkey, Egypt, Persia, and India.

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A. D. F. HAMLIN.

MOHAMMEDAN LITERATURE. The study of the traditions of Mohammed, in all their extended ramifications, comprises what might be termed Mohammedan literature; and as these are pre-eminently embodied in the Koran, that work, without striking literary art and mechanically constructed, became the incomparable classic of Islam, to give rise to schools of thought and to systems of theology and jurisprudence, and to promote distinct branches of history, biography, criticism, science, grammar, philosophy, legend, and poetry. It is curious how such a book, revealed in bits and scraps, arranged according to the length of the chapters, without uniform style, and whose text was not collated in the Prophet's lifetime, should have been worshiped and idealized. But our Western mind cannot understand the Oriental point of view, and least of all the windings and complexities of the Semitic brain. Othman, third caliph of the Moslems, had done away in 651–652 with all existing copies of the Koran except that of Abu Bekr, which itself was shortly afterward destroyed by Marwan, governor of Medina. All copies of the book in current use, wherever scattered, are reproductions of Abu Bekr's edition. Uniformity and authoritative text could apparently be secured in no other way. Out of the exegesis of the Koran sprang the most vital and varied elements in Arabic literary history, which began in primitive pre-Islamic times in the ceaseless caravan marches across the deserts, where the camel's regular swing taught the Arab to sing rhymes. The more cultured Moslem of a later age is a city dweller, and shares wider aspirations; but the Koran, not the desert, is still his starting point, to which he always returns, whether he follows the simple monotheism of Mohammed or an agnostic mysticism.

It can readily be seen how history among the Arabs began with the *Maghazi*—books devoted to the study of Mohammed's wars. The deeds of that era were to be narrated, the chronicles and legends gathered, at second hand generally. Efforts to obtain information as to the Prophet's life gave birth to biography, which was to develop in later centuries. Parallel with histories of wars and events were written histories of famous cities, like Medina or Mecca, Baghdad and others, most of which works have perished. How this field was cultivated can be shown from what is recorded of al-Tabari, the most illustrious historian (838–923), who for 40 years wrote 40 sheets a day. The oldest biography extant is that of the Prophet by Ibn Ishaq (d. 767). The beginnings of the historical romances go back to the first centuries of Islam, when veneration for Mohammed gave rise to legend and fable that passed as genuine history.

The literature of jurisprudence sprang naturally from the study of the *hadith* (body of traditions). The Koran had to be supplemented at an early date to provide laws for the Moslem world. The sayings of the Prophet after his death, his usages and decisions, had to be collected, arranged, and sifted. The Koran itself was absolute authority, if it contained a law applicable to the case in hand; otherwise the memories of the *Sayids,* the companions of the Prophet, were resorted to for his rulings. If these proved of no avail, recourse was had to the common law of Medina, and finally to the common sense of the judge. Hence a vast legal literature arose—collections of traditions, called *Musnads,* because each tradition was "supported" against the companion from whom it came. One of the first and greatest of these was the *Musnad* of Ahmad ibn-Hanbal (780–855), a collection of about 28,000 traditions.

Another type of book of traditions was the *Musannaf* or "arranged,"—chapters classified according to their subject matter. Al-Bukhari (810–870) made the most respected of all the collections, termed *Sahih* ("sincere book"), which is so arranged as to form bases for a complete system of jurisprudence. Another is that of Muslim ibn al-Hajjaj (d. 883). These were the two most honored authorities. Four other legal collections, *Sunan* ("usages"), stand second to the two *Sahihs.* Different writers, however, give the number of canonical works as five, seven, or even 10. It did not take long before the six great books were themselves abridged and explained—the rules of the faith were summed up into a selection of 40 traditions, and these became the subject of endless commentaries. The Roman as well as the Rabbinical law had marked influence on Moslem law. Four schools of thought held sway that of Abu-Hanifah (699–767), speculative jurist; of Malik ibn-Anas (715?–795), historical jurist; of al-Shafi'i (767–820), reverent and conciliatory; and that of the pupils of Ahmad ibn-Hanbal, reactionary. A fifth school, the Zahirite, whose discovery is due to Ignaz Goldziher, founded by the Abu Sulaiman David ibn Ali (815–883) insisted on the external meaning of the Koran and the traditions, and repudiated further tradition. "It never held rank," writes Duncan Black Macdonald, "as an acknowledged school of Mohammedan law."

With the deeper study of the Koran, two fur-

ther branches arose—the science of reading the text and that of its interpretation. Oral tradition, which was at first depended upon, was soon followed by written tradition, and books were compiled on the various ways of reading, some of which, dating from the 10th century, are preserved at Berlin, Algiers, and Leiden. One book, written by a grave jurist, and entitled *Kitab Muhbarak* (Blessed Book) is a story of those who died listening to the reading of the Koran. In the line of exegesis, the array of books is overwhelming, the mystical comprising a large number. Hence arose the increased study of grammar, most of the commentators being grammarians.

In the department of theology, whole libraries have been written. Ghazali, one of the famous masters (1058–1111), wrote 69 works that are extant. Like its jurisprudence, Moslem theology could not begin until after the Prophet's death. At first it was more political than religious, but soon settled down to more or less logical wrangling between sect and sect. Christian, Jew, Persian, Greek alike had their influence, with developments now rational, now mystical, now radical, now pantheistic, giving birth to countless works, some of which are almost modern in their suggestions and implications. They prove the fertility and the intensity of the Moslem intellect, and what marvelous power existed in the Prophet to have supplied thought for so many ages and to so many minds.

Bibliography.—The best recent books which can be recommended are Huart, Clement, *A History of Arabic Literature* (New York 1903); Macdonald, Duncan B., *Development of Muslim Theology, Jurisprudence and Constitutional Theory* (New York 1903).

ABRAHAM S. ISAACS.

MOHAMMEDAN SECTS, the numerous schisms and schools of thought which arose in Islam. See MOSLEM SECTS.

MOHAMMEDANISM, a system of belief founded by Mohammed, the Arabian prophet. See ISLAM.

MOHAMMERAH, mō-hăm'ĕr-ȧ, Iran, port at the confluence of the Karun and the Shatt al Arab, capital of Khuzistan Province. It is known also as KHORRAMSHAHR. Although the Shatt al Arab is within Iraqi territory, the Iranians have freedom of navigation as far as Mohammerah and neighboring Abadan by virtue of a treaty concluded with Turkey in 1847. Pop. 30,000.

MOHAVE, DESERT. See MOJAVE DESERT.

MOHAVE INDIANS. See MOJAVE INDIANS.

MOHAWK, mō'hôk, a river whose headwaters rise in Mohawk Hill, in the southern part of Lewis County, N. Y. It flows south to Rome, where, east by south, with many curves, it continues to the Hudson River, which it enters at Cohoes, nine miles above Albany. It is about 175 miles long, and is the largest tributary of the Hudson. In several places along the route there are rapids and falls, as at Little Falls in Herkimer County, Oriskany in Oneida County, all of which are noted for manufacturing. The falls of the Mohawk River (Cohoes Falls) 70 feet high are near Cohoes, where in a glacial pothole the complete skeleton of a mastodon was discovered in 1883. The bed of the Mohawk River was once much wider than the present channel through which the water passes; in some places the distances between the old banks are from a mile to nearly three miles. The Mohawk Valley is noted for its beauty and the fertility of its soil. The Barge Canal (q.v.) of New York State is parallel with the river to Rome. Two railroads also parallel the river to Rome, the New York Central and the West Shore. The manufacturing industries of the valley, which depend largely for motive power upon the water power of the Mohawk, are extensive. A number of pretty villages and thriving manufacturing towns are on its banks, chief of which from west to east are Rome and Utica in Oneida County; Ilion, Herkimer, and Little Falls in Herkimer County; Fort Plain, Canajoharie, Fonda, and Amsterdam in Montgomery County; Schenectady in Schenectady County; and Mechanicville in Saratoga County.

In the "settlement period" of the United States, this valley was the main highway from the "east colonies" to the Great Lakes. It was the home of the most warlike tribes of Indians, the headquarters of the Five Nations. The first missionaries and the first explorers who left the Hudson River in this part of the United States journeyed along the country through which flowed the Mohawk. In this valley, near the Mohawk, René Goupil was killed by the Indians, and later Isaac Jogues was martyred at the place now called Auriesville, on the south side of the river a little east of Fonda. Sir William Johnson built two homes in this valley, one at Fort Johnson about one mile west of Amsterdam (now the railroad station of Akin), the other, Johnson Hall, near the present Johnstown, in Fulton County. Much of the early history of the river and valley as related to the whites is connected with the rule of Sir William Johnson and his power over the Five Nations. The center of wealth and power in the valley before the American Revolution was at Johnson's home. At the breaking out of the Revolutionary War, an effort was made by both parties to hold possession of the Mohawk. The death of Sir William Johnson, just at the beginning of the war, removed a strong power from the council. His sons and their friends lacked his humanity and wisdom. The union between the British and the Indians resulted in many terrible scenes, among others the massacres of Cherry Creek and Schoharie, the burning of homes, and the taking of many lives in the valley. Gen. John Burgoyne realized the value of having possession of this valley, and some of the important battles of the revolution took place along the Mohawk. There were many Tories in the valley; but a large number of the settlers were always patriots. When the news of Concord and Lexington reached the inhabitants along the Mohawk, many of them loaded into wagons all the grain they could spare and sent the precious cargoes over the rough roads to Boston. When the British determined to end the war the Mohawk Valley, the gateway to the West, was the site chosen. Here the Tories outnumbered the patriots, and the Indians were the allies of the British; but Barry Saint Leger's defeat at Oriskany by men under Nicholas Herkimer filled Burgoyne with despair, and fired the enthusiasm and enlivened the hope of the patriots.

MOHAWK INDIANS, a tribe of North American Indians, the easternmost of the Six Nations, named collectively by the French, the Iroquois. According to their own tradition, confirmed by those of other tribes, they were the eldest people in the confederacy of the Six Nations and styled themselves Kaniengehaga, "people of the place of the flint." They believed that they were liberated from subterranean confinement by Tareya-wagon, who guided them into the valley of the Mohawk; thence they passed to the Hudson and to the sea. The valley in which they at first established themsleves was the seat of their power from the discovery of the country until the American Revolution. Their dominion extended from Lake Champlain to the headwaters of the Susquehanna and the Delaware. A warlike tribe, they inflicted great tortures on their prisoners and practiced cannibalism. With the introduction of firearms by Dutch traders they became renowned above all the other nations for their skill as warriors, and carried terror wherever they went. Their forays extended as far as the Connecticut River, and their influence prevailed among the small independent tribes about the region of the present city of New York. During the French and Indian War they supported Sir William Johnson, following him in his most perilous expeditions and aiding him in the contests of Lake George and Niagara. After his death they transferred their attachment to his family, and were forced to flee from their ancestral home to Canada; lands were assigned them on the Grand River and on the Bay of Quinté, near the east end of Lake Ontario, where over 1,200 still reside. See Iroquois League; Six Nations.

MOHAWKITE. An arsenical ore of copper with minor amounts of nickel and cobalt, a variety of domeykite. Occurs in Mohawk copper mines, Houghton County, Mich.

MOHEGAN, mō-hē'gän, **INDIANS,** a tribe of North American Indians of the Algonquian (Mahican) family, who formerly lived on the Thames River in eastern Connecticut. They were at one time united with the Pequots and after the death of Sassacus, the Pequot leader, the remainder of the tribe came to the camp of the Mohegan chief. After the death of King Philip (Metacomet) in 1676, the Mohegan tribe was the only important one in that region.

The Mohegan seem to have been the eastern branch of that group of closely connected tribes that spread to the farther side of the Hudson River. As the white settlements extended the Mohegan sold most of their lands and confined themselves to a reservation on the Thames River in New London County, Conn. Their village, also called Mohegan, was on the site of the present town of that name. They rapidly dwindled away when surrounded by the whites. Many joined the Scaticook but in 1788 a still larger number, under the leadership of Occom, joined the Brotherton Indians in New York. The rest of the tribe continued to reside in the vicinity of Mohegan or Norwich, Conn.

MOHILEV. See Mogilev.

MOHL, mōl, **Hugo von,** German botanist: b. Stuttgart, April 8, 1805; d. Tübingen, April 1, 1872. He studied at the universities of Tübingen and Munich, and from 1832 he held the professorship of botany at Tübingen. His researches into the physiology of higher plant forms was of major importance. He suggested use of the term protoplasm to indicate the substance of the cell body, and may be considered the founder of the cell theory. His *Die Vegetabilische Zelle* (1851) was translated into English by H. Henfrey under the title *Principles of the Anatomy and Physiology of the Vegetable Cell* (1852). *Vermischte Schriften botanischen Inhalts* (1845) was a collections of his most important papers. He was the brother of Julius von Mohl (q.v.).

MOHL, Julius von, German Orientalist: b. Stuttgart, Oct. 25, 1800; d. Paris, France, Jan. 3, 1876. He was the brother of Hugo von Mohl (q.v.). In 1823, after studying theology for five years at Tübingen, he went to Paris to devote himself to Oriental languages and history. Although holding the assistant professorship of Oriental literature at Tübingen from 1826 to 1833, he spent most of that period in research in London and Oxford. The French government commissioned him in 1826 to prepare a translation of *Shah Namah* (Book of Kings), the great epic of Firdausi (Firdusi), the Persian poet, and this task was his major preoccupation until his death. Six folio volumes of the work were published in Paris between 1838 and 1866, the seventh being completed by Barbier de Meynard. In 1847 he was appointed professor of Persian at the Collège de France; and he became secretary and subsequently president of the Société Asiatique. He published *Lettres de M. Botta sur les découvertes à Khorsabad* (1845), concerning the search for Assyrian antiquities near Khorsabad by Paul Émile Botta; and in collaboration with Justus Olshausen he wrote *Fragments relatifs à la religion de Zoroaster* (1829). His valuable reports to the Société Asiatique between 1840 and 1867 were collectively published after his death by his widow, Mary (daughter of Charles Clarke), under the title *Vingt-sept ans d'histoire des études orientales* (1879–1880). Consult, Simpson, M. C. M., *Letters and Recollections of Julius and Mary Mohl* (London 1887).

MOHLER, mû'lĕr, **Johann Adam,** German Roman Catholic theologian: b. Igersheim, Württemberg, May 6, 1796; d. Munich, April 12, 1838. He studied theology at the University of Tübingen, and after entering the priesthood taught there, becoming tutor in 1822 and full professor in 1828. He was an able doctrinal exponent, distinguished alike intellectually and spiritually, doing much to arouse the Roman Catholic Church in Germany to new vigor. His writings at this period included *Die Einheit in der Kirche* (1825), *Athanasius der Grosse* (1827), and *Symbolik* (1832). The last, of which an English translation was published by J. B. Robertson in 1843, was an exposition of the doctrinal differences between Protestants and Catholics. It attracted considerable attention, and provoked works in rebuttal by Ferdinand Christian Baur (also a professor at Tübingen), Philipp Marheineke, Karl Immanuel Nitzsch, and others. In reply to their writings, he published *Neue Untersuchungen der Lehrgegensätze zwischen den Katholiken und Protestanten* (1834). In 1835 he was given a professorial post at the University of Munich. Consult Friedrich, J., *J. A. Möhler* (Munich 1894).

MOHN, mōn, **Henrik,** Norwegian meteorologist: b. Bergen, Norway, May 15, 1835; d. Oslo, Sept. 12, 1916. After studying at the university in Christiania (now Oslo), he became observer at its astronomical observatory, and in 1866 professor. He was appointed director (1866–1913) of the Meterological Institute he helped to found there. In 1876–1878 Mohn led a scientific expedition in northern Norwegian waters, and set up the Bossekop meteorological station in Lapland in 1882–1883, as well as other stations in northern Europe. His most important work was *Grundzüge der Meteorologie* (1875; 5th ed. 1898), and he published other books on the climate and meteorology of the North Atlantic, and on the dynamics of the atmosphere, as well as editing, from 1867, the *Yearbook of the Norwegian Meteorological Institute.*

MOHOCKS, mō'hŏks, **The,** a club in London, England, also known as the Mohawk Club, although it did not deserve the name of club, being rather a group of young men of fashion who used the club as an excuse for disorderliness in the early 18th century. Their behavior has been frequently mentioned in literature of and about the period. John Gay (1685–1732) mentions in *Trivia* that the Mohawks rolled women in hogsheads down Snowhill, and Jonathan Swift told Stella of a report that 80 of them had been put in prison, while Lady Wentworth, writing to her son, Lord Strafford, says, "I am very much frightened with the fyer, but much more with a gang of devils that call themselves Mohocks." A royal proclamation was issued against them March 18, 1712.

MOHOLY-NAGY, mō'hôl-y nŏd'y', **László** (or **Ladislaus**), Hungarian painter and designer: b. Borsod, Hungary, July 20, 1895; d. Chicago, Ill., Nov. 24, 1946. First identified with constructivism in Budapest, Moholy-Nagy later designed stage sets, painted, and made use of many materials and forms of art. Forced by the Nazis in 1935 to leave Germany, where in 1923–1928 he had been professor of constructive, texture, and photographic technique at the Bauhaus school in Weimar, he went to London, where he designed the sets for H. G. Wells' motion picture, *The Shape of Things to Come.* In 1937 he founded the Bauhaus School of Design in Chicago, which failed, but as head of the Chicago Institute of Design in 1939 he won backing from important industrial firms for his theories of art in the machine age. He was the author of *The New Vision* (Eng. tr. 1932) and *Vision in Motion* (1947).

MOHON, mô-ôN', commune, France, in the Department of Ardennes, an industrial suburb of Mézières from which it is separated by the Meuse River. It has tool and hardware manufactures and railway shops of the Compagnie de l'Est. A 16th century church was destroyed in World War I. Pop. (1946) 6,541.

MOHR, mōr, **Charles Theodore,** German-American botanist: b. Esslingen, Germany, Dec. 28, 1824; d. Asheville, N. C., July 17, 1901. Educated in the sciences at the Polytechnic High School in Stuttgart, Germany, he afterwards devoted his life to the study of botany. His first expedition was to Dutch Guiana in 1845, where he aided August Kappler's collecting. In 1848 he went to the United States, taking part in the 1849 gold rush to California, but returning to Louisville, Ky., and eventually to Mobile, Ala. There he specialized in the botany of Alabama, publishing papers for the United States Department of Agriculture on the timber pines of the southern United States and the plant life of Alabama. He prepared exhibits for expositions at Atlanta (1881) and at New Orleans (1884). In 1900 he moved to Asheville to work in the Biltmore Herbarium and to finish his final book *The Plant Life of Alabama.*

MOHR, Joseph, Austrian Catholic priest and poet: b. Salzburg, Dec. 11, 1792; d. Wagrein, Dec. 4, 1848. As curé of the newly established parish of Obendorf he wrote a poem entitled *Stille Nacht, heilige Nacht* (*Silent Night, Holy Night*) which, on Dec. 24, 1818, he asked the village schoolmaster and organist, Franz Xaver Gruber (1787–1863), as the latter recalled, "to set to suitable music, for two solo voices, chorus and guitar accompaniment." The organist composed the simple melody in a few hours, and brought it to Father Mohr. The same evening it was sung with great success at the Christmas Eve service, the priest and organist singing the solo parts. A guitar accompaniment had been stipulated because the church organ had broken down. In a few years this nostalgically tender Christmas carol had attained so wide a popularity that it was translated into most modern tongues and became perhaps the best known of all Christmas carols.

Consult Weinmann, Karl, *Stille Nacht, Heilige Nacht* (Ratisbon 1918, 1920).

MOHR, mōr, a North African gazelle (*Gazella mhor*) noted as a source of bezoars, concretions found in the alimentary organs of certain ruminants and valued for their supposed medicinal properties, especially as antidotes for poisons.

MOHS, mōs, **Friedrich,** German mineralogist: b. Gernrode, Anhalt, Germany, Jan. 29, 1773; d. Agordo, near Belluno (now in Italy), Sept. 29, 1839. Successively professor at Graz (1811), Freiberg (1816), and Vienna (from 1826), and the author of several books on mineralogy, he is best remembered for the Mohs' scale, named for him, which he proposed in 1822 to classify the hardness of minerals. See HARDNESS, SCALE OF.

MOHUN, mōōn, **Charles,** 4th BARON MOHUN, English duelist: b. ?1675; d. London, England, Nov. 15, 1712. The diaries and records of the period in which Mohun flourished show him as a high-spirited and uncontrollable young man, playing tricks with Edward Rich, earl of Warwick, arrested at the age of 17 for murder, but acquitted before a jury of his peers, and dueling at every opportunity. He occasionally took his seat in the House of Lords, and was a Whig, supporting William III. His final duel with James Douglas, 4th duke of Hamilton, in which both men were killed, arose from a quarrel over estates, but was interpreted by the Tory Party to have been a Whig plot against Hamilton. An account of the duel occurs in W. M. Thackeray's *Henry Esmond.*

MOHUN, Michael, English actor: b. about 1620–1625; d. London, England, October 1684. Before the Civil Wars he acted at the Cockpit in

Drury Lane. Fighting for King Charles I he attained a captaincy, in Flanders was promoted major. At the Restoration he returned to England to resume his stage career. Pepys seeing him for the first time in the *Beggar's Bush* (Beaumont and Fletcher) reported the consensus that he was "the best actor in the world." He was the original Beamont in Dryden's *Amboyna,* and Ventidinus in *All for Love, or the World well Lost;* also the original Pinchwife in Wycherley's *Country Wife.*

MOI. See ASIATIC TRIBES—*Assam, Southeast Asia, and South China.*

MOIDORE, moi'dōr (Port. *moeda d'ouro,* coin of gold), a gold coin of 4.93 grains of fine gold worth about $3.27 when in use as formerly in Portugal and Brazil (1640–1732). A double moidore was also minted.

MOIRA, MOIRAI, or **MOERAE,** moi'rà, in Greek mythology, the Fates, corresponding to the Roman Parcae. Homer speaks of a single divinity who assigns to every man his lot (*moira*); Homer's Moira is the personification of Fate, directing the consequences of man's actions at the behest of the gods; only once does he speak of Fates (Moirai). Hesiod develops the personification of several Fates, identifying the Moirai as three daughters of Zeus and Themis: Clotho, the spinner; Lachesis, the disposer of lots; and Atropos, the inevitable. The first spins the thread of life, the second assigns to man his fate, and the third severs the thread. Like the Parcae, the Latin Tria Fata were assimilated to the Greek Moirai. See also FATES.

MOIRE, mwär, a French name for watered silks. Though made in the same way as ordinary silks, these are of double width and must be of a stout substantial make. They should also be folded in such a way that the air contained between the folds should not be able to escape easily. They are subjected to an enormous pressure, of from 60 to 100 tons, generally in a hydraulic machine, and the air, in trying to escape, drives before it the small quantity of moisture that is used, and so produces the permanent marking called watering, which is for the most part in curious waved lines. The finest kinds of watered silks are known as *moires antiques.* Woolen fabrics to which the same process has been applied are called *moreen.*

MOISE, moi'sē, **Penina,** American poet: b. Charleston, S. C., April 23, 1797; d. there, Sept. 13, 1880. A personality of much charm, she was born of French parents of Hebrew extraction, who came originally from the island of St. Eustatius. She contributed to many of the magazines and newspapers of her day, and a collection of her poems was published as *Fancy's Sketch Book* (1833). Her best known work is contained in *Hymns Written for the Use of Hebrew Congregations* (1856). Despite blindness in later years, she continued to write poems, and her home was a place of pilgrimage to her admirers.

MOISSAN, mwà-sàN', **Henri,** French chemist: b. Paris, France, Sept. 28, 1852; d. there, Feb. 20, 1907. Educated at the Museum d' Histoire Naturelle and at the School of Pharmacy in Paris, he taught in the latter from 1879 to 1883, in 1886–1899 became its professor of toxicology and inorganic chemistry, and in 1900 was professor of general chemistry at the Sorbonne. He isolated and liquefied fluorine, winning in 1887 the Lacaze Prize from the Academy of Sciences. He won great fame by his important experiments and achievements with the electric arc furnace. In 1892 he made the manufacture of acetylene simple and commercially profitable by his discovery that if carbon and lime be fused in the electric arc furnace, pure calcium will be formed, which makes the liberation of acetylene an easy matter. Much more spectacular was his formation of artificial diamonds in 1893. In 1906 he received the Nobel Prize in chemistry. He wrote *Reproduction du diamant* (1893); *Étude complète des carbones amorphes et des graphites* (1898); and *Traité de chimie minerale,* in 5 vols. (1904–1906). See also DIAMOND—*Artificial Synthesis.*

MOJAVE DESERT (also MOHAVE), mô-hä'vê, arid basin, California, mainly in San Bernardino County. Part of the Great Basin, it lies south of Death Valley and the southern end of the Sierra Nevada and is bordered on the west and southwest principally by the Tehachapi, San Gabriel, and San Bernardino Mountains, meeting the Colorado Desert on the southeast. The Mojave River, an intermittent stream, rises in the San Bernardino Mountains near Lake Arrowhead and flows generally northeastward, disappearing into the sand at Soda Lake, about 90 miles distant. The desert is about 15,000 square miles in extent. Elevations vary from 2,000 to 5,000 feet. Deposits of minerals, including gold, silver, tungsten, iron, manganese, clay, perlite, talc, salines, and boron minerals, lend the Mojave considerable economic importance.

The area is one of low humidity and very scanty annual rainfall, no part ordinarily receiving more than five inches annually. Temperatures are moderately high in winter, very high in summer, with a wide daily range. Before noon the winds begin to blow down the mountain sides, frequently attaining gale proportions on the desert floor. The velocity increases until about midnight, when it lessens, and calm prevails before dawn. On the higher edges of the area are found weird forests of California, or desert, juniper (*Juniperus californica*) and Joshua trees (*Yucca brevifolia*). The latter often reach heights of 30 feet, and present fantastic sentinel-like silhouettes against the sky.

JOHN H. JONTE.

MOJAVE INDIANS (also MOHAVE), an American Indian tribe, formerly the most populous and warlike of the Yuman linguistic stock. They live on the Colorado River Reservation, the Fort Mojave School Reservation, and near the town of Needles and the entrance to Black Canyon. The Mojaves were pottery makers and farmers who grew corn, melons, and beans in the bottom lands, relying on periodic inundations for moisture. Their houses were of brush, low, and scattered. In 1775–1776 they were estimated at 3,000 persons; in 1905 as 1,589. See also YUMAN STOCK.

MOJI, mô-jê, city, Japan, on the northernmost tip of Kyushu Island, in Fukuoka Prefecture. Moji is a seaport on Shimonoseki Strait, opposite the city of Shimonoseki on Honshu Island, with which it is connected by ferry and a

tunnel built in 1942. Coal is the main export. The city is the terminus of the Kyushu railroad system, and an industrial center with steel mills, sugar refineries, breweries, and rice mills. Its growth from a small fishing village in feudal times began with the completion of the railroad (1887) and was stimulated by the opening of the Kyushu coalfields and war booms during conflicts with China and Russia. It was heavily bombed in 1945. Pop. (1950) 124,399.

MOKANNA, mŏŏ-kăn'nă, **al-** (real name HASHIM IBN-HAKIM), Arab religious impostor, fl. 8th century; d. ?780. Called the Veiled Prophet because he hid his face under a veil, supposedly to hide the splendor of his countenance, he won many followers by attributing to himself divine powers and performing apparent miracles. At last the Caliph Mahdi was compelled to send an armed force against him. He retired to a fortress in Transoxiana, where he first poisoned his soldiers and then burned himself. His followers continued to pay him divine honors after his death. He is the hero of Thomas Moore's *Mokanna, or the Veiled Prophet of Khorassan* in the first part of *Lalla Rookh* (1817).

MOKI, mō'kē, or **HOPI,** hō'pē, is a sedentary Indian group of about 2,000 individuals, living on three mesas in the desert of northeast Arizona. Culturally they are related to the Anasazi, or Cliff Dweller—Pueblo peoples, who have inhabited the Southwest for more than 1,000 years. However, they are a Shoshone-speaking people, related to the nomadic Utes of the north, who centuries ago drifted into the Southwest and either borrowed or helped in the development of Pueblo culture. Villages consist of terraced houses rising from a central court. This type of dwelling fortress doubtless developed in connection with defense needs in the past but is still perpetuated by custom. The Hopi are farmers who have searched out every spot in the desert where moisture lingers long enough to grow crops. In these plots they raise corn, beans and squash sufficient for their needs. Their religious life is highly complex and accompanied by elaborate ceremonialism—the chief aim of which is to bring the necessary rain and sunshine (see SNAKE DANCE). Such ceremonies are conducted by semi-secret fraternities which meet in underground chambers (kivas), in or near the central courtyard. Although each pueblo is independent there is a feeling of unity among them. An exception is the village of Hano whose inhabitants came from the Rio Grande Valley in 1680. They speak a different (Tanoan) language and are not fully integrated into Hopi life. Clan organization, with inheritance and descent in the female line, determines one's place in the community and to a large extent regulates behavior.

FAY-COOPER COLE.

MOKSHA, môk'shä, river, European Russian SFSR, rising in the Penza Oblast and flowing north and west through the Mordvinian Autonomous SSR, an agricultural region, with dense forests on its west bank. It joins the Oka River above Murom, its course being about 430 miles long. Its lower course is navigable from 30 to 175 miles, according to the season.

MOL, môl (formerly MOLL), commune, Belgium, in Antwerp Province, 12 miles southeast of Turnhout, on railroads and highways and a branch of the Nèthe River. It is a popular resort for artists, has a textile industry, manufactures of zinc and tobacco, and cattle markets. Pop. (1952) 20,707.

MOLA, mō'lä, **Emilio,** Spanish soldier: b. Placetas, Santa Clara, Cuba, 1887; d. near Castin de Peones, Spain, June 3, 1937. Appointed to the Infantry Academy at Toledo in 1904, after his graduation he distinguished himself in North African campaigns, earning quick promotions and the Military Medal. A general in 1927, he was given command of the Larache military district in Morocco. However, with the advent of the republic in April 1931 he fell out of favor and was placed in the reserve. The amnesty of 1934 brought him back into active service. Commanding the 12th Infantry Brigade at Pamplona, he was among the officers who threw in their lot with Gen. Francisco Franco and the Nationalist cause in July 1936. Commanding the Army of the North he directed operations against Irun, San Sebastian, and Bilbao in 1937. A hard-fighting soldier and brilliant strategist, he did not live to see the fall of Bilbao or Madrid, both of which cities his forces were besieging, dying in an airplane accident in a flight between the Bilbao front and Burgos. His *Memorias de mi paso por la Dirección General de Seguridad* (1934) was a three-volume defense of his career. Other works include *Lo que yo supe; Tempestad, calma, intriga y crisis; El pasado,* and *Azaña y el porvenir.* His *Obras completas* were published in 1940. In 1948 the dukedom of Mola was created, making his descendants grandees of Spain.

MOLA, mô'lä, **Pierfranceso** (sometimes called MOLA DI ROMA), Italian painter: b. Coldre, near Como, Italy, 1612 or 1620; d. Rome, 1666 or 1668. At an early age he went to Rome, where he studied painting under Giuseppe Cesari, Cavaliere d'Arpino. Afterward he painted at Venice, Milan, and Bologna, where he adopted the style of the local painters, especially Francesco Albani. The landscape backgrounds of his religious paintings are his best work. The National Gallery in London possesses his *St. John Preaching in the Wilderness* and *The Repose of the Holy Family in the Flight into Egypt.* In the Ravenna chapel of the Church of Jesus in Rome is his *Peter in Prison.* He also painted the *History of Joseph* in the Quirinal Palace. Other works are in museums in France and Germany. Like Francesco Albani, he was a follower of Annibale Caracci, whose manner he reproduced with ease, but he was lacking in imaginative depth.

MOLA DI BARI, mô'lä dē bä'rē, town, Italy, in the province and district of Bari, a port on the Adriatic Sea and on the Bari-Brindisi Railway. It has a church of the Norman period, a gymnasium, oil presses and tanneries. Pop. (1951) 22,884.

MOLASSES. See SUGAR GROWING.

MOLASSES ACT. See ACTS OF TRADE.

MOLAY, mô-lā', **Jacques de,** last grand master of the Knights Templar: b. Molay, Jura Province, France, about 1243; d. Paris, March 11, 1314. He entered the Order of the Templars in 1265 and became its grand master in 1298. In 1306, after the Templars had been driven from

Palestine, and while he was in Cyprus busied about raising new troops against the Saracens, he was summoned to France by Pope Clement V, who was determined to end the feuds between the Templars and the Knights of St. John. King Philip IV of France fearing, it is alleged, the power of the order, seized de Molay and all the knights then resident in France, after receiving them with the greatest kindness, charged the order with heresy, tried them before a packed court and found them guilty. Molay was imprisoned and ill-used for more than five years, then, after recanting certain admissions of guilt he had made, was burned at the stake as a relapsed heretic. The guilt of the Templars is still a disputed historical question.

Consult Viollet, P. M., *Les Interrogatoires de Jacques de Molay* (Paris 1910).

MOLDAU. See VLTAVA.

MOLDAVIA, mŏl-dā'vĭ-ȧ, province, Rumania, in eastern Rumania, separated from the Moldavian Soviet Socialist Republic by the Prut River on the east, and from Transylvania in the west by the Carpathian Mountains. The Ukraine is on its northern border, Walachia on the south. It has extensive forests and raises grain, fruit, and livestock. Founded in the 14th century as a principality, it suffered in wars between rulers and countries, under Turkey, Russia, and Austria. The union of Moldavia and Walachia (1861) began the nation of Rumania. Pop. (1948) 2,598,258.

MOLDAVIAN SOVIET SOCIALIST REPUBLIC, a constituent republic, European USSR, in the southwest, in the center of the former province of Bessarabia. On its west is the Prut River and Moldavia; the Ukraine surrounds its other borders. A very fertile region, though very rainy, with poor roads, its industries are mainly agricultural. Several railways cross it. In 1918 after World War I Rumania annexed all of Bessarabia. In 1924 the USSR established the Moldavian Autonomous SSR of the Ukraine, which in 1940 was merged with Bessarabia to form the Moldavian SSR, and the mainly Ukrainian districts were taken back into the Ukraine. Rumania recaptured it with the help of Germany in 1941, but it was retaken by Russia in 1944. Its capital is Kishinev. Pop. (1954 est.) 2,700,000. See also BESSARABIA.

MOLDENKE, mōl-dĕn'kė, **Charles Edward,** American Egyptologist: b. Lyck, East Prussia, Oct. 10, 1860; d. Watchung, N. J., July 18, 1935. Moldenke was taken to the United States when a year old by his father, a Lutheran clergyman. He was educated at Columbia University and at the Lutheran Seminary in Philadelphia, after which he traveled and studied abroad, earning a Ph.D. from Strasbourg University in 1885. Until 1900 he was a practicing minister, after which he devoted his time to the study of botany and archaeology. He published *The Egyptian Origin of Our Alphabet* (1886); *The Trees of Ancient Egypt* (1886); *Egyptian Classics* (1900).

MOLE, mô-lā', COMTE **Louis Mathieu,** French statesman: b. Paris, France, Jan. 24, 1781; d. Château Champlâtreux, Seine-et-Oise, Nov. 23, 1855. His early years were spent abroad, but after his return to France he became an adherent of Napoleon Bonaparte, who gave him several important offices. In November 1813 Molé was made minister of justice, and held the same office during the Hundred Days. After the Restoration, Louis XVIII appointed him minister of marine (1817–1818). In 1830 he became minister of foreign affairs and in 1836 premier, resigning in 1839, but continued to sit in the Constituent Assembly (1848) and the Legislative Assembly (1849), where he opposed the coup d'état of 1851 which brought Louis Napoleon (Napoleon III) to French dictatorship and retired to private life.

MOLE, mô-lā', **Mathieu,** French jurist and politician: b. Paris, France, 1584; d. there, Jan. 3, 1656. Entering politics at an early age, he became procureur général in 1614. Molé's insistence on law and justice in the case of political prisoners brought him into conflict with his superiors. From 1641 to 1653 he was president of the Parlement, having been appointed by Cardinal Richelieu. During the first Fronde (1648–1649, q.v.), although often threatened with violence, he attempted to mediate between monarchy and Parlement, succeeding in negotiating the temporary peace of Rueil (1649). In 1651 he became keeper of the great seal, retiring from active politics. His *Mémoires,* in 4 volumes, were published in 1855.

MOLE, mōl, a small, fossorial (digging) velvety-furred mammal of the family Talpidae. The several species are distributed throughout the temperate zones of the Northern Hemisphere in North America, Europe, and Asia. Moles are the size of common rats, but their tails are usually very short; sometimes more or less equal to the length of the head and body. The body is thick and cylindrical; head, in the more highly specialized fossorial species, placed well between the shoulders; neck short; pectoral muscles bulky; snout elongated and either pointed, trumpet-shaped, or "star-nosed"; eyes small, in some species hidden beneath the skin; external ears small, generally without pinna, and nearly always completely hidden by the fur. The limbs are short, with five digits each, and in most species adapted for digging. The forefeet are especially large, powerfully built, and spadelike in form and function. The coat is thick, soft, usually velvety in texture, and often has a silky sheen. Females are provided with three or four pairs of mammae. There are 9 to 11 teeth on each side of the upper jaw, 8 to 11 in the lower jaw.

Most moles are strictly fossorial; some may be semiaquatic as well. The so-called shrew moles of the Old World, though classified with typical moles in the family Talpidae, do little or no digging. The almizclero and desman are other nonfossorial members of the family.

The typical fossorial species and type of the family is the common European mole (*Talpa europea*). This species occurs in all European countries south of 59° north latitude, except Ireland and Portugal. It is very like the North American eastern mole in size, appearance, and habits. Other species of moles of the genus *Talpa* are found in Europe, and in northern, eastern, and extreme southwestern Asia.

The common eastern mole (*Scalopus aquaticus*) of the eastern United States is from four and a half to six and a half inches in head and body length. The tail is from one to one and a

half inches long. This mole spends practically its whole life underground. It tunnels just beneath the surface by pushing its way through loose dirt in search of food, which consists of earthworms, insects, and grubs. Its subterranean runways appear on the surface as ridges of broken ground. For nesting purposes, the eastern mole makes burrows from 6 to 25 inches below the surface. Despite its Latin name, the eastern mole is not aquatic.

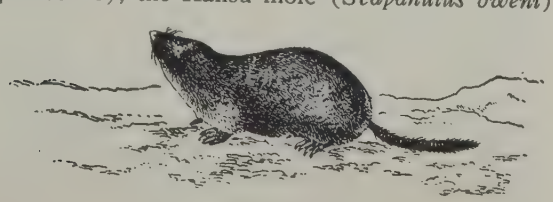
The starnose mole (*Condylura cristata*) of the eastern United States is fond of water and swims as proficiently as it burrows. It is somewhat smaller than the eastern mole, but has a longer tail proportionately. Its eyes are functional and exposed to the surface. The principal distinction of the starnose mole is the presence of a starlike ring of 22 fleshy tentacles around the tip of its nose.

The hairytale mole (*Parascalops breweri*), the smallest of the eastern American moles, measures about four and a half inches in head and body length. The distinctly haired tail is little more than an inch long. Its nose, as in the eastern mole, is naked and without tentacles. It further resembles the eastern mole by its degenerate eyes, which are covered with a membrane, and its fused eyelids.

Star-nosed mole.

The four moles that occur along the west coast of the United States include the smallest and largest American species. The Townsend mole (*Scapanus townsendi*) of Washington and Oregon, is the largest, with its head and body six to seven inches long, tail about two inches and slightly hairy. The California mole (*Scapanus latimanus*), an inch shorter, but otherwise similar, ranges along the coast from southern Oregon to northern Lower California. The Pacific mole (*Scapanus orarius*) of Washington, Oregon, and northern California is slightly smaller than the preceding, but otherwise hardly distinguishable. The fourth Pacific coast species, the American shrew mole (*Neurotrichus gibbsi*), is the smallest, measuring less than four inches in head and body length. Its small eyes are visible at the surface, and functional. Its tail is hairy. This species is found on the humid northwest coast from the northern half of California into southern British Columbia.

Closely related to and closely resembling the moles of the western United States are the Japanese hairytale mole (*Urotrichus talpoides* and *pilirostris*), the Kansu mole (*Scapanulus oweni*) of China, and the long-tailed mole (*Scaptonyx fusicaudus*) of China and Burma.



American shrew mole.

PHILIP HERSHKOVITZ,
Curator, Division of Mammals, Chicago Natural History Museum.

MOLE, a long pier or breakwater built of masonry and extending into the sea, at times to a distance of a mile or more.

MOLE CRICKET, any insect of the family Gryllotalpidae, order Orthoptera. Mole crickets differ from other members of the Orthoptera in having the front legs modified for digging in the soil. Their tunnels are inconspicuous, unlike the tunnels of moles. The day is spent underground. While mole crickets appear to be sluggish creatures, they are able to fly with considerable speed. The front wings are short, the hind wings protrude behind them like a pair of tails. The tarsi usually have three segments, as in the true crickets, the ovipositor is inconspicuous, and the unsegmented cerci are short.

The commonest European species, *Gryllotalpa gryllotalpa,* which is about two inches long, has become established in the United States. The most widespread American species is *G. hexadactyla,* which occurs over most of the United States and Central and South America. The eggs are laid in the burrows, some of which may extend a foot or more below the surface of the ground. The young resemble the adults except for the absence of wings. When numerous, mole crickets may cause damage to cultivated crops. Poisoned baits are used to control them. Members of the South American and Australian genus, *Cylindrachaeta,* are quite slender, and burrow into the stems of plants.

CHARLES HOWARD CURRAN,
Curator, Department of Insects and Spiders, The American Museum of Natural History.

MOLECH. See MOLOCH.

MOLECULAR THEORY, in physics and chemistry, asserts that the properties of ordinary pieces of matter are the properties of an aggregate of very small particles, called molecules. The distinction between molecular theory and atomic theory is that whereas a molecule is generally defined as the smallest particle of a chemical substance that is capable of independent existence, an atom is defined as the smallest amount of any chemical element that can take part in chemical combination. (See ELEMENT.) Until the 19th century it was not possible to distinguish between atoms and molecules, and even today the names are sometimes used interchangeably. The early Greek philosophers of the atomistic school used the term atom in much the same way that we now use the word molecule.

The distinction between atoms and molecules may be illustrated by considering the substance *water.* If we imagine ourselves taking a progressively smaller and smaller amount of this substance there comes a time when we can no longer subdivide the material without destroying its character as being water. At this stage we are dealing with one molecule. But this molecule may be broken into fragments by an electrical discharge or by other means, and it yields three atoms, two of hydrogen and one of oxygen. For that reason the molecule of water is said to be triatomic, and is written H_2O. A molecule such

as sodium chloride (common salt) is diatomic, and is written NaCl (Na for sodium, after the Latin *natrium*, Cl for chlorine). Ethyl alcohol (the normal alcohol in spirits) is C_2H_6O, and is said to be polyatomic, though for reasons to appear later it is more usual to write it C_2H_5OH. Thus molecules vary in size from the monatomic elements helium, neon, argon—which contain only one atom and are therefore both atoms and molecules according to our definition—through diatomic and triatomic molecules to huge assemblies such as a protein molecule (see PROTEINS) containing many thousands of atoms. There are even grounds for believing that each of the 10 to 20,000 genes (see GENETICS) which control the hereditary characteristics that we inherit from our two parents, is essentially one large molecule.

The distinction between atoms and molecules may be seen in a slightly different way if we compare two solids, solid hydrogen and solid copper. Hydrogen, which is a gas under normal conditions, becomes a solid at very low temperatures. Solid hydrogen consists of diatomic molecules (written H_2) arranged in a regular fashion. The individual molecules may be free to turn round about, and even to vibrate to and fro in a limited fashion; but they remain individual molecules, and on allowing the temperature to rise, the solid evaporates to become a gas of H_2 molecules. In solid copper, however, there is again a regular arrangement of atoms which can vibrate to and fro around their mean centers of position. But the unit is the separate atom, and there is no tendency to form clusters of atoms of any definite size. Solid hydrogen may therefore be called a molecular crystal, solid copper is an atomic crystal.

STATES OF AGGREGATION

Gases.—Molecules may exist in three states of aggregation—gaseous, liquid, and solid. In the gaseous state the molecules are well separated from each other, and fly about in all directions with a wide range of velocities, occasionally colliding with each other, or with the walls of the container, and then bouncing off. Except during the relatively short time of collision the molecules may be regarded as distinct and isolated. Their behavior is described by the kinetic theory of gases (see GASES, KINETIC THEORY OF) which accounts in a satisfactory way for the pressure which they appear to exert on the container as a result of their incessant collisions with it, and for the heat energy which they possess as a result both of their random velocities and also of their internal motion. A molecule of water, for example, which we write as H_2O, is not entirely rigid; but the three atoms can make small vibrations, or oscillations, relative to each other. These internal vibrations and rotations occur with very great frequency, but the distances moved by the atoms away from their mean positions are very small, so that these internal motions do not at any stage destroy the triatomic character of the molecule.

Liquids.—In the liquid state the molecules are much closer together, but they do not have fixed, or even nearly fixed, centers of position, and can drift—or, more strictly, diffuse—from one part of the liquid to another. The rate of this diffusion depends on the temperature, since at higher temperatures it is supposed that the molecules have more energy of motion than at lower temperatures, and are therefore better able to overcome any restraining forces that tend to confine them to any one region. The rate of diffusion is measured by the diffusion coefficient, and the variation of this coefficient with the temperature allows us to estimate the magnitude of the forces tending to confine the molecule. Thus according to this picture any one molecule in a liquid is always surrounded by other molecules, almost filling the available space, and in continual oscillatory motion; from time to time a small gap appears momentarily in the surrounding sheath of molecules (molecule *C* in Fig. 1), and if the central molecule has sufficient energy, it may break through this gap and thus move one unit of distance away from its starting point. The energy E necessary to break through in this fashion is called the activation energy for molecular diffusion, and the diffusion coefficient varies with the temperature according to an exponential law $e^{-E/kT}$. (T is the absolute temperature and k is Boltzmann's constant $1 \cdot 371 \times 10^{-16}$ ergs per degree.)

The process of evaporation of a liquid is a particular case of this phenomenon, for it corresponds to a molecule of the liquid breaking completely away from its neighbors and becoming a gas molecule. The fact that in order to evaporate any large quantity of liquid it is necessary to heat it, and thereby to give the molecules more energy, shows us that in the liquid state molecules attract each other. These attractive forces have to be overcome when a molecule evaporates. It also follows that a molecule (*A* in Fig. 1) in the body of a liquid is being attracted by its neighbors on all sides, and therefore experiences no mean force in any particular direction. But a molecule at the edge of a liquid (*B* in Fig. 1) is attracted towards the body of the liquid by those adjacent molecules which lie inside the liquid, and there are no corresponding forces to balance this, since there are effectively no adjacent molecules outside the boundary. Thus there is an apparent force tending to pull the liquid into as compact a volume as possible. Another way of putting this is to say that the liquid appears to be always trying to reduce its surface area. In this way we see how intermolecular forces give rise to the phenomenon of surface tension. (See SURFACE TENSION.) The stronger these forces of attraction the larger is the surface tension.

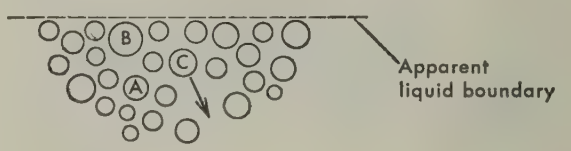


Fig. 1. The boundary of a molecular liquid. Notice the fairly close type of packing of the molecules. A molecule *A* experiences forces in all directions and these effectively cancel each other out. A molecule *B* is attracted towards the interior of the liquid, and can evaporate from the liquid only if sufficient energy is given to it. A molecule *C* finds itself with a momentary gap in the sheath of surrounding molecules, and, if it has sufficient energy, can diffuse to a neighboring position, as shown by the arrow.

Molecular Layers.—A particularly interesting and important application of this occurs in the common use of soap. A good foam, or lather, can be obtained if the surface tension is sufficiently low. Water has a rather high surface tension, but this value is considerably reduced by the use of soap. The important part of the soap for this purpose is a molecule called sodium stearate.

This is a long molecule similar in shape to a match, and having for the "stick" a relatively inert tail composed of carbon atoms and hydrogen atoms. The "head" is a much more chemically active group (actually CO_2Na) which rapidly embeds itself in the water, so that a layer of molecules is soon formed (see Fig. 2) with the "matches" all parallel to each other and sticking out of the water. The forces of attraction between these hydrocarbon tails which form the new surface are so much smaller than those between molecules of water that the surface tension is drastically reduced, and a good lather is easily formed. The existence of this layer of sodium stearate molecules, which, if it is only one molecule thick, is called a monomolecular layer, has been verified by an ingenious technique due to J. W. McBain, whereby the top layer of the liquid can be skimmed off. The change in surface tension when a small amount of soap is dissolved in the water is clearly demonstrated.

Molecular Distribution Function in Liquids.—According to our earlier description of a liquid, the constituent molecules are quite close together, as in Fig. 1, but in a somewhat irregular fashion. This description can be verified experimentally by the use of X-rays. For if we let a beam of X-rays fall upon a liquid and think of the beam as if it were a stream of bullets (sometimes called photons), then we can see that there will be

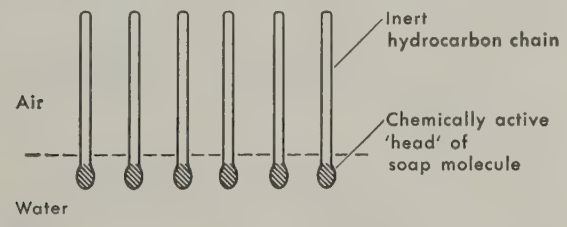


Fig. 2. A monomolecular layer of soap (sodium stearate) on the surface of water, which reduces the surface tension and makes foaming and lathering much easier.

collisions of these photons with the molecules of the liquid. Consequently many of the photons will emerge from the liquid in directions different from their line of incidence. It was shown by F. Zernicke and J. Prins in 1927, and more fully by P. Debye and H. Menke in 1932, that from a careful study of the way in which the number of photons scattered through a certain angle depended on the angle, it was possible to calculate the distribution of neighbors around any given molecule. This distribution, which is called the molecular distribution function, is an average taken over all the molecules. Thus, in the case of liquid water at room temperature it appears that on the average each H_2O molecule is surrounded by a first shell of between 4 and 5 neighbors, though none of these ever gets closer than about 2.3 angstrom units of length (1 angstrom is 10^{-8} cms). This, incidentally, tells us something about the size of the water molecule, though there are better ways for measuring these sizes, as will be shown later. Other details of the molecular distribution are found in the same way, such as that outside the first coordination shell there is a tendency to form a second shell at a distance of 4.8 angstroms. However, on account of the diffusion and other motion of the molecules these distances are only mean or average distances. What this analysis shows most clearly is that in a liquid there does not exist the rigid and highly regular type of molecular arrangement which is typical of a solid. It also shows that as the temperature is increased the various coordination shells become more and more blurred, as a result of the molecules acquiring more heat energy, and oscillating backwards and forwards through larger and larger distances.

Molecular Solids.—The distinction between a liquid and a solid is that although both are compact, without much space being wasted between the component molecules, the arrangement in the solid is regular and, relatively, fixed. A particular example will show what this means. Let us consider the molecules of methane—the chief constituent gas which bubbles up in muddy water containing decaying vegetation, when it is disturbed. Each molecule of methane consists of one carbon atom and four hydrogen atoms, and is written as CH_4. Its shape (see later) is roughly spherical. If the temperature is sufficiently low methane becomes liquid: the molecules remain intact, but fit quite close together in the fluctuating sort of manner illustrated in Fig. 1. Now let the temperature be lowered still further. Eventually the liquid freezes, that is, solidifies, and in this state each molecule takes up a definite position, or center, around which it moves with a vibrational motion of relatively small amplitude. These regularly arranged positions form what is called a face-centered-cubic lattice. This means that if an array of similar cubes are stacked corner to corner, there is a molecule of methane at every corner of each such cube, and another molecule in the center of each face. These molecules are rotating and vibrating but only very occasionally does one leave its lattice site and diffuse to some other lattice site. If the temperature is now lowered still further, there comes a moment when the molecules cease to spin around their centers. But they still vibrate and retain their molecular identity.

There are other forms of crystal packing with molecules of a different shape from that of methane. All of them may be identified by X-ray analysis, using methods analogous to those previously described for liquids. However, the analysis of solids, particularly monatomic solids such as copper, had been developed much earlier than the analysis of liquids, and dates from the discovery by Max von Laue in 1912 of the scattering of X-rays by a crystal. Molecules such as methane, whose chemical valence (see later) is fully satisfied, do not exert very great forces on each other, and consequently they tend to fit into a crystal lattice in such a way that they pack as closely together as possible. Generally this implies a large number of neighbors which may be said to be almost touching each other. (In the case of methane each molecule has 12 close neighbors.) The essential problem in this field of chemical crystallography is two-fold: first, to discover the type of lattice at whose lattice points the molecules are centered; second, to discover the way in which the molecules orientate themselves relative to these lattice points. With nearly spherical molecules such as methane there is very little tendency to orient the molecules except at exceedingly low temperatures. But with less symmetrical shapes the elucidation of the orientation of the molecules is a matter of great complexity. Benzene, for example, is a molecule with the chemical formula C_6H_6. Its shape is that of a rather thin flat disk. Fig. 3 shows the appearance of crystalline benzene. The molecules arrange themselves in such a way that, when

looked at end-on, they fit together in this unexpected manner. Each molecule has 12 nearest neighbors, four of which, unshaded, lie with their centers in the plane of the paper, and four, shaded, in each of two parallel planes above and below the original plane. By virtue of the two directions in which the planes of the molecules lie, it is found that a closer packing is possible than if all the disks were placed parallel to each other.

Forces Between Molecules.—Two questions immediately arise out of this discussion. First, are molecules in the gaseous, liquid and solid states identical, or does the state of aggregation modify them in any way? Second, what is the nature of the forces that act between molecules, and determine both the temperatures at which the changes occur from one state to another, and the way in which molecular packing occurs?

The answer to the first question is that in most cases the molecule is scarcely affected by a change of state. Two examples will illustrate this. The iodine molecule is diatomic, and written I_2. Each molecule, when isolated, consists of two atoms held together at a distance of about 2.65 angstroms. But when the molecular crystal is formed, this distance is increased to about 2.70 angstroms. Such a small change shows that each I_2 molecule is almost unchanged in going from the gas phase to the solid phase. Our second

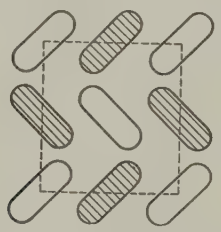


Fig. 3. Solid benzene. Each disc, shown in profile, represents one molecule. Unshaded molecules have their centers in the same plane as the central molecule. Shaded ones have their centers in parallel planes above and below the plane of the paper.

example is benzene, already referred to in connection with crystal packing. It can be shown from infrared spectroscopy that a benzene molecule performs a variety of internal vibrations in which its shape is distorted in a rhythmical fashion. These vibrations can be studied in the gaseous, liquid, and solid states. It is found that the time taken for a typical vibration changes by only one third of one per cent on going from the gas to the crystal. We conclude that in most cases the molecules suffer very little deformation in these phase changes. It is this near-invariable character of a molecule that makes a thoroughgoing molecular theory possible.

For the sake of completeness it must be added that this invariable character of a molecule does break down sometimes. The most interesting examples are referred to as molecular complexes. In such complexes pairs of molecules—usually of different species—are able to exert sufficiently strong forces on one another that, for example, their color is profoundly modified. A familiar illustration is a combination of benzene (C_6H_6) and iodine (I_2) which forms a molecular complex with one molecule of I_2 attached strongly to one molecule of C_6H_6. In this close association the properties of both molecules are much more modified than in liquid benzene or liquid iodine. But even now it is interesting to notice that if the complex is broken up, as will occur on heating, the components split off as normal molecules of iodine and benzene.

The second question—concerning the forces between molecules—is more difficult to answer. It is evident that they are of great importance in understanding both the transitions from one state of aggregation to another, and also the type of crystal packing in the solid. Two facts about these so-called intermolecular forces are well established. When two molecules are well separated from each other—by a distance more than 2 to 3 times the size of the molecule—it seems that they will almost always attract each other. The only serious exceptions to this rule arise when the molecules carry net electrical charges, and then, on account of the inevitable forces of repulsion between like charges, the molecules will repel each other. The other well-established fact is that if we attempt to bring two molecules close together, there comes a stage when, instead of attracting each other, they exert forces of repulsion. The interpretation of these repulsion forces is that they come into play when the molecules begin to overlap each other. We shall see in later paragraphs that there is no rigorously defined boundary of a molecule, so that

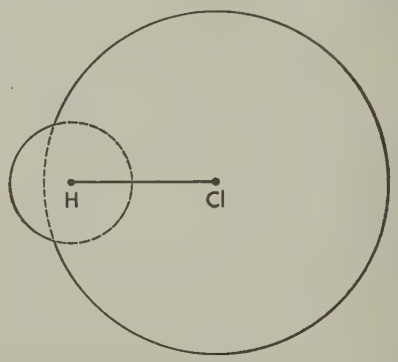


Fig. 4. Van der Waals' surfaces around the hydrogen and chlorine atoms in a molecule HCl. The outer contour, which is symmetrical around the axis joining H and Cl, gives the distance of closest approach of any other molecule.

the moment at which the overlap begins is itself not clearly defined. We may say that the repulsive forces are ineffective until the separation between the molecules is decreased below a certain value, but that then the magnitude of these forces increases very rapidly. As a result the combination of attractive and repulsive forces leads to a net attractive force at large distances of separation, and a net repulsive force at small distances. If the molecules are not very symmetrical (compare benzene whose shape is like a thin disk) then there is a complicated variation of the repulsive force with the mutual orientation of the molecules, as well as with their mutual separation. It appears that a good description of this situation is obtained if we suppose that we draw an imaginary surface round each atom of a molecule; the radii of these spherical surfaces are sometimes called the van der Waals' radii of the atoms, in honor of J. D. van der Waals, the Dutch scientist whose early observations of the pressure of a gas, in his doctoral dissertation at Leiden in 1873, initiated much of the later study of intermolecular forces. Fig. 4 shows the van der Waals' spheres round the diatomic molecule hydrogen chloride (HCl). Experience now shows that in the solid state it is exceedingly rare to

find atoms in adjacent molecules closer together than the sum of their van der Waals' radii. This is because as soon as the van der Waals' surfaces of two molecules begin to overlap, the forces of repulsion grow rapidly, and the system is no longer stable.

An example will show how this notion is applied in practice. Molecular iodine is diatomic, written I_2. In the solid it crystallizes as shown in Fig. 5, where any one I_2 molecule lies surrounded by six others in the same plane, and eight more in parallel planes above and below it. The diagram shows that the packing is such that all iodine—iodine distances between neighbor molecules are approximately equal, with a value 3.54 angstroms. Thus we may infer that the van der Waals' radius of an iodine atom is $\frac{1}{2} \times 3.54$, i.e. 1.77 angstroms. In passing we may notice that this radius is considerably greater than one-half of the distance between iodine atoms in the same molecule ($\frac{1}{2} \times 2.65 = 1.33$ angstroms). This shows that the forces responsible for holding the atoms together to form the molecule are of a different nature from those which one complete molecule exerts on another complete molecule.

At this stage it may be asked why, if each pair of molecules attract each other at reasonably large distances apart, they do not always come together and form liquid or solid aggregates.

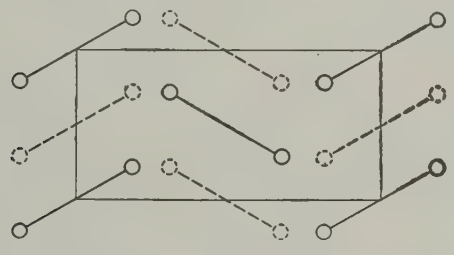


Fig. 5. The crystal of molecular iodine I_2. The thick molecules lie in the plane of the paper, the dotted ones lie above and below the plane of the first group.

For by doing this they would appear to lower their total energy, that is, become more stable. The explanation of this apparent paradox is that at temperature T° (measured on the absolute scale of temperature) each molecule possesses an energy of motion, called kinetic energy, whose magnitude is $\frac{3}{2}$ kT where k, as before, is Boltzmann's constant. Unless T is fairly small this kinetic energy of motion will be sufficient to overcome the gain in potential energy when the two molecules are kept near each other, and the system behaves as a gas. On cooling the gas, however, the kinetic energy term $\frac{3}{2}$ kT decreases until eventually the potential energy forces dominate, and first a liquid (where the molecules are close together but still can move about) and then a solid (when they can no longer move about so easily) are formed.

Origin of the Attractive Forces.—We have seen that the origin of the repulsive forces between molecules lies in the compressive distortion of each when they are held too close together. The origin of the attractive forces which are so important in the gaseous and liquid phases, is more complex. Following the pioneer work of W. H. Keesom (1912), P. Debye (1920) and F. London (1930) it is now recognized that at least three effects all contribute to these attractive forces. The first of these, identified by Keesom, is called the orientation force (sometimes alignment force); the second, identified by Debye, is called the induction force; the third, whose development had to wait for the growth of wave mechanics, since it has no simple model in classical theories, was identified by London, and is called the dispersion force. These three forces may be briefly described as follows:

Fig. 6. Two molecules *A*, *B*, with permanent dipole moments. The interaction of the + and — charges on these molecules gives rise to the orientation force of attractions.

Suppose (Fig. 6) that we have two molecules *A* and *B*, in which the electric charge possesses an asymmetry, with the result that the mean center of the positive charges does not coincide with the mean center of the negative charges in each molecule. These mean positions are labeled + and — in the figure. The molecules are electrically neutral, because the total amounts of positive and negative charge are equal. But they are said to possess a dipole moment. We may suppose that these dipole moments are of fixed magnitude, but as the molecules spin around their respective centers, the direction of each dipole moment is continually changing. The energy of interaction of the two molecules is the same as the energy of interaction of the pair of + and — charges. Evidently this depends on the directions in which the dipoles are instantaneously pointing. But when proper allowance is taken for all positions, it turns out that there is a mean energy of attraction; and this energy varies inversely as the sixth power of the distance between the molecular centers. This corresponds to a force of attraction varying as the inverse seventh power. This force is called the orientation force because it arises from the mutual orientation of the molecules. With symmetrical (homonuclear) molecules such as H_2 or I_2, it is evidently zero, since by symmetry the centers of positive and negative charge coincide and there is no dipole moment.

The induction force has a related origin. For if, as in Fig. 7, the molecule *A* has a fixed dipole moment, but *B* does not, it will, notwithstanding, acquire one as a result of the electric field due to *A*. We may say that the asymmetry of charge in *A* induces an asymmetry in *B*. Once this happens there will be a net force of attraction just exactly as in the case of two fixed dipole moments. Its variation with distance is also of the same type. In the above account we have explicitly assumed that *B* had no permanent dipole moment. This, however, is an unnecessary assumption. All that happens in that eventuality is that an additional moment is induced; this adds on to the original permanent moment, leading to an induction force superposed upon an orientation force.

The dispersion force can best be understood

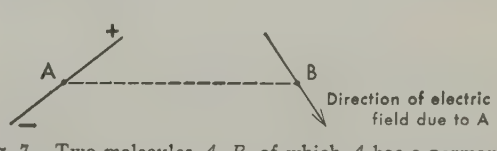


Fig. 7. Two molecules *A*, *B*, of which *A* has a permanent dipole moment. The electric field due to this, shown by the arrow at *B*, induces in *B* a new dipole moment, which then interacts with the original one on *A* to give the induction force.

if we think of each molecule as a system containing one or more electrons, in continual motion. At any moment there will be, in both molecules *A* and *B*, temporary asymmetries of charge. These asymmetries fluctuate with extreme rapidity, but they interact with each other and when averaged over their fluctuations give rise to an attractive force. The reason for the name dispersion forces lies in the fact that the electrons responsible for the fluctuating dipole moments are precisely the same as the electrons which are responsible for the scattering, or dispersion, of light according to the theories of H. A. Lorenz and, later, H. A. Kramers and W. Heisenberg (1925).

The most interesting and important fact concerning the three contributions to the attractive forces is that all of them correspond to a potential energy of interaction which varies as the inverse sixth power of the distance. This implies a force varying as the inverse seventh power. The orientation force is inversely proportional to the temperature, and becomes of less importance as the temperature rises. The other two contributions are independent of temperature. This group of three forces is often known collectively as the van der Waals' force between the two molecules. Generally the induction forces are the smallest of the three, the orientation forces (at room temperature) being greater than the dispersion forces if the dipole moments are large (as in water) and smaller if the dipole moments are not large (as in HCl). With molecules such as H_2 and CH_4, which possess no permanent dipole moment, only the dispersion forces exist.

The most simple mathematical expression of these forces is due to J. E. Lennard-Jones (1924). He suggested that the potential energy be used, rather than the force; this is the sum of a term b/r^6 due to the attractions, where b is a constant and r is the intermolecular separation; and a term often taken to be a/r^{12}, to represent the repulsion. Since the attraction gives negative potential energy, the total energy of interaction is the so-called Lennard-Jones potential $a/r^{12} - b/r^6$.

Virial Coefficients.—This account which has just been given of the forces between two molecules is largely a theoretical one. Experimental measurements are almost wholly confined to applications of the kinetic theory of gases. If a gas consists of molecules which are quite rigid and exert absolutely no forces on one another, the pressure p and volume V are related to the number of molecules N and the absolute temperature T by Boyle's and Charles' law: $pV = NkT$ (k is Boltzmann's constant). However, if the molecules do exert forces on each other this equation of state is no longer valid, and may be replaced by a more general equation:

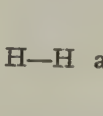
$$pV = NkT\ \{1 + B/V + C/V^2 + \ldots\}$$

where the coefficients B, C, are functions of the temperature. They are called the second, third, virial coefficients, the word virial being derived from the Latin *vis* (plural *vires*) meaning force. Careful measurements of pressure, volume, and temperature over a wide range of values enables the virial coefficients B and C to be determined. According to the kinetic theory of gases these are simply related to the forces between the molecules. By this means it has become possible to infer the law of force, and, if the Lennard-Jones potential is being used to represent it, to estimate the values of the unknown parameters a and b.

An alternative line of approach to the study of molecular interactions is by careful measurement of the transport properties—thermal conductivity, viscosity, electrical conductivity. Yet another approach is to shoot a stream of molecules with known speed into a gas of the same molecules. There will be collisions, so that the original molecules are scattered. From a study of the number scattered through any given angle it is, in principle, possible to calculate the law of force. At present these methods have not proved so easy to handle, or so fruitful, as the earlier virial expansion methods.

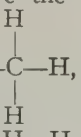
STRUCTURE OF MOLECULES

We now pass from an account of the forces between molecules and the way they pack together in liquids and solids, to consider the structure of an individual molecule. In early days there was no point in asking the questions: what is the size and what is the shape of a molecule? For there were no ways of effectively answering such questions. The only kind of question which it was possible to ask was: how many atoms of one kind will combine with an atom of another kind? Considerable progress was made in this latter direction. It was found, for example, that atoms of hydrogen always formed a diatomic molecule (H_2), and that one atom of carbon was able to combine with four atoms of hydrogen in the form of methane (CH_4). But why no one could ever isolate H_3 or CH_3 was a question whose answer could not be provided until the advent of wave mechanics in 1926. Until that time the atom itself was thought to be rather like a billiard ball of extremely small size around whose surface there were attractive forces, rather like hooks, with which it could attach itself to other atoms. The number of such hooks measured the number of atoms with which it could simultaneously enter into chemical combination. It was usually called the valence of the atom. Thus hydrogen was monovalent, carbon tetravalent. For light atoms the combining ratio was usually a constant for any pair of atoms (for example C and H, giving CH_4). But for heavier atoms, particularly the so-called transition elements of the periodic table (see Periodic Law) and the rare earth atoms, many different valences were found to exist for the same atom, and the idea of a definite valence for an atom is less satisfactory. As long ago as 1860 (W. Odling) and 1861 (A. Kekulé) it became the custom to represent the bonding together of two atoms in a molecule by a line. Thus H_2 would be written H—H and CH_4 would be written

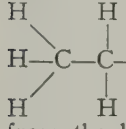


to represent the mutual satisfying of all the valency demands of each of the atoms in the molecule. This representation provides some sort of basis for understanding our inability to isolate any CH_3, since not all the valency demands of the carbon atom would be satisfied. (Incidentally, we now have very good grounds for believing that CH_3—the methyl radical—does exist, for minute periods of time, and plays a central part in many chemical reactions. But it cannot be isolated, and can at best be called an unstable molecule.)

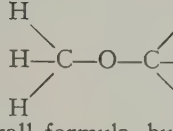
In cases such as those of molecular hydrogen and methane, in which the valency demands were all met by the drawing of a single line between pairs of atoms, it became usual to speak of a saturated molecule, and the bonds were called single bonds. But there were other cases, such as carbon dioxide (a chief constituent of soda water), where, to preserve the valence numbers of the atoms, it was necessary to draw two lines between some of the atoms—for example O=C=O. These bonds were called double bonds, and the molecules were said to be unsaturated. In acetylene, whose formula was simply C_2H_2 it was necessary to introduce triple bonds H—C≡C—H. To a very large degree, however these diagrams were formal; for they did not say whether the three atoms in CO_2 were in a line, as in fact they are, or whether the two C=O directions make an angle with each other. The matter is not at all obvious or clear-cut, for although both O=C=O and H—C≡C—H are linear, neither water (H—O—H) nor hydrogen peroxide (H—O—O—H) is linear. Nor do such diagrams give any indication of the size or length of the bonds. Historically their value was, first, that by concentrating on the valence number of an atom they interpreted the familiar combining ratios and showed, for example, that methane could only have the structural relationship expressed by



all other possibilities such as H—H—C—H—H, which were not excluded by the chemical formula CH_4, being excluded by their failure to saturate all the atomic valences. This, incidentally, is the reason why, a little earlier, we said that ethyl alcohol was written C_2H_5OH rather than C_2H_6O. For C_2H_5OH shows that its structural formula must be



In this way it is distinguished from the known molecule dimethyl ether, which has the same overall formula, but the different structural formula



Molecules with the same overall formula, but different relative structural arrangement of the atoms, are called isomers. Secondly, these structural formulae focused attention on the mutual orientation of the atoms, and led to further work, both theoretical and experimental, which established the stereochemistry of a molecule (that is, spatial relationship of the atoms) and its size and shape (that is, distance apart of the atoms). In the solving of these problems, mathematics, physics and chemistry have now almost merged into one another.

Experimental Molecular Structure.—Questions about the size of a molecule are essentially physical questions, and so physical ideas and experiments are needed to answer them. But questions about the shape of a molecule are both physical and chemical. The strictly chemical type of reasoning is less clear-cut than the physical, but until the 1920's it had progressed much farther.

In methane the structural formula

suggests, as was found experimentally, that all four C—H bonds are equivalent, so that there is only one type of molecule CH_3X, where X is some other monovalent atom which has replaced one of the H atoms. But the original CH_4 molecule might be planar; or it might be a prism with the four H atoms as base and the C atom as vertex; or it might be a tetrahedron with the C atom at the center and the H atoms at the vertices (see Fig. 8); and there are other alternatives also. The chemical fact that it has only been found possible to obtain one di-substituted methane of type CH_2X_2 makes it almost certain that the tetrahedral shape is the correct one. Arguments of this kind were used by J. H. van't Hoff and J. A. Le Bel to establish the tetrahedral character of carbon in a large number of saturated systems, and led to the idea of definite valency angles. But quite evidently the number of cases where such arguments are applicable, is limited, and the arguments themselves are not rigorous. Thus the nonexistence of more than one type of molecule CH_2X_2 may mean nothing more than that one of the various alternatives is so much more stable than the others that we always form it and not the others. We should not therefore be led unequivocally to a tetrahedral carbon atom.

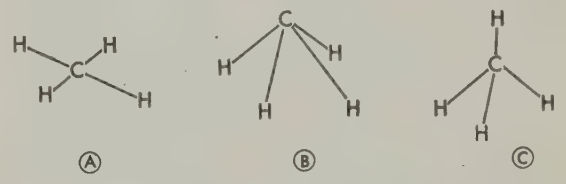


Fig. 8. Conceivable shapes for the methane molecule CH_4. (A) is planar, (B) is pyramidal and (C) is tetrahedral. Only (C) is correct.

Physical Approach.—The more physical lines of approach to this problem may be classified under the main headings (a) electron diffraction, (b) X-ray diffraction, (c) spectroscopic.

Electron diffraction: In electron diffraction a beam of electrons is fired into a container filled with a gas containing the molecules under investigation. The electrons are scattered in all directions, chiefly by the nuclei of the atoms. These electrons, on emerging from the gas, fall on a photographic plate, or other measuring system. From a careful analysis of the way in which the number of electrons at any angle varies with the angle of scatter, it is possible to infer the relative positions of the atoms of the scattering molecules. This technique has been much used, particularly in America, to study small molecules in the gas phase. In the early 1950's, however, modifications of the method, particularly in the USSR, have allowed crystalline solids to be studied also.

We have already discussed X-ray diffraction methods in our earlier account of solids. In early days this method was widely used for nonmolecular solids. The reason for excluding molecular solids was that in each repeating unit, or unit cell, of the solid there might be a quite large number of atoms, so that immense calculations would be needed to establish the detailed shape of each molecule. But the advent of electronic

computers has changed this situation. Professor R. Peipinsky of Pittsburgh University has developed a machine of this kind (XRAC) which will make the necessary calculations in what is often less than one per cent of the previous time. As a result it is now practicable to deal with molecules of 30 or 40 atoms; and there is every reason to suppose that eventually some of the very large systems like proteins will be understood in their molecular architecture.

There is one important difference between electron diffraction and X-ray diffraction so far as the study of molecules is concerned. A beam of electrons is scattered chiefly by the nuclei of the atoms, a beam of X-rays chiefly by the electrons of which the atoms are composed. So it would be more accurate to say that electron diffraction tells us where the nuclei are, X-ray diffraction tells us the charge-cloud density at all points of the molecule. We shall see later that the electrons in a molecule may be represented by a kind of cloud of negative charge. It is the density of this cloud that may be inferred from X-ray observations. With heavy atoms the density is exceedingly great in the immediate vicinity of the nucleus, so that there is no difference between conclusions from the two types of experiment. But with light atoms, and particularly with hydrogen, which only carries one electron, the electron diffraction technique has advantages over the X-ray technique. In the year 1955 the relative status of the two methods was that except for the location of hydrogen atoms, X-ray analysis (in the solid) was distinctly more accurate than electron diffraction (in the gas). Since World War II a beam of neutrons (see NEUTRONS) has been used instead of X-rays. These particles are greatly scattered by hydrogen atoms, so that a new approach to molecular structure determination has begun, complementary to the other two.

However, there can be little doubt but that, where it can be applied, spectroscopy gives the greatest accuracy. Conventional spectroscopic measurements yield what are effectively principal moments of inertia. Now each molecule has three such moments, though a planar molecule is such that the greatest moment of inertia is exactly equal to the sum of the other two. A linear molecule has one moment of inertia zero and the other two equal. In the case of a diatomic molecule consisting of two masses m and M a distance l apart, the moment of inertia, measured relative to the center of mass as origin, is $mMl^2/(m+M)$. If the value of this quantity is known, then l is soon calculated. With polyatomic molecules the corresponding formulae are more complex, but not fundamentally more difficult to obtain. With three atoms, for example, they involve not only the three atomic masses, but also the two bond lengths and one valence angle. The experimental measurement of one moment of inertia does not therefore immediately yield one bond length or one valence angle, but a relation between them. As there are in general three independent moments of inertia it follows that by careful analysis of the rotation-vibration spectrum three independent relations between the molecular constants can be obtained. By themselves these may not be sufficient to specify all the parameters—such as bond lengths and bond angles—which define the shape and size of the molecule. But the number may not infrequently be increased by supposing that in related molecules (such as CH_4, $H_3C—CH_3$) certain parameters (such as C—H bond length) remain invariant. The number may also be increased by the device of replacing one or more atoms by isotopes (see ISOTOPES) which are chemically entirely equivalent to the original atoms, but which differ by having a different mass. This new mass affects the moments of inertia, and so alters the spectrum. The most important such isotopic replacement is of hydrogen (H) by deuterium (D), that is, heavy hydrogen, for which the mass is twice as large. But carbon may be used, with mass numbers 12 and 13, and other atoms have similar alternatives. A suitable synthesis of all the information obtained from a series of isotopic substitutions in one given molecule may sometimes be sufficient to yield internuclear distances (that is, bond lengths) and valence angles with an accuracy of 1 in 10^4. Particularly is this the case when the newer microwave techniques can be used. An accuracy of this order is embarrassingly high. For it must always be remembered that the atoms are vibrating around their mean positions: even at low temperatures the amplitudes of these residual, or zero-point, vibrations exceed the precision with which the mean bond length is known. X-ray and electron diffraction measurements seldom give an accuracy anything like so great, and seldom one better than 1 in 10^2.

In addition to the measurements of moments of inertia which have just been described, there are some more subtle, but exceedingly important, factors which help to fix the shape, or more correctly the symmetry, of a molecule. We know that a molecule of N atoms has $3N-6$ modes of internal vibration ($3N-5$ if it is a linear molecule). If the molecule has some symmetry these vibrations will reveal it. For example, a linear molecule like CO_2, in which the C atom lies symmetrically between the two O atoms, will have a total of 4 (i.e. $3\times 3-5$) internal modes of vibration. Two of these can be shown to be "parallel" vibrations, in which all three atoms move along their common axis. The other two, of equal frequency, are associated with motion of the atoms "perpendicular" to this axis. In the first place it is possible from the appearance of the infrared and Raman spectra to distinguish parallel and perpendicular vibrations. This is a great aid in identifying the vibrations. And secondly it is possible to show that of the two parallel vibrations, one is symmetrical in the sense that the two O atoms move in phase towards or away from the central C atom, and the other is unsymmetrical with the corresponding motions out of phase. If it can be shown spectroscopically that there are both symmetrical and antisymmetrical modes of parallel vibration in a molecule such as CO_2, this shows that the two C=O bonds are equal. Analysis of this kind can rule out the structural formula N—O—N for N_2O, and show that it must be N—N—O. More complicated symmetries give more information. Thus C. K. Ingold and his colleagues in London have shown by combining all possible kinds of spectroscopic measurement, that benzene C_6H_6 is planar, and that the six carbon atoms lie at the corners of a regular hexagon, with the six hydrogen atoms directed radially outwards (Fig. 9). Doctors B. Stoicheff and G. Herzberg (1954) have shown, by isotopic replacement of H by D, that the carbon-carbon distance is 1.397×10^{-8} cm. The type of mathematics which is used in dis-

cussing the symmetry properties of a molecule is called Group Theory.

A few examples (to be used later) of the kind of information that is obtained in this way may be given at this stage. Thus from its pure rotation spectrum it can be shown that the H—Cl distance in hydrogen chloride gas (Fig. 4) is 1.27×10^{-8} cm. From the moments of inertia of water we find that the molecule is not linear, but has a valence angle (Fig. 10a) of 104.5°. From the fact that in methane the largest moment of inertia is not equal to the sum of the other two, we cut out the planar structure Fig. 8a; and by symmetry considerations we establish the tetrahedral shape of Fig. 8c. Ammonia NH_3 is not planar, but is like a pyramid

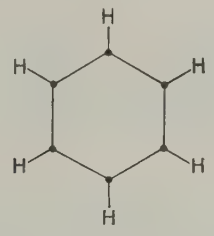


Fig. 9. A molecule of benzene. The dots denote carbon atoms arranged in a regular plane hexagonal fashion. The carbon-carbon distance is 1.397 ± 0.004 angstrom units.

(Fig. 10b) with each HNH angle equal to about 107°.

There are other ways in which information about certain parts of a molecule may be obtained. Thus in nuclear magnetic resonance we measure the energy necessary to "flip" the spin of one of the nuclei from one of its allowed orientations to another. If, for example, this nucleus is a proton as with the atom of hydrogen, and if there should happen to be a second proton in the same molecule a definite distance away from the first proton, then the energy of flip will be altered. Careful measurements of the absorption of energy in this process allow us to infer the distance apart of these two atoms, without reference to the rest of the molecule.

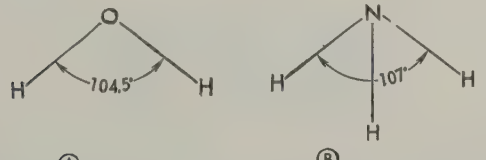


Fig. 10. (A) a water molecule H_2O, (B) an ammonia molecule NH_3.

Lastly, we must mention the use of dipole moments. We saw earlier that molecular dipole moments are effective in determining intermolecular forces. But they also tell us something about the molecule. Thus if the dipole moment of CH_4 turns out to be zero (as it is) we can almost certainly reject the pyramidal model in Fig. 8b: it would be almost unbelievable that the electrons would be attracted absolutely equally to the carbon and the hydrogens. Similarly from the facts that the dipole moment of water is not zero, and that of CO_2 is zero, we are led to the angular shape of Fig. 10a for H_2O and the linear shape for CO_2.

Theoretical Molecular Structure.—The explanation of many of the structural details just mentioned could not be seriously considered until 1927. In the early days the internal structure of an atom (See Atomic Theory) was unknown. How could anyone hope to know the structure of a molecule? When the electron was discovered and identified in 1897 by J. J. Thomson at the Cavendish Laboratory, Cambridge, England, it became clear that the mechanism whereby atoms exert forces on each other was essentially electronic. This led to a series of models, due to I. Langmuir and others, in which an attempt was made to locate certain electrons—the outer ones, sometimes called valence-shell electrons—at the vertices of a cube surrounding each atom. So some of the electrons would appear to "belong" to two or more atoms, and, by extrapolation from the case of the rare-gas atoms (helium, neon etc.) which appeared to be so stable as not to form compounds, and which were characterized by the presence of 8 electrons in their outer shell, it was postulated that each atom would seek to attach other atoms to itself in such a way and of such a number that it would complete its octet of electrons at the corners of the imaginary cube around it. Models of this kind, however ingenious, are unsatisfactory because a stationary electrical distribution of such a type can be shown to be unstable.

The next fundamental step was due to G. N. Lewis of California. In 1916 he made the important observation that practically all single bonds (as in H—O—H or H—Cl) could be regarded as involving two electrons. As a general rule one electron came from each of the two atoms at the ends of the bond, though in certain special cases (called donor bonds) both electrons could come from one of the atoms. These two electrons were said to be shared between the atoms. With double bonds four electrons were involved and with triple bonds six electrons. As a result of this sharing process each atom such as O, Cl, completed an octet of electrons, and H a duplet. In HCl, for example, the H atom provides just one electron, but the Cl atom has 7 electrons in its outer, valence shell (this is the M-shell). By sharing one of these 7 with H, the Cl atom acquires an interest in 8 electrons, the H atom acquires an interest in 2 electrons, and both the octet and the duplet are complete. In H—O—H the O atom has 6 valence-shell electrons, and by sharing one each with the two H atoms, it acquires its necessary total of 8. If it attempted to add on a third H atom, to form a hypothetical H_3O, it would find itself with an interest in 9 electrons, contrary to the rule. This model explains the saturation of valence, though of course it says nothing about size or shape. It is interesting to notice that in fact oxygen can attach itself to three hydrogen atoms provided that it first becomes ionized by giving up an electron. Thus the ion H_3O^+ with one net positive charge, is present very widely when an acid is dissolved in water. (See Acid). In O=C=O we preserve the octet rule for both O and C by supposing that in each bond a total of four electrons are involved. This is in agreement with their designations as double bonds.

The next important step was the introduction of wave mechanics in 1926 by Erwin Schrödinger. For the first time it became possible to say what was meant by the term electron distribution in an atom or a molecule. One result of the Uncertainty Principle of W. Heisenberg (see Quantum Theory) was that on account of its small mass it was not possible to follow an elec-

tron in its orbital path, so that some new mode of description was necessary. The mode which is most common in chemical problems is that of the charge-cloud, similar in some respects to a city fog; the cloud is not equally dense everywhere, and for an atom or a molecule its density decreases as we move away from the neighborhood of the nuclei. We interpret the cloud as telling us the probability that if we could instantaneously photograph the atom or the molecule, we should find the electron in any chosen small region. The density of the cloud is proportional to the probability. The density itself is found from the wave function, which in its turn is found as the solution to the appropriate Schrödinger Wave Equation. So, in order to calculate the distribution of charge we (a) set up the appropriate wave equation, (b) solve it to get the wave function ψ, (c) write ψ^2 as the density of our charge-cloud. On the average it is as if each electron were itself smeared out into a volume distribution of electric charge, and the density of this charge is given by the square of the calculated wave function.

So far as an atom is concerned, this process gives us the charge-clouds which correspond to the distinct energy levels which are allowed for this atom. It is unfortunate that except for the one-electron problem, the wave equation is too complicated to be solved exactly. Consequently

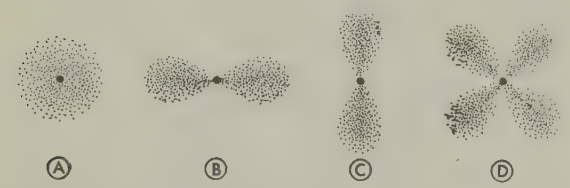


Fig. 11. Atomic orbitals, showing (A) *s*-type, with spherical symmetry, (B) and (C) *p*-type, with axial symmetry, (D) *d*-type, with four regions of high charge-cloud density. In each case the central dot denotes the position of the nucleus of the atom.

various approximations to the solution have to be obtained; and various mathematical techniques exist for getting better and better approximations. When the individual electron levels have been obtained, the Pauli Exclusion Principle is applied. This principle allows us to put not more than two electrons into each of the calculated energy levels. If we have two electrons in a charge-cloud pattern (now usually called an orbital, since it replaces the older notion of an orbital path) these two electrons must have their spins antiparallel, that is, opposed to each other. In the lowest state of the atom as a whole we simply calculate the allowed orbital energies, and then feed in electrons, two at a time, beginning with the level of lowest energy, until all our available electrons are used up.

With molecules a similar situation obtains. In the first place it is easy to show that all the inner-shell electrons of the atoms are effectively unchanged as a result of a molecule being formed. These electrons have monocentric orbitals such as those of Fig. 11. But at least some of the valence-shell electrons have orbitals which, to a high degree of accuracy, can be thought of as bicentric. Since each orbital can accommodate two electrons, with opposed spins, this shows that two electrons can have an orbital associated with a pair of adjacent atoms; these two electrons together constitute G. N. Lewis' electron-pair bond. And we can see that the deepest explanation which is possible for the existence of an electron-pair bond is in the application of the Exclusion Principle to the idea of orbitals.

In molecular hydrogen (H_2) there are only two electrons and the charge-cloud is of the form shown in Fig. 12. As the bond is due to two electrons it is a single bond, and like almost all normal single bonds the charge-cloud is axially symmetrical, that is, has cylindrical symmetry around the line of the bond.

In HCl the charge-clouds for the K- and L- shells of chlorine are just as in the isolated Cl atom. The bond is associated with two electrons whose charge-cloud pattern resembles that of Fig. 13. Other electrons in the valence-shell of chlorine have orbitals closely similar to the

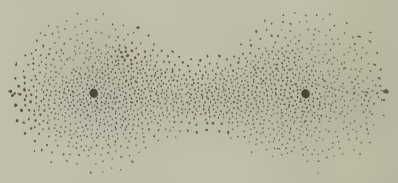


Fig. 12. Charge-cloud for molecular H_2. Thick dots denote positions of the two nuclei. Notice symmetry around the axis, and the closeness with which this diagram resembles the superposition of two diagrams such as in Fig. 11a.

isolated atom orbitals. It is of great significance that the charge-cloud for the bonding electrons is not very different from that due to a superposition of a hydrogen atomic orbital (an *s*-type orbital, see Fig. 11a) and a chlorine atomic orbital (a *p*-type orbital, see Fig. 11b). For this reason we say that the hydrogen electron has been paired with the chlorine electron to form the bond. Now the only orbitals that may be used in this way are those which are not already doubly filled. Hence the valence number of an atom is equal to the number of unpaired electrons in the atom. Nitrogen, for example, is triatomic (Fig. 10b) because there are three unpaired electrons in the outer shell of the isolated N atom.

Finally, in H_2O, we have atomic nonbonding electrons round the O atom, and their two

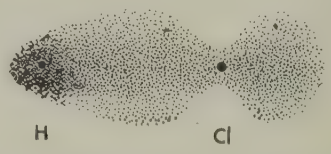


Fig. 13. Charge-cloud for molecule H-Cl. Notice symmetry around the axis, and the closeness with which this diagram resembles a superposition of diagrams such as in Figs. 11a and 11b.

charge-clouds, similar in shape and size, one for each O—H bond. (See Fig. 14.) Each separate charge-cloud resembles the superposition of a hydrogen *s*-type orbital and an oxygen *p*-type. Now it may be shown that the available *p*-type orbitals in an atom—we need two of them here for the two bonds—are naturally directed at right angles to each other. This, as Linus Pauling showed in 1931, gives us insight into the reason why the angle H—O—H is not 180°, but is nearer to 90°. Indeed the whole basis of stereochemistry lies in considerations analogous to these.

We can also see why bonds are so nearly constant, in length and energy. For if, in H_2O we replaced one H atom by another group, such as C_2H_5, to give ethyl alcohol H—O—C_2H_5,

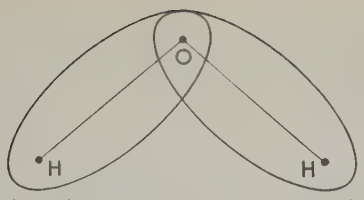


Fig. 14. Schematic representation of the two charge-clouds that represent the two O—H bonds in water H—O—H. The cloud for each bond is similar in general pattern to that shown in Fig. 13, and is almost wholly localized within the volumes obtained by rotating each closed curve around the appropriate O—H axis.

there is no particular reason why the charge-cloud for the remaining H—O region should be seriously modified. It is true that there will be some small modification, so that the O—H bond is not really identical in all molecules. But the variations from molecule to molecule are not so large that they prevent us from drawing up tables of bond properties—length, energy, force constant, dipole moment, and so on. It is also easy to see from diagrams such as those of Figs. 12–14 what is meant by the size and shape of a molecule, and the relation of all this to the van der Waals' radii mentioned earlier.

Enormous progress has been made in this field since W. Heitler and F. London first introduced some of these ideas in 1927. We can now give a fairly detailed account of most simple molecules. For details the reader is referred to the standard works listed below. See also Electron Theory; Stereochemistry; X-Rays, Applied.

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MOLECULE, mŏl'ê-kūl, the smallest particle of a chemical substance capable of a separate existence. See Molecular Theory.

MOLESKIN, mōl'skĭn, originally the skin of moles used as fur, now a fabric so called from its softness like the skin of a mole, such as velveteen. It is a strong twilled cotton fabric, cropped or sheared before dyeing.

MOLESWORTH, mōlz'wûrth, **Mary Louisa** (nee Stewart; pseudonym Ennis Graham), English writer: b. Rotterdam, Netherlands, May 29, 1839; d. London, England, July 20, 1921. Her first books were sentimental novels for adults, written under the pseudonym Ennis Graham. After 1874 she used her married name as an author, achieving wide success as a writer of children's stories. Among the most popular were *Carrots* (1876) and *The Cuckoo Clock* (1877).

MOLEY, mō'lĭ, **Raymond (Charles),** American educator, editor, and author: b. Berea, Ohio, Sept. 27, 1886. Graduated from Baldwin-Wallace College in 1906, he taught school in Ohio for a number of years and joined the faculty of Western Reserve University in 1916. In 1919 he was appointed director of the Cleveland Foundation, publishing the results of his work in *The Cleveland Crime Survey* (1922). Named associate professor of government at Columbia University in 1923 and professor of public law there in 1928 (retired 1954), he was research director of the New York State Crime Commission (1926–1927) and the New York State Commission on the Administration of Justice (1931–1933), the latter under Franklin D. Roosevelt, who was then governor. In March 1933, when Roosevelt became president, Moley was made assistant secretary of state and a member of the so-called "brain trust." Resigning in September, he established and edited *Today,* a weekly magazine which in 1937 was merged with *Newsweek,* Moley remaining as contributing editor. His acid criticism of the New Deal was summed up in *After Seven Years* (1939). Among his other books are *Lessons in American Citizenship . . .* (1917; 10th ed., 1930); *Our Criminal Courts* (1930); *27 Masters of Politics* (1949); and *How to Keep Our Liberty* (1952).

MOLFETTA, môl-fât'tä, commune and city, Italy, in Bari Province, on the Adriatic Sea, 15 miles northwest of Bari, with which it is connected by railroad. It has a magnificent Romanesque cathedral begun in the 11th century, and a well-sheltered harbor, exporting chiefly olive oil, wine, and almonds. There are variegated manufactures, as well as shipbuilding and canning industries. Just outside the town are caves of archaeological interest. Pop. (1951) city 55,150; commune 55,962.

MOLIERE, mô-lyâr' (pseudonym of Jean Baptiste Poquelin), French dramatist: b. Paris, France, bap. Jan. 15, 1622; d. there, Feb. 17, 1673. Known as the greatest French writer of comedy, he began life as an upholsterer's son and apprentice. The senior Poquelin held a position of some slight importance at the French court as *valet de chambre* and upholsterer, and he arranged for his eldest son to succeed to this office. In the meantime he sent the boy to the Jesuit college of Clermont in Paris, where he received an excellent education and made friends in the smart world—notably Armand de Bourbon, prince de Conti—who were helpful to him in later years.

Early Career in the Theater.—Molière's choice of the theater as a career was, on the face of it, a surprising one. Thanks to his father he was assured a safe position in the world; and the theater, besides being hazardous, was frowned upon by the church in which young Poquelin had been raised. His decision is generally attributed to the influence of Madeleine Béjart, daughter of a minor government official and member of a large, rather Bohemian family, interested in the theater, who had become neighbors of the Poquelins. In 1642, the year before Molière's meeting with Madeleine, the elder Poquelin had made a final attempt to get his son interested in the upholstery business. He sent the young man with Louis XIII to Narbonne, to act in his appointed role as *valet-tapissier du roi,* chiefly to make the king's bed. When the boy returned from this sojourn in the south of France, he met Madeleine, and soon persuaded his father to let him out of his contract to succeed him in office. He and Madeleine then (1643) launched the Illustre Théâtre, an attempt to establish a third playhouse

in Paris. As was the fashion of the day, he took a new name, Molière.

Their efforts were unsuccessful in the capital (Molière was imprisoned briefly for debt), and in 1646 they took to the provinces. Here for 12 years they enjoyed a sufficient measure of success and got enough recognition to insure them a welcome return to the French court. In these 12 years, too, the greatness of Molière the dramatist was fashioned. As actor, producer, and business manager he learned all the tricks of the trade. As playwright, which he of necessity soon became, he was brought in close touch with his audience and was able to study at first hand the people of France. Molière's greatness rests on his knowledge of people, his understanding of human nature, and in these 12 formative years he developed this discernment.

Bettmann Archive

Molière at breakfast with Louis XIV at Versailles, from the original painting by Jean Léon Gérôme.

The repertory of plays available for itinerant actors at that time featured many tragedies. Molière's contract with his troupe stated that he was to alternate in the leading role. He was not a great tragedian, but he was an excellent comic actor. It is not surprising then to find the repertoire of Molière's company swinging to farce and Molière adapting an Italian play by Niccolò Barbieri for his first writing effort, *L'étourdi* (*The Blunderers*), produced in 1655 in Lyon. Molière, the author, always wrote roles for Molière, the actor, in which he would be sure to get laughs. The inspiration for his early plays came from the old French farces as well as the *commedia dell'arte* and, of course, from his direct experience of life. It was mostly a burlesque type of humor, with broad jokes and suggestive situations, but it evoked the basic human emotions and was very popular material. The time was becoming ripe, however, for classical comedy of the kind that Molière was soon to produce.

Return to Paris.—In 1658, Molière and his troupe returned to Paris, and on October 24 they staked their future on an appearance before the most important audience of their career: the young King Louis XIV, his brother Philippe (later duc d'Orléans), and the court, in the Guard Room of the Louvre. The vehicle in which they chose to display their talents was Pierre Corneille's tragedy *Nicomède*. Molière addressed the august assemblage with a felicitous speech and asked permission to conclude the entertainment with a little farce, one he had written for the provinces. The result was that the playwright and his company were given permission to play regularly at the royal Petit-Bourbon theater, under the patronage of the king's brother, and were thenceforth known as the *troupe de Monsieur*.

In 1659, Molière's growing power as a dramatist was shown in *Les précieuses ridicules*, q.v. (*The Affected Young Ladies*), a new comedy which satirized the social climbers of the day, their affectations and false standards. It was an immediate success and brought them the best box-office receipts of any production to date. In this, as in most of his work, Molière lashed out against the distortions in society which frustrate man's innate goodness and common sense, presenting a picture of social life in which character is shown to be more important than station. Naturally, this point of view was immensely appealing to the common people, who were able to identify themselves with his characters and to find society itself amusing.

In 1662, Molière, who was 40, married Armande Béjart, aged 18, a younger sister of Madeleine. Armande had been raised with Molière's troupe and was much loved and spoiled. She was a part of the theater from her earliest years and became a vivacious and appealing comedienne. The marriage, however, was beset with domestic difficulties. Sometimes thereafter they lived apart, and increasingly in his plays one finds themes of jealousy and unfaithfulness. Molière added fuel to the flames of gossip about his marriage by producing in 1662 a play he had written about an older man marrying a girl half his age, *L'école des femmes* (*The School for Wives*). While not one of his greatest comedies, the touch is surer, and the author is more mature than in his earlier works.

Major Comedies.—Henceforth Molière wrote and produced at an increasing pace. It was fortunate for his career that he had Louis XIV for a friend and protector; but regrettably the king encouraged him to waste his time on many divertissements for the royal festivals. In spite of many preoccupations and domestic trials, he kept on writing and acting, without taking time to polish and repolish. He had two importunate rulers to satisfy: the people and the king.

Tartuffe, one of the Molière's most famous and most controversial plays, appeared on May 12, 1664. It is the story of a hypocrite, a genuine devotee of hypocrisy, who deceives even himself. Unfortunately for the contemporary fate of the play, he is a religious hypocrite; and the storm it provoked among the ultrareligious people of Paris did not take long to break. On the fifth day of what promised to be a long and highly successful run, the king politely advised Molière to withdraw the play. For five years thereafter *Tartuffe* led a clandestine existence, having a number of readings before royalty and the aristocrats, but no public appearances. When it finally reappeared in public (after the king had composed his differences with the Holy See), it played to packed houses, much to the discomfiture of Molière's enemies; and the play has since been acclaimed one of the great masterpieces of the French theater.

Since the suppression of *Tartuffe* was a serious financial blow to Molière, he worked hurriedly to produce another play, *Don Juan, ou le festin de Pierre* (see DON JUAN), in February 1665. He yielded nothing to his caviling critics, who denounced the play as the work of an atheist.

It went uncensored, however, and in August of that year the king took him under his protection, gave him a pension of 6,000 livres, and permitted his company to be known as the *troupe du Roi.*

On June 4, 1666, Molière's greatest comedy, *Le misanthrope* (q.v.), was produced. Here he worked on a bigger canvas, painting a picture of society that is more inclusive than his former efforts at exposing particular fads and vices. In it is reflected, too, many of the domestic trials of Molière's own life. Alceste, the misanthropic young protagonist of the play, revolts against the sham and glitter of the court. He makes a strong plea for "the honest man" but argues his case so violently that one feels a neurotic, compulsive quality in his protestations. At the same time, he is deeply in love with Célimène, who is representative in many ways of the courtly vices he detests. It is difficult, therefore, to accept Alceste's arguments in favor of social sanity, right as they may be. His friend, Philinte, and Célimène's cousin, Éliante, offer the most reasoned analysis of the conflict between society, which exists on compromise, and the just man, who seeks absolute virtue. But there is no satisfactory resolution of the conflict; the audience is permitted to draw its own conclusions. In *Le misanthrope,* as in most of Molière's plays, the material is subjective in nature; the execution objective. His young wife, Armande, must have had many of the qualities of Célimène; Alceste bears many resemblances to the author. Despite the fact that it has come to be considered his greatest comedy, the play, possibly because of its subtle construction, was not a success with contemporary audiences.

Molière began work immediately on another play to increase the revenue of his troupe, and on Aug. 6, 1666, produced *Le médecin malgré lui* (*The Physician in Spite of Himself*). This famous farce pokes fun at the doctors of the day by turning a poor faggot binder, Sganarelle, into a physician in spite of himself. Molière, who was to spend the rest of his life under the care of doctors, exposes the charlatanry of the contemporary medical profession in an amusing way.

During the next year Molière underwent a most trying period; he was ill much of the time and one of the longest periods of separation from his wife was just beginning. As usual, he applied himself to new production. The following year (1668) three of his plays were produced: *Amphitryon, Georges Dandin,* and *L'avare,* q.v. (*The Miser*), of which the last was the least successful. Most of his work was being written now to satisfy Louis XIV's taste for amusement. In 1669, Molière satirized the doctors again in *M. de Pourceaugnac,* and in 1670 he produced his most successful comedy-ballet, *Le bourgeois gentilhomme* (*The Would-be Gentleman*).

Last Plays.—On Feb. 17, 1672, Madeleine Béjart died; but Molière, however much he was grieved, continued to work. On March 11 he produced *Les femmes savantes* (*The Learned Ladies,* q.v.), a much more mature comedy than *Les précieuses ridicules,* to which it is sometimes compared. His health became worse, and it was necessary to close the theater for a few days because of his inability to perform. Despite all his difficulties, he kept busy with the preparation of his last play, *Le malade imaginaire* (q.v., *The Imaginary Invalid*), the story of a man whose illnesses, unlike Molière's own, were only imaginary. On Feb. 17, 1673, the first anniversary of Madeleine's death, Molière was much worse. His friends and Armande, who had returned to their house, begged him not to go on. Molière told them he had no choice; the wages of 50 members of his troupe depended on his appearance. While he was on stage, it was observed that he was in difficulty. After the performance he complained of being cold and was carried home. When he had eaten a bit of bread and cheese, he began coughing. He called for his wife, but she was not there. He died then in the arms of two strangers who were staying at his house, without receiving the final offices of the church; and later, on these grounds, the archbishop refused him Christian burial. At Armande's request the king intervened, and burial was permitted at St. Joseph's Cemetery, but without ceremony. During the French Revolution, his supposed remains were transferred to the Panthéon, and later to the Père Lachaise Cemetery. But their identification was uncertain, and it is doubtful that the tomb by Alexandre Lenoir contains the actual relics of Molière. See also DRAMA—*The Renaissance* (France): Molière; and FRANCE—*17. Dramatic Art* (The 16th and 17th Centuries): Classical Comedy with Molière.

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MOLINA, mō-lē'nä, **Luis,** Spanish Jesuit teacher and writer: b. Cuenca, New Castile, Spain, 1535; d. Madrid, Oct. 12, 1600. He entered the Jesuit Order in 1553, and from 1566 to 1586 taught theology at Evora, Portugal. In 1588 he published his most celebrated work, *Concordia liberi arbitrii . . .,* in Lisbon. In his teachings (Molinism), he sought to reconcile free will, divine grace, and the foreknowledge of God. If God knows, through all eternity, the righteous and the damned; if He gives His grace to all, yet requires man to be responsible for his own destiny, how is it possible to explain freedom of will, efficacy of grace, or the infallibility of God's prescience? Molina taught that grace by its very nature is always efficacious; that man's free will permits him to accept or reject it; and that God foresees throughout eternity the use each would make of the divine gift. The Jesuits supported this view, but the Dominicans hotly disputed it because they felt Molina neglected the reconciliation of free will and grace made by St. Thomas Aquinas. The controversy, referred to the Vatican in 1596, was settled satisfactorily to both sides by Pope Paul V in 1607, after Molina's death.

MOLINA, Tirso de. See TÉLLEZ, GABRIEL.

MOLINE, mō-lēn', city, Illinois, in Rock Island County, on the Mississippi River, at an altitude of 585 feet. It is served by the Chicago, Rock Island & Pacific; Chicago, Burlington & Quincy; and Chicago, Milwaukee, St. Paul and Pacific railroads, and is on many important highways. The city adjoins East Moline and Rock Island, and is directly across the river from Davenport, Iowa, about 165 miles southwest of Chicago. Moline has a fine airport, city-owned,

with airline service. The immediately surrounding area is agricultural, but there are extensive coal fields near by. Together with Rock Island, the city constitutes the greatest center in the United States for the manufacture of farm implements, with such companies as Deere and International Harvester operating on a major scale. Other industrial products include electrical equipment, machinery, foundry products, machine tools, rubber products, wood products, sporting goods, and clothing. First important as a river port, Moline's industrial growth began after the decline in Mississippi steamboating in the latter part of the 19th century. It was settled about 1832, platted in 1843, and incorporated as a town in 1848 and as a city in 1872. It is governed by a mayor and council. Pop. (1950) 37,397.

MOLINET, mô-lē-nĕ′, or **MOULINET, Jean,** French poet and chronicler: b. Desvres, France, 1435; d. Valenciennes, Aug. 23, 1507. After receiving his master's degree in Paris about 1461, he served as assistant to Georges Chastellain, chronicler of the house of Burgundy, and continued Chastellain's *Chroniques* from 1474 to 1504. He was also the author of *L'art de rhétorique vulgaire* (before 1492), and a leader of the *rhétoriqueurs,* a school of Burgundian poets who favored an affected, pedantic, rhetorical style. He also wrote a prose version of the famous *Roman de la rose* (1503). A modern edition of the *Chroniques* was published, 3 vols. (1935–37); and of Molinet's *Faictz et Dictz,* 3 vols. (1936–39).

MOLINISM, mō′lĭ-nĭz′m, the teachings of Luis Molina (q.v.). The term is also sometimes used for the quietism (q.v.) taught by Miguel de Molinos (q.v.).

MOLINO DEL REY, Battle of, mô-lē′nô thĕl rĕ′ê, one of the bloodiest engagements of the Mexican War. It took place a few miles southwest of Mexico City on Sept. 8, 1847. Inaccurate intelligence led Gen. Winfield Scott to believe that the Mexicans at the Molino del Rey (King's Mill) were casting church bells into cannon to be used in the defense of Mexico City. He ordered the capture of the ¼-mile-long stone buildings and the Casa Mata, 500 yards to the northwest, a powder magazine. Gen. William J. Worth, in immediate command, attempted a daring daylight attack after the briefest artillery preparation. The 500 picked American attackers were quickly decimated, but reinforcements stormed the Molino and then overcame the Casa Mata. They found the powder but no evidence of cannon casting. Total American losses were 117 killed, 658 wounded, 18 missing, out of 3,447 engaged. The Mexican force was several times larger and their losses considerably more, but there are no accurate figures. Col. Ethan Allen Hitchcock referred to the battle in his diary as "a sad mistake." Little was gained for the terminal assault on Mexico City, the army's confidence was shaken, and a breach was widened between Generals Scott and Worth.

MOLINOS, mô-lē′nōs, **Miguel de,** Spanish mystic: b. near Saragossa, Spain, June 29, 1628; d. Rome, Italy, Dec. 28, 1696. He began his ecclesiastical studies early, was a parish priest in Valencia, and in 1663 was sent on a mission to Rome, where he took up permanent residence some years later. In 1675 he published his *Guida spirituale* . . . (in Italian), which bore the imprimatur of five distinguished Catholic theologians and was soon translated into a number of other languages. In 1685, however, he was arrested by the Inquisition on charges of heresy; and after a two-year trial, he pleaded guilty and was sentenced to prison for life. All Molinos' writings, printed and in manuscript (including his letters), were prohibited *in globo* and placed on the Index of literature forbidden to Catholics. His condemnation (in part instigated by a penitent Louis XIV) was based primarily on his oral teaching and his letters, rather than on his book. Molinos, whose doctrine is known as quietism (q.v.), saw Christ and the church as paths by which to approach God, but felt that man could realize God in His infinity only by divesting himself insofar as possible of all materiality. The Jesuits charged that Molinos' doctrine meant indifference to the external world and to the church and that it condoned carnal sins; Molinos himself was accused of gross personal immorality. Despite this condemnation, he received the sacraments at his death.

Consult Pierre Dudon, *Le quiétiste espagnol, Miguel de Molinos* (Paris 1921) for the Jesuit viewpoint; also John Bigelow, *Molinos the Quietist* (New York 1882).

MOLL FLANDERS, mŏl′ flăn′dĕrz (in full The Fortunes and Misfortunes of the Famous Moll Flanders), a novel by Daniel Defoe (q.v.), first published in 1722. The novel, in the form of an autobiography, tells the story of Moll Flanders' adventurous and disreputable life. Moll, who was born in prison and abandoned as a child, is brought up in the house of the mayor of Colchester. Seduced and then widowed at an early age, she turns to a life of crime. In an attempt to reform, she marries a Virginia planter, who turns out to be her brother. Returning to England, she plunges into criminal ways again, and is transported to Virginia as a felon with her next husband, a convicted highwayman. In the New World they settle down and prosper as planters, dying rich and respectable. The novel is full of realistic detail—as, for example, when Moll makes a lengthy inventory of the goods which she is taking with her to America—and is valued as a source of knowledge about the life of the times.

MOLLENDO, mô-yān′dô, city, Peru, a seaport on the Pacific coast, located in the Department of Arequipa, about 50 miles southwest of Arequipa on the Pan American Highway. A railroad connects it with Puno on Lake Titicaca. Formerly the chief coastal port for southern Peru and Bolivia, it has largely been replaced by the new and safer port facilities completed in 1941 seven miles to the north at Matarani. Among its industries are textiles, flour milling, shoe and furniture manufacturing, and fish canning. The chief export of the region is alpaca wool. Pop. (1948 est.) 14,606.

MOLLENDORF, mûl′ĕn-dôrf, **Wichard Joachim Heinrich von,** Prussian general: b. Lindenberg, Germany, Jan. 7, 1724; d. Havelberg, Jan. 28, 1816. He distinguished himself in the service of Frederick II the Great during the Seven Years' War, especially in the battles of Leuthen, Hochkirk, and Torgau; and, remaining in the Prussian military service, rose to the rank

of general field marshal in 1793. The next year Möllendorf commanded the Prussian Army on the Rhine and won the Battle of Kaiserslautern against the French Republic. During the Napoleonic Wars he was wounded at Auerstedt (1806) and captured, and after his release, retired from active duty. He was noted as a pioneer in seeking more humane treatment of common soldiers.

MOLLET, mô-lĕ, **Guy,** French statesman: b. Flers, Orne Department, France, Dec. 31, 1905. The son of an impoverished weaver and a concierge in a savings bank, he won a government scholarship to attend secondary school, and at 17 became a teacher in a boarding school at Le Havre. He joined the Socialist Party in 1923, and from 1932 gave his full time to politics. Wounded and captured by the Germans in June 1940, he was repatriated in February 1942, and became "M. Laboule," one of the chiefs of the resistance movement; on one occasion he was arrested by the Gestapo but released for want of evidence. Elected mayor of Arras in 1945 and secretary general of the Socialist Party in 1946, he served in Léon Blum's cabinet, and in 1949 was named French delegate to the Consultative Assembly of the Council of Europe, of which he was president in 1954–1955. On Jan. 31, 1956, he became premier of France in a left-of-center Republican Front cabinet and held office for over 16 months, until June 12, 1957, the longest tenure of any French premier to that date since World War II.

Guy Mollet

French Embassy Press and Information Division

MOLLHAUSEN, mûl'hou-zĕn, **(Heinrich) Balduin,** German traveler and writer: b. Bonn, Germany, Jan. 27, 1825; d. Berlin, May 28, 1905. The son of a Prussian army officer and engineer, Möllhausen went to the United States in 1849, and joined a scientific expedition headed by Duke Paul William of Württemberg to explore the Rocky Mountains. The expedition failed because of the hostility of the Indians, and Möllhausen experienced many hardships. He returned to America in 1853, however, and was chosen by the United States government to serve as topographer on an expedition surveying a course for a railroad to the Pacific coast. Back in Germany in 1854, he was given the post of custodian of the royal libraries in Potsdam. He visited America once more in 1857–1858, when he was sent out by the government to explore the Colorado River. He subsequently wrote some 45 full-length novels and travel books and many shorter stories, most of them dealing with American Indian and pioneer life. On the basis of these writings, he is frequently referred to as the German Cooper.

MOLLIEN, mô-lyăn', Comte **François Nicolas,** French statesman: b. Rouen, France, Feb. 28, 1758; d. Paris, 1850. Before the French Revolution, Mollien held various positions in the ministry of finance, including that of supervisor of the farmers-general of taxes. In 1786 he negotiated a commercial treaty with England, which abolished many restrictions on needed imports. Imprisoned for a short time during the revolution in 1794, he went to England, returning to the ministry of finance in 1799, after Napoleon's seizure of power. Recognizing his financial ability, Napoleon made him a councilor of state in 1804, and in 1806 minister of the treasury, in which capacity he assisted in reorganizing the banking system of France. During the Hundred Days he was again minister of the treasury, but although he was consulted on budgetary problems by succeeding rulers, he refused office after 1815.

MOLLISON, mŏl'ĭ-s'n, **James Allan,** British aviator: b. Lanarkshire, Scotland, April 19, 1905. Commissioned in the Royal Air Force in 1923, he established numerous flying records, including the Australia-England record (8 days, 19 hours, 28 minutes) in 1931, and the England-Cape of Good Hope record (4 days, 17 hours, 5 minutes) in 1932. In the latter year he also made the first solo flight westward across the North Atlantic, and in February 1933 the first England-South America flight. In July 1933, accompanied by his first wife, Amy Johnson, he made the first England-United States crossing, and in 1934 they made the England-India record of 22 hours. During World War II Mollison was an airplane ferry pilot. He wrote two volumes of autobiography: *Death Cometh Soon or Late* (1932) and *Playboy of the Air* (1937).

MOLLN, mûln, town, Germany, in the State of Schleswig-Holstein, on the Elbe-Trave Canal, 16 miles south of Lübeck. An ancient place whose records go back to 1188, Mölln was chartered as a town in 1220, as a city in 1254, and from 1359 to 1683 was a possession of Lübeck. After World War II it was included in the German Federal Republic (West Germany). It manufactures chemicals, textiles, furniture, and mattresses, and processes food. Till Eulenspiegel, the legendary comic hero, is supposed to have died here. Pop. (1946) 12,907.

MOLLUSCA, mŏ-lŭs'kà, one of the great divisions or phyla of the animal kingdom, containing the oysters, clams, snails, slugs, squids, and octopus as well as the chitons and tusk shells. The class is characterized by having a mantle which secretes the shell and a radula or food-rasping organ. Both of these organs are peculiar to this group of animals. The body is primarily bilaterally symmetrical with the mouth and anus at the two ends of the body, the alimentary canal traversing it as an axis. However, the bilateral symmetry in the Gastropoda or snails is frequently obscured by a secondary change of a torsional nature. On the lower surface of the body there is developed a muscular organ, the foot, which is the organ of locomotion. This has been modified in the Cephalopoda to become the tentacles and the funnel, and in the Pelecypoda it has become a digging or plowing organ.

The outer surface of the body is encased by a pallium or mantle. This organ is attached dorsally and more or less open ventrally. The cavity between the mantle and the visceral mass is the mantle cavity in which the gills are developed. In the Pulmonata the gills disappear and a sac, the pulmonary sac, is developed in the body which is surrounded by blood vessels and functions as a lung. The outer surface of the mantle develops the shell which is present in most mollusks. This latter morphological structure exhibits an enormous number of modifications among all classes, orders, and families. Even below the family level down to the individual species, shell structure, color, and sculpture exhibit a nearly endless series of differences.

In many groups the posterior and dorsal surface of the foot bears a horny or calcareous plate, the operculum. When the animal retracts within the shell, the operculum closes the aperture. In several groups, the shell is reduced to a remnant, generally internal as in the slugs, or to a chitinized rod in the squids. It may be entirely lacking in the adults of some forms as in the nudibranchs, a group of marine mollusks.

In all mollusks, other than the bivalves, the mouth contains a remarkable structure, the radula. This consists of a band possessing a series of hooklike structures, the teeth, on its upper surface. These teeth exist in transverse rows and vary greatly in the different classes, orders, and families. The number and shape of the teeth play a very important part in the classification of the various groups, especially in the class Gastropoda. When feeding, the radula is extruded to the mouth opening and by means of strong muscles is pulled rapidly back and forth. It acts as a file in principle, rasping away particles of food, either animal or vegetable, depending upon the food requirements of the family or order to which the species may belong.

In a restricted group of the Gastropoda, the suborder Toxoglossa, the radula has become modified as a poison apparatus. The individual teeth have become elongate and spear-shaped and, in addition, associated with a poison gland. The teeth, as barbs, deliver the poison into the victim. Paralysis and death may soon follow. More than 20 deaths are known to have occurred among humans bitten by members of this group, all caused by species belonging to the family Conidae. The action of the poison is rapid, a death occurring in Queensland, Australia, only four and one half hours after the victim was bitten.

Mantle and Foot.—Typically the mantle is a paired structure, but in most groups the two halves unite in front and behind. This has its effect upon the shell, since, where the lobes are separate, there are two halves or valves to the shell, but where united there is but a single (univalve) shell. Sometimes this univalve shell is a straight cone, but, while conical, it is usually coiled in a spiral, a part of the body extending toward the apex of the cone. As the animal increases in size, the shell also increases in thickness and extent, the successive additions being usually recognizable on the external surface by lines of growth which run parallel to the free edge of the shell. When the edge of the mantle is provided with projections or lobes, these cause ridges or protuberances on the surface of the shell. When the mantle is colored (striped or spotted), the color pattern is reproduced in the shell, since pigment from the mantle is deposited along with the carbonate of lime. On the outside of the shell there is usually a thin organic cuticle and beneath this two layers of carbonate of lime. Sometimes the inner layer consists of thin lamellae parallel to the surface, the free edges of which produce diffraction spectra and thus give the inside of the shell an iridescent appearance—mother-of-pearl. (See PEARL.)

In the bivalve shell (see BIVALVES) an elastic hinge ligament connects the two valves and causes them to open. The valves are closed by muscles (the adductors), one or two in number, which extend across the body from valve to valve. In the univalves there is always a muscle attached to the inside on the axis of the shell, by the contraction of which the animal is retracted into the shell, the foot being the last part to withdraw. On the other hand, the shell is often greatly reduced and may become internal, as in the slugs and squids; or it may be entirely absent in the adult, as in the naked mollusks (nudibranchs) although it is formed in the young and then later lost.

Digestive Organs.—The alimentary canal is typically a straight tube, but in most forms it becomes convoluted to increase the amount of digestive surface. Not infrequently it is so flexed upon itself that the mouth and anus, instead of being at opposite ends of the body, are in close proximity to each other. Behind the gullet there is a large saclike stomach and closely connected with it are the ducts of the large digestive gland. The intestine is long and without enlargement.

Circulation.—The heart lies dorsal to the digestive tract enclosed in a special sac, the pericardium, which is to be regarded as the sole representative of the true body cavity or coelom. In the heart, two parts are always to be distinguished, a muscular ventricle which forces the blood through the arteries to all parts of the body, and usually two auricles which receive the blood as it comes from the gills and force it into the ventricle. The heart thus receives only oxidized blood. With the loss of the gill on one side of the body, the corresponding auricle disappears. When four gills are present, as in the genus *Nautilus,* there are four auricles.

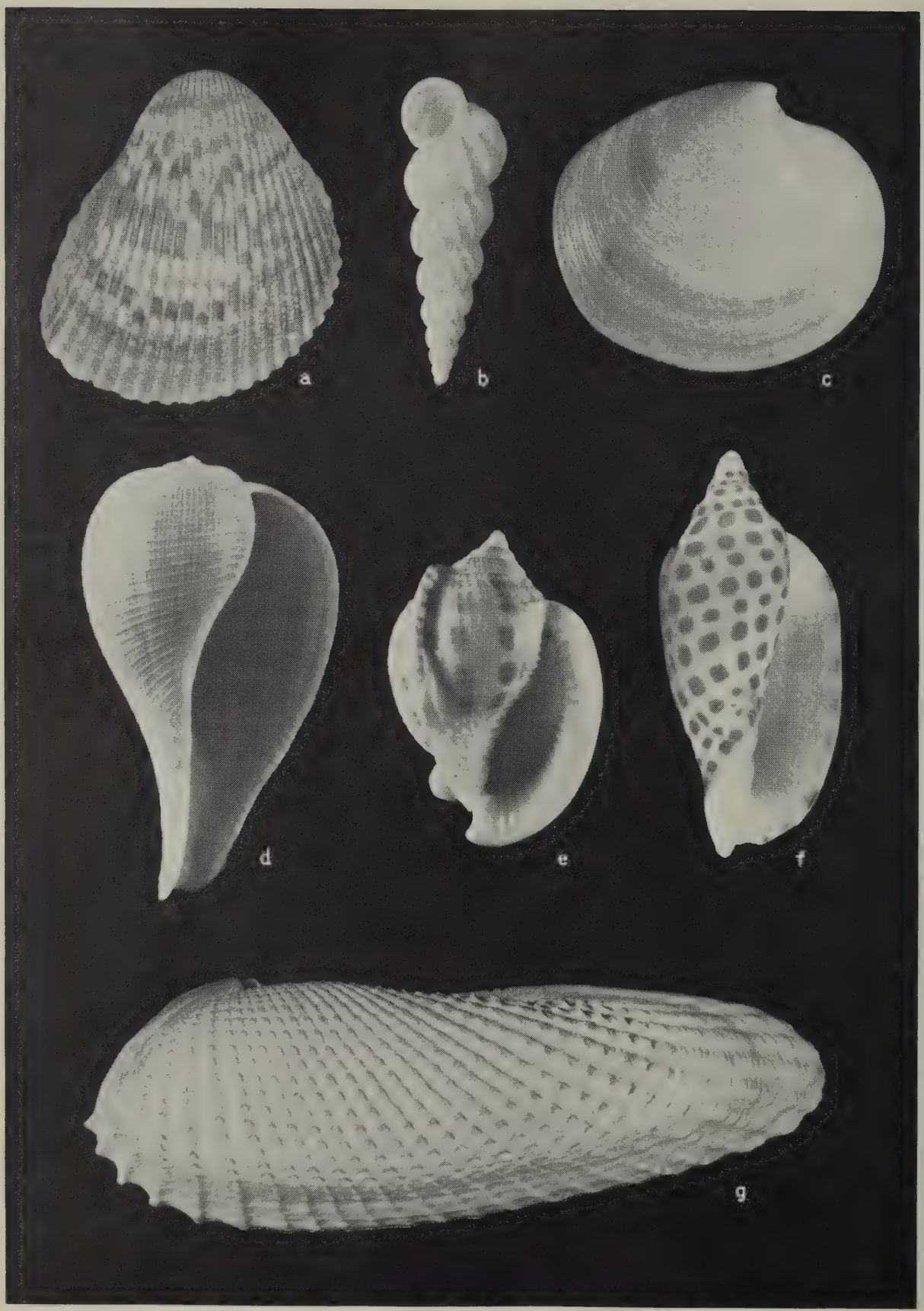
Gills.—The gills are true ctenidia or branchial structures of various kinds. By means of cilia, water in the mantle cavity is kept in circulation. In many bivalves the gills function as marsupia, retaining the eggs until they are hatched. In addition the outer surface of the gills collects the fine food particles captured in mucus, and by means of cilia these captured food particles are led into food grooves and eventually are carried to the mouth.

Structure of the Shell.—The shell is composed usually of three layers. The outermost, the periostracum, is made up of organic material called conchiolin, which is allied to chitin. The middle layer is composed of prismatic cells of calcite, and the inner surface, the laminated or nacreous layer, is composed of aragonite. There is, however, in these two layers, a matrix of conchiolin, in which the mineral salts, mainly calcium carbonate, are impregnated.

Reproduction.—So far as known, all land pulmonates are hermaphroditic, each individual containing both sexes. However, mating generally takes place between two individuals, either as a reciprocal process or with one functioning as male and the other as a female. In most marine snails the sexes are separate. Eggs are produced either

From "American Seashells" by R. Tucker Abbott, published by D. Van Nostrand Company, Inc.

THE FIVE CLASSES OF MOLLUSKS. (a) *Gastropoda:* Turnip whelk. (b) *Pelecypoda:* Calico clam. (c) *Cephalopoda:* Paper nautilus. (d) *Amphineura:* West Indian chiton. (e) *Scaphopoda:* Dall's Pacific tusk.



A group of mollusks found in the Western Atlantic area: a, Van Hyning's cockle (*Dinocardium robustum vanhyningi* Clench and L. S. Smith), x ½; b, Georgette's wentletrap (*Epitonium georgettina Kiener*), x 2; c, disk dosinia (*Dosinia discus* Reeve), actual size; d, common fig shell (*Ficus communis* Röding), x ¾; e, Scotch bonnet (*Phalium granulatum* Born), x ⅔; f, junonia (*Scaphella junonia* Shaw), x ½; g, angel wing (*Cyrtopleura costata* Linné), actual size.

in gelatinous masses or encapsulated within a chitinized case. In the latter, the free-swimming stage is generally passed within the capsule, the young emerging as young snails with the shell well developed. Many, if not most, of the marine bivalves give birth to their young at a very early stage, the two larval stages, the trochophore and veliger, developing in the water. These two larval or free-swimming stages have made possible a very wide dispersal, as they are subject to the movements of currents. Species with long larval life may be carried for hundreds of miles. It is for this reason that buoys, ships, and marine installations are soon covered with many kinds of mollusks as well as other organisms even when stationed far at sea. Most of the freshwater mussels have a parasitic stage, the young attaching themselves to the fins and gills of fish. Here for short or long periods of time, depending upon the species, the young derive sustenance from their fish host. At the end of their parasitic stage they drop from their host and begin to live as young bivalves in the mud and sand of lakes, ponds, and rivers.

Habits.—The mollusks are among the most adaptive of all animal groups. They are found in the great ocean deeps, in depths of over 30,000 feet (bivalves), and are known to occur up to 18,000 feet on mountain ranges (land gastropods), a vertical range of more than 9 miles. They have succeeded in occupying nearly every type of environment other than the air, and even here they have been partially successful, depending in part upon wind-blown debris to carry their eggs and even the adults over considerable territory. Their one limiting factor is lime; from this they build their shells and as there are few regions completely devoid of lime, there are few areas completely devoid of mollusks.

Most land shells are secretive in habit, hiding under leaves, boards, or other debris, particularly during dry periods. They are mainly active at night when most of their feeding is done. In many tropical areas several groups of land shells live in trees, feeding mainly upon lichens which live on the bark of the trees. With few exceptions, these tree snails are highly colored and certain of them, like the genus *Polymita* of eastern Cuba, are the most highly colored snails that exist, exceeding even the vivid coloration developed by many marine snails. Other land snails live only on limestone rocks and these, like the tree snails, feed on lichens.

Freshwater mollusks have many types of habitat, most preferring the quiet water among reeds and other aquatic plants. Others prefer the swift water of shoals and rapids, living on rocks and stones and feeding upon the algae.

Marine snails accept a very wide variety of habitats, living on and under rocks or in and around coral reefs. Others, notably the bivalves, prefer sandy and muddy bottoms where they lie buried. The depth in which they live is generally governed by the extent to which they can extend their siphons. Many others bore or drill into rocks, heavy clay, and wood. A few of the marine mollusks, particularly certain Cephalopods, are pelagic, living in the open sea hundreds of miles from any shore line. Others are to be found in the depths of the ocean, a few even at the bottom of the great deeps. The ecological area which produces the largest number of mollusks in any one region is that which extends from near low water to depths of about 50 fathoms, as this situation furnishes the optimum in protection and food. In general, tropical areas are the richest in number of species, and in these warm waters the most colorful species are also found. In colder waters, though the number of species is not so great, individuals of a few species may exist in great abundance. Most mollusks are plant feeders, living either upon live vegetation or upon decaying plant tissue. A few groups are carnivorous and feed mainly on other mollusks.

Economic Importance.—Mollusks play a very important part in the economy of man. As beneficial organisms they supply considerable food along most shore lines of the world. In addition they are a prime factor as food for many of the important food fish. Others, such as the pearl oyster, supply us with pearls and shells for various types of jewelry. Many species of fresh-water mussels are the main source of nacre for the pearl button industry. On the other hand, a few groups, like the shipworms (family Teredinidae), are among man's most destructive enemies. These are highly specialized marine clams which have become greatly modified for boring into wood, including wharf pilings and other marine structures, as well as rope and even marine cables. The financial loss from damage done to such structures and to wooden boats and vessels far exceeds the financial gain from all other beneficially-important mollusks.

Several fresh-water species and even a few land species are involved as secondary hosts for trematode worms, the blood and liver flukes which cause schistosomiasis, one of the dreaded diseases, of the tropics and some temperate regions. In the life cycle of these trematodes, usually a single, or at most only a few, species of fresh-water snails act as secondary hosts, the primary host being some vertebrate. Larval stages of these parasites, after leaving their snail host, enter the primary host through the skin and then enter the blood system. Though different kinds of trematodes select different primary hosts, any trematode that affects mammals can usually affect man. The snail is the most important target of control measures. Once the snail is eliminated from a region, the disease is under control.

Classification.—The Mollusca are divided into five classes based upon the modification of the foot or locomotor organ as well as the diversification of other morphological structures.

Class Amphineura. Chitons or coat-of-mail shells. All members of this class are marine.

1. Order Polyplacophora. This order contains most of the existing species. The shell is composed of eight plates which are covered or held together by a thick, fleshy portion of the mantle, the girdle.

2. Order Aplacophora. These are small wormlike animals without shells. The foot is reduced or lacking, and there are calcareous spicules imbedded in the mantle. They live mainly in deep water.

Class Scaphopoda. Tusk shells. All members of this class are marine. The shell and mantle together form a slightly curved tube which is open at both ends.

Class Gastropoda. Snails and slugs. Members of this class occur on land, in fresh water, and in all seas.

1. Order Prosobranchia. Nearly all members of this order are operculate. They exist on land, in fresh water, and in all seas. Most of the marine snails belong to this order.

2. Order Opisthobranchia. These are nonoperculate snails, usually without a shell or with the shell greatly reduced. All are marine.

3. Order Pulmonata. Members of this order are nonoperculate, and breathe air by means of a pulmonary sac. They constitute most of the land snails and many of the fresh-water groups.

Class Pelecypoda. Bivalves. Members of this class occur in fresh water and in all oceans.

1. Order Taxodonta. The most primitive of the bivalves, containing a series of similar teeth and sockets in each valve.

2. Order ANISOMYARIA. In this order the anterior adductor muscle is much reduced or wanting; the posterior adductor muscle is enlarged, and is developed near the center of the shell.

3. Order EULAMELLIBRANCHIA. Most of the bivalves belong to this important order. Both adductor muscles are present and generally about the same size. The hinge plate contains but few teeth, and these may be massive or almost lacking, depending upon the group.

Class CEPHALOPODA. Squids and octopus. All members of this class are marine.

1. Order DIBRANCHIA. This is by far the larger order, containing the squids, octopus, cuttlefish, and ARGONAUTA.

2. Order TETRABRANCHIA. This order contains only *Nautilus* as a recent genus.

See also AMMONITES; CEPHALOPODA; CLAM; NAUTILOIDEA; OYSTERS; SHELL.

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MOLLWITZ, môl'vĭts (Pol. MALUJOWICE), village, Poland, in Opole Province, Lower Silesia, 5 miles west of Brzeg (Brieg). Mollwitz was the scene of a famous battle (April 10, 1741) during the War of the Austrian Succession (see SUCCESSION WARS), in which Frederick II (the Great) had his first command. Frederick's cavalry was put to flight by the Austrian infantry, but Field Marshal Kurt Christoph von Schwerin finally defeated the Austrians under Field Marshal Wilhelm Reinhard von Neipperg in the battle.

MOLLY MAGUIRES, mŏl'ĭ mà-gwīrz', an Irish secret society formed in 1843 at Farney, County Monaghan, to intimidate bailiffs or process servers distraining for rent or impounding the cattle of tenants who were unable or unwilling to pay. In the anthracite coal-mining region of Pennsylvania in the 1850's, an inner group of the Ancient Order of Hibernians set up a similar society called by the same name, which became active on a large scale about 1865. The members, disguised in "Molly Maguire" or women's dresses, sought to intimidate officials and others, and even resorted to murder. In 1874 the Pinkerton detectives were called in by the president of the Philadelphia Coal and Iron Company to cope with the situation, and one of the detectives, James McParlan, undertook to track the murderers. Posing as a criminal, he joined the organization and became secretary of his division. After the conviction of one murderer, McParlan was under suspicion by the group, and his life was in danger. When he withdrew, his evidence served to hang the murderers, and led to the disbanding of the society in 1877.

MOLLY PITCHER. See PITCHER, MOLLY.

MOLNAR, môl'när, **Antal,** Hungarian musician and critic: b. Budapest, Hungary, Jan. 7, 1890. His compositions include church music, of which *Missa brevis* won the Haynald Prize in 1910; choral works; works for orchestra, piano, and organ; chamber music; and settings for songs. He played viola with various Hungarian quartets, and was teacher of composition, musical history, and solfeggio at the Municipal School of Music in Budapest (1912–1918) and at the Academy of Music from 1919. From 1933 to 1940 he also edited *Népszerü Zenefüzetek* (*Popular Musical Pamphlets*) to which many distinguished musicians contributed. When the Hungarian Association of Musicians was re-established in 1946, Molnár was elected deputy president. As a critic he did much to further the understanding of the work of Béla Bartók, Zoltán Kodály, and other modern composers.

MOLNAR, Ferenc (originally NEUMANN), Hungarian playwright and novelist: b. Budapest, Hungary, Jan. 12, 1878; d. New York, N. Y., April 1, 1952. He studied law in Budapest and Geneva, became a journalist on a Budapest newspaper, and soon began to publish fiction, notably the novel *A Pál-uccai fiuk* (1907; Eng. tr., *The Paul Street Boys,* 1927). With the production of *Az ördög* (1907; Eng. tr., *The Devil,* 1908), his reputation as a playwright was established; his comedies, at once sophisticated and sentimental, continued to charm international audiences for a generation. *Liliom,* the most genuine of his plays, was presented in Budapest in 1909, and later scored a great success in the United States (1921) when Eva Le Gallienne and Joseph Schildkraut took the leading parts. It was followed by *A testör* (1910; Eng. tr., *The Guardsman*), in the New York production (1924) of which Alfred Lunt and Lynn Fontanne acted together for the first time.

During the first two years of World War I, Molnar served as a war correspondent with the Austro-German forces on the Russian front, and wrote an account of his experiences, *Haditudósító naplója* (*A War Correspondent's Diary,* 1916). American productions of his postwar plays included *The Play's the Thing* (1927), in which Lunt and Fontanne also appeared; *The Swan* (1929); and *The Good Fairy* (1932). In 1940 he took up permanent residence in New York City, publishing his first novel with an American setting, *Farewell My Heart,* in 1945. The musical comedy *Carousel* was adapted from *Liliom* in the latter year, and *Make a Wish* from *The Good Fairy* in 1951. *Companion in Exile,* an autobiographical volume, appeared in 1950.

MOLOCH, mō'lŏk, or **MOLECH,** mō'lĕk, a pagan fire god called in the Old Testament an idol of the Ammonites, identified with the god of the Canaanites, who introduced his worship into Judah and Israel. His image was of bronze or iron, with a hollow human body, the head of a calf, and extended arms. A fire was heated in the lower part, and children were placed as sacrificial offerings in the arms, while the people danced to flutes and timbrels. Some authorities maintain that the children of the Israelites were not burned alive but sacrificed, and their bodies burned. The valley of Hinnom, or Tophet, near Jerusalem, where sacrifices of children took place, was later called Gehenna, a place of abomination.

In Leviticus 20:2-5, the Lord warns Moses against those who give their seed to Molech, and in I Kings 11:7-13, He rebukes Solomon for building a temple to Molech. Amos, Jeremiah, and Ezekiel all condemn Molech worship. In the New Testament the people are reminded (Acts

7:43) of the days when their ancestors sacrificed to Moloch.

MOLOCH, a small Australian desert lizard (*Moloch horridus*) of the family Agamidae. Its skin is covered with irregular plates bearing thorny pointed tubercles, spines, and prickles, which are especially well developed behind the head.

MOLODECHNO, mŭ-lŭ-dyĕch'nŭ, oblast, USSR, in the Belorussian SSR. Its area is about 5,700 square miles. A region fought over in World War I, and afterward assigned to Poland, the oblast was formed from two Polish provinces in 1939, when the eastern portion of the country was taken by the Soviet. Until 1944 it was called Vileika Oblast. The region has many lakes and swamps drained by the Viliya River, and is well supplied with fish. In the north, flax and dairy farming are major industries; in the south, cereals and fruit are grown. Timber is plentiful, and quarrying is important. Pop. (1947 est.) 580,000.

MOLODECHNO (Pol. Molodeczno), city, USSR, capital of Molodechno Oblast, in the Belorussian SSR, 40 miles northwest of Minsk on the Minsk-Vilnyus Railroad, of which it is a junction. Its chief products are musical instruments, flour, and meat. Ceded by Poland to Russia in 1793, it was returned to Poland after World War I (1921) and transferred formally to the USSR at the close of World War II (1945). Pop. (1931) 5,964.

MOLOGA, mŭ-lô'gà, river, USSR, in the Russian Soviet Federated Socialist Republic, rising west of Bezhetsk and flowing into the Rybinsk Reservoir in Yaroslavl Oblast. Its length is about 200 miles. Before the formation of the reservoir (1941), the river joined the Volga near Rybinsk. The former city of Mologa was included in the area of about 2,000 square miles covered by the reservoir.

MOLOKAI, mō-lō-kä'ê, island, Hawaii, located in the center of the island group. About 37 miles long and 7 to 10 miles wide, the island is mountainous, Kamakou (4,958 feet) being the highest peak. A special organization called the County of Kalawao administers the affairs of the celebrated leper colony, Kalaupapa, founded in 1860 and now a government settlement; it is shut off from the rest of the island, in the north central part. Father Joseph Damien de Veuster (q.v.) spent his noble life of self-sacrifice with the colony. The islanders produce pineapple and breed cattle. Pop. (1954) 4,878.

MOLOPO, mō-lō'pō, river, South Africa, in Cape Province and Bechuanaland Protectorate, rising east of Mafeking and flowing in a winding westerly direction to form a border between the two territories, and then into the Orange River west of Upington. Its course is about 600 miles long. It once drained the Kalahari Desert, now completely dry, and stretches of it are dry beds affording good pasturage, with water below the surface.

MOLOTOV, mô'lŭ-tôf, **Vyacheslav Mikhailovich** (original surname Skryabin), Russian statesman: b. Kukarka, Vyatka Province, Russia (now Sovetsk, Kirov Oblast, USSR), March 9, 1890. One of the leading figures in the Soviet Union from the early days of the Communist regime, Molotov began his political activity as a student in Kazan during the revolution of 1905, and joined the Bolshevik Party in 1906. Three years later he was arrested and exiled to the north of Russia for a two-year term; on being released, he went to St. Petersburg (now Leningrad), where in 1912 he joined Joseph Stalin in founding the party newspaper *Pravda*. When the 1917 revolution began, Molotov became a member of the Executive Committee of the Petrograd Soviet, and of the Military Revolutionary Committee which organized the Bolshevik seizure of power in November.

After the revolution, he rose rapidly in party ranks: in 1921 he became a candidate member of the Politburo and in 1926 a full member. Then, in 1930, he was named chairman of the Council of People's Commissars, an office equivalent to that of premier. He held this position all through the difficult period of the collectivization of agriculture, the Trotskyite-Bukharinite trials, and the rising menace of war, until the spring of 1941, when Stalin replaced him. Meanwhile, Molotov had also assumed the portfolio of foreign commissar (minister), succeeding Maxim M. Litvinov in 1939. In this capacity he negotiated the nonaggression pact with Germany in August 1939 and later, after the Nazi invasion of the USSR, attended the Allied conferences at Teheran, Yalta, and Potsdam, and the San Francisco Conference which organized the United Nations.

Molotov was succeeded as foreign minister by Andrei Y. Vyshinsky in 1949, but he retained the post of deputy prime minister under Stalin, and after the latter's death in 1953, became foreign minister once more. He represented the USSR at the Berlin Conference of Big Four foreign ministers early in 1954 and at the Geneva Conference on Far Eastern questions later the same year. He also was a member of the Soviet delegation at the Geneva Conference of Big Four heads of state in 1955. See also Pacts and Conferences: World War II.

MOLOTOV, oblast, USSR, in the eastern European part of the Federated Socialist Republic. About 65,900 square miles in area, it lies in the Kama River valley on the western slopes of the Ural Mountains. Formed in 1938 out of the western portion of Sverdlovsk Oblast, it was called Perm until 1940, and then renamed for the Russian statesman Vyacheslav M. Molotov (q.v.). Two railroads serve it, and new cities have grown up as coal-mining centers since World War II. It is the largest mining region of the USSR, containing potash, salts, some petroleum, magnesium, coal, chromite, gold, iron, and many other minerals. In the southern part cereals and flax are grown and livestock raised. The forests supply building materials, and the many navigable rivers transport paper, pulpwood, and charcoal. The Komi-Permyak National Okrug, an ethnic subdivision of the oblast, is located in the northwest. Pop. (1946 est.) 2,250,000.

MOLOTOV, city, USSR, capital of Molotov Oblast, on the left bank of the Kama River, 700 miles northeast of Moscow. Until 1940 it was known as Perm. Its waterfront extends for 15 miles, and it is a major transportation center, with railroad repair shops and an airport. Other important cities in the area are Berezniki, Solikamsk,

and Kungur. The city of Molotov has good educational facilities, among them a large university and museums. Copper is smelted in Molotov, and other of the city's industries include the manufacture of machinery, matches, leather goods, and lumber. The region was occupied by the Russians in 1472, and the name Perm was given in the 17th century to a Russian settlement which had been established in 1586 at the village of Egoshikha. In 1939 the city of Molotov had a population of 255,196.

MOLTING, the change of skin, or of such cutaneous or partially cutaneous appendages as hair or feathers, which occurs annually or periodically in animals of many sorts, such as arthropods, birds, reptiles, and amphibians. It is a process often perilous to the animal, being not infrequently attended by loss of life. In mammals it may be gradual, as when the pelage or hair is changed. Examples of analogous processes are the annual shedding of the antlers of deer in spring, or the autumnal dropping of the horns of the pronghorn antelope.

Molting in Amphibia and Reptiles.—Here the entire skin is cast. The newt in early spring sheds its skin by detaching it from around the jaws, then pulling it back over the head and the limbs. The toad in molting causes the old skin to split along the back; it then pulls it off as one would a coat by working the muscles of the back; it is detached by movements of the head from around the lips, face, eyes, and mouth; the skin is more readily pulled off from the legs to the tips of the toes. The skin, as in salamanders, is a thin film, and it comes off in four pieces. Immediately after molting the creature is shy and active. Dallas Lore Sharp (q.v.) described the molting of the common striped snake (*Eutaenia sirtalis*). One came out of the water in a vivarium, gliding on to the grassy sod; it then shrugged itself for a moment, when the skin parted at the jaws. The skin on the head, however, remained fixed, so that when the creature crawled out the old skin was inside out. The operation took less than one minute. The rattle of the rattlesnake (q.v.) consists of those parts of the successive molts which are retained by a long knob made by the coalescence of the last few caudal vertebrae.

Molting in Birds.—The feathers may all be cast or only a part of them. Young birds molt several times before adult age. The passerine birds undergo a complete ecdysis after the breeding season is over (postnuptial), when the worn-out plumage is restored; and they may also before the breeding time pass through an incomplete molt, when their wedding dress is put on. The process is so gradual as a rule that few birds, except the ducks and certain others, are unable to fly, or go unprotected. The height of the molting season is in August, though the feathers drop out in nearly every month of the year. The complete molt is undergone in from a month to six weeks' time. Besides their feathers the pelican sheds a horny projection on the ridge of the bill, and the puffin and certain allied species shed the horny sheath of the bill. For further information see PLUMAGE.

Molting in Arthropods.—In most arthropods the various developmental stages become indicated in the external appearance of the animal by means of the successive molts, for no modification of form is possible without the removal of the rigid exoskeleton. The Arachnid *Limulus,* the common horsefoot crab (q.v.), frequently sheds, its skin opening around the edge of the head; this is also the case with the freshwater crustacean *Apus.* In the crayfish and lobster the skin splits open between the thorax and abdomen, and the animal draws itself out of the transverse rent thus formed. The skin is cast entire, while the chitinous lining of the mouth, throat, fore stomach and of the rectum is also shed. The process of exuviation in the crayfish has long been known to be aided by the outgrowth of little delicate papillae called casting hairs; these serve to loosen the old integument.

In insects molting is frequent, especially in the larva stage, most caterpillars molting four or five times. The body moves convulsively and splits along the back, at the same time, casting hairs being usually absent, a molting fluid is poured out which serves to detach the old skin. The head is molted separately, the shell falling off by itself, then the body skin is shuffled off, being pulled back toward the tail, and with the outer integuments all the lining of the digestive canal is shed (except that of the stomach and beginning of the intestine), and the lining of the spiracles, as well as the cuticle of all the hairs, and the spines.

MOLTKE, Helmuth Karl Bernhard, hĕl'moot kärl bĕrn'härt mōlt'kĕ, COUNT VON, German soldier: b. Parchim, Mecklenburg-Schwerin, Oct. 26, 1800; d. Berlin, April 24, 1891. In 1805 his father removed to Lubeck, where young Moltke shortly afterward saw his home looted and burned during the French invasion and his family reduced to poverty. In 1812 he was admitted as a cadet of the Royal Military Academy, Copenhagen. In 1818 he was appointed one of the pages of the king of Denmark and passed his examination for a commission as first of the candidates. Seeing little prospect of advancement, he entered the Prussian service in 1822, becoming 2d lieutenant. He then studied three years at the staff college, Berlin; in 1832 was appointed to the general staff; in 1833 became lieutenant, and in 1835 captain. He had already visited Italy, and he now went to Turkey, where he became military adviser of the sultan Mahmud. He took part in the Turkish expedition against Ibrahim Pasha in 1839, but his advice was disregarded, and he returned to Constantinople, and on Mahmud's death to Berlin, where he was again employed on the general staff. His experiences in Turkey led him to publish two valuable works *The Russo-Turkish Campaign of 1828-29 in European Turkey* (1835), and *Letters on Affairs in Turkey in the Years 1835–39* (1841). After rising through the various army grades he was placed permanently at the head of the general staff of the army in 1859 with the rank of lieutenant general. His labors in reorganizing the Prussian army were of immense value to Prussia and to Germany, and had a great influence on the general history of Europe. The defeat of Denmark in 1864 was largely owing to his genius for military operations, and the result of the greater war of 1866 against Austria is equally to be attributed to him. Then followed the Franco-Prussian War of 1870, for which Moltke was entirely prepared, having foreseen for some years what was likely to happen, and having

immediately after the war against Austria prepared for a campaign against France. The success of the operations was in large measure a personal triumph for Moltke, and with the capitulation of Metz he was raised to the rank of count. Following his return to Berlin in 1871 he was created field marshal and appointed for life a member of the Prussian upper house. He continued as chief of the general staff till after the accession of Emperor William II in 1888, when he resigned.

MOLTKE, Helmuth von, German army officer: b. Gersdorf, Mecklenburg, May 23, 1848; d. June 18, 1916. A nephew of Count Helmuth Karl Bernhard von Moltke (q.v.), he received his army commission in 1870. He became quartermaster general in 1904, and in 1906 he was appointed chief of the general staff. With outbreak of World War I in 1914 he directed the strategy of the compaign on two fronts. The plan proved unsuccessful, and he was blamed for the German defeat at the First Battle of the Marne. On Nov. 3, 1914, he was relieved of his command and assigned to a post in Berlin.

MOLUCCA, mō-lŭk'ȧ, **SEA,** an arm of the Pacific Ocean bounded on the west by the northeast coast of Celebes Island and on the east by the Moluccas, Indonesia; the southern limits are frequently considered to be the waters between the southeast Celebes and Boeroe Island. It is connected with the Pacific by the Molucca Passage, some 150 miles in width, between the northeast coast of the Celebes and the northern Moluccas.

MOLUCCAS, mō-lŭk'ȧz, or **SPICE ISLANDS,** a group in Indonesia, east of the Celebes and west of New Guinea. Besides the three large islands of Halmahera (Djailolo), Ceram, and Boeroe (Buru), the Moluccas include several lesser groups, among them Soela (Sula), Batjan (Bachan), Obi (Obira), Kai (Kei), Aroe (Aru), Tanimbar (Timorlaoet), Banda, Babar, and Leti (Letti). Smaller islands include Morotai and Wetar; and even smaller, though important, are Amboina (Ambon), Ternate, and Tidore. The Moluccas have an area of 32,298 square miles, and a population estimated to number 560,000. Nearly all of the islands are mountainous, some of them having peaks rising to 7,000 or 8,000 feet. There are several active volcanoes in the group, and earthquakes are of frequent occurrence. For the most part, the islands are covered with dense forest with luxuriant vegetation. There are deer and baboons, and some of the islands in the southwestern area of the group contain the large hog-like babirusa. Among the birds are megapodes, who make mounds of vegetable debris in which to hatch their eggs, cassowaries (akin to emus), and birds-of-paradise. Nutmegs, mace, cloves, and other spices are exported, as well as products of the forest, sago, oil of the cajuput tree, and coconut palm products. The Moluccas were discovered in 1512 by the Portuguese, who acquired by purchase in 1528 earlier claims put forward by Spain. The Dutch succeeded the Portuguese on Amboina in 1605, and gradually they extended their influence over the entire group. The British were temporarily in control in 1796, and they effectively occupied the Moluccas from 1810 until 1814, when sovereignty was restored to the Netherlands. With reorganization of the Netherlands East Indies as autonomous Indonesia after World War II, the Moluccas became part of one of the several federated republics of the United States of Indonesia. The unitary Republic of Indonesia which came into being in 1950 was opposed by an insurgent group on Amboina; they proclaimed the "Republic of the South Moluccas" in April, but organized resistance to the central government virtually ended in November, when troops of the unitary state captured Amboina. See also INDONESIA.

MOLY, mō'lĭ, magic herb of the ancient Greeks that Homer says Hermes gave to Odysseus as a talisman against the enchantments of Circe. The plant is described as having milk-white flowers, and has been identified by different scientists under different herbs of the Liliaceae family, as the white water-lily, also as the garlics. *Allium magicum L.,* or *Allium moly L.* were claimed by Italian Renaissance botanists, but these kinds have yellowish-red to red bloom instead of white, causing some to claim *Allium nigrum L.* or black hellebore, as more probable. See also GARLIC.

MOLYBDENITE, mō-lĭb'dē-nīte, a native sulphide of molybdenum crystallizing in tabular or hexagonal forms. It commonly occurs in granite, gneiss, and other crystalline rocks, and is the principal source of the important metal molybdenum (q.v.). It is mined in various countries of the world, but far more extensively in the United States than elsewhere. Bohemia, Saxony, Great Britain, and Australia are leading producers of molybdenite. In the United States the chief centers of production are Colorado (principally), Arizona, Idaho, New Mexico, Utah, and Washington.

Molybdenite or molybdenum disulphide, MoS_2, contains about 60 per cent molybdenum and 40 per cent sulphur. It is a soft, opaque mineral, with a lead-gray color, sometimes bluish or brownish, and with metallic luster. When crystallized it is found in tabular or short prismatic, hexagonal crystals. It has a perfect cleavage, and yields flakes which are flexible but not elastic. It is sectile and feels slightly greasy. Its hardness is 1 to 1.5, and its specific gravity is 4.7 to 4.8. Its streak is lead-gray metallic, bluish-gray on paper, and greenish on glazed porcelain. It occurs in fine granular or foliated masses or scales scattered through or imbedded in many crystalline rocks, including granite, gneiss, zircon syenite, and granular limestone. Its appearance is similar to that of graphite, for which it is frequently mistaken by the prospector. *Wulfenite* is a molybdate of lead, $PbMoO_4$, and contains about 26.2 per cent molybdenum and 56.4 per cent lead. Its color is bright red to orange or wax-yellow; sometimes it is brown, grayish-white, or nearly colorless; occasionally it is yellowish-gray to pale green. Its luster is resinous to adamantine. When crystalline it is translucent, and occurs commonly in thin, square, tabular, tetragonal crystals. Sometimes octahedral and prismatic forms are found. It occurs also as crystal crusts and in massive granular forms. It is always found with other lead minerals, especially pyromorphite and vanadinite. It has one good pyramidal cleavage, and two less distinct ones. It is brittle and its fracture is subconchoidal in form.

Its hardness is 2.75 to 3, and its specific gravity is 6.7 to 7. Its streak is white. *Molybdite,* or molybdic ochre, is a hydrous ferric molybdate, $Fe_2O_3.3MoO_3.7½H_2O$, and contains 39.6 per cent molybdenum. It occurs as an earthy, yellow powder, or in hair-like crystals of pale yellow color, usually associated with molybdenite, of which it is an alteration product. Alone, it is not an important ore of molybdenum. It has a dull lustre, a straw yellow streak, a hardness of 1 to 2, and a specific gravity of 4.5. *Powellite* is calcium molybdate, $CaMoO_4$, and contains 48 per cent molybdenum. Sometimes tungsten replaces part of the molybdenum. It is greenish-yellow to dull gray in color, subtransparent, resinous, without cleavage, has an uneven fracture, a hardness of 3.5, and a specific gravity of 4.52. *Ilsemannite* is an oxide of molybdenum, $MoO_2.4MoO_3$, and contains about 68 per cent molybdenum. It is a blue-black to black cryptocrystalline mineral, associated with barite and wulfenite. It is soluble in water, giving a deep blue solution which on evaporation yields dark blue crystals. Rare. *Belonesite* is magnesium molybdate, $MgMoO_4$, and contains 52 per cent molybdenum. It is a white transparent mineral, occurring in minute tetragonal crystals. It occurs in rock fragments enveloped in Vesuvian lava. Rare. *Pateraite* is cobalt molybdate, $CoMoO_4$, and contains 43.8 per cent molybdenum, or it is molybdate of cobalt and iron, $FeCoMo_2O_8$, and contains 44.1 per cent molybdenum. It is an impure massive black mineral associated with uranium minerals. Rare. *Achrematite* is lead arsenate, chloride and molybdate, $3(3Pb_3As_2O_8.PbCl_2)4(Pb_2MoO_5)$, and contains 3.4 per cent molybdenum. It is a massive, cryptocrystalline mineral with an uneven to subconchoidal fracture, is brittle, has a hardness of 3 to 4, and a specific gravity of about 6. Its color is sulphur-yellow to orange and red, but in mass is liver-brown, owing to admixture of limonite. Its streak is pale cinnamon brown. Its lustre is resinous to adamantine, and fragments are translucent on thin edges. *Eosite* is a vanado-molybdate of lead, $Pb_3V_2MoO_{16}$, and contains 8.9 per cent molybdenum. Its color is deep Aurora-red. It has a brownish, orange-yellow streak. Its hardness is 3 to 4. It occurs in minute octahedral crystals of the tetragonal system which are found on pyromorphite and cerrusite. *Molybdurane* is molybdate of uranium, $UO_2UO_3.2MoO_4$. *Molybdoferrite* is molybdate of iron, $FeMoO_4$.

MOLYBDENUM, mō-lĭb'dē-nŭm, a pure white metal, softer than steel, malleable and capable of being forged and welded. It can be filed and polished and may be drawn into ribbons and fine wire. Metallic molybdenum is used in various electrical contact making and breaking devices, in X-ray tubes, in voltage rectifiers, in the form of wire for filament supports in incandescent electric lamps, for winding electric resistance furnaces and in dentistry. It is also employed in the manufacture of chemical reagents, dyes, glazes and disinfectants. The principal use of molybdenum is in the manufacture of special alloy steels, usually in conjunction with chromium, manganese, nickel, cobalt, tungsten or vanadium. These steels are used for self-hardening and high-speed machine tools, for crank-shaft and propeller-shaft forgings, high-pressure boiler plate, armor-piercing projectiles, permanent magnets, etc. The field of application is being constantly extended. About 92 per cent of the metal is produced in the United States—29,419,000 pounds in 1937 out of the world total of 32,000,000 pounds, of which 22,750,368 pounds came from Colorado. The purest molybdenum is produced from wulfenite, but practically the whole world's supply is obtained from molybdenite. Molybdenite resembles galena in some respects and owes its name to this fact, the word «molybdenite» being based upon the Latin name for galena. It was first clearly distinguished from galena by Scheele in 1778, and in 1782 Hjelm obtained the element molybdenum in the metallic form. Molybdenum may be prepared by reducing the oxide by hydrogen, carbon or potassium cyanide, as well as by various other methods. It has a specific gravity of about 8.6 and a specific heat of about 0.0659. Its melting point is higher than that of platinum. Molybdenum is not affected by air or moisture at ordinary temperatures, but oxidizes slowly when heated in air, and at high temperatures it burns, whether heated in air or in steam. Chemically, molybdenum behaves both as a metal and as a non-metal. It has the chemical symbol Mo and an atomic weight of 96 if O = 16, or 95.3 if H = 1. It forms several oxides, of which the trioxide, MoO_3, is the most important. This is the oxide that is formed when the metal is burned in air, and it may also be prepared by roasting the native sulphide in air. The trioxide occurs native in small quantities, as «molybdenum ochre,» or «molybdite.» Metallic molybdenum combines directly with chlorine to form $MoCl_5$, and with bromine to form $MoBr_4$; but it does not combine directly with iodine. Unlike the other metals, molybdenum does not readily replace the hydrogen of acids to form definite salts, but its oxides dissolve in acids with the formation of compounds which have, as yet, been but little studied. The trioxide combines with water to form substances of the nature of acids, and which are, in fact, called «molybdic acids.» These further combine with metallic bases to form an extensive series of compounds known as «molybdates.» Ammonium molybdate is used in the laboratory as a reagent for the detection of phosphoric acid, a yellow precipitate being thrown down when a nitric acid solution of ammonium molybdate is added to a solution containing a phosphate. Consult Wolf, H. J., 'Molybdenum' (Golden, Colo., 1918); Wilson, A. W. G., «Molybdenum» in 'The Mineral Industry during 1916,' Vol. XXV.

MOLYNEUX, mŏl'ĭ-noo, **William,** Irish philosopher: b. Dublin, 17 April 1656; d. there, 11 Oct. 1698. He was graduated from Trinity College, Dublin, entered the Middle Temple, London, became a student of applied mathematics and philosophy, and a friend of Locke; was elected F. R. S. in 1685 and was elected to Parliament for Dublin University in 1692 and 1695. Besides his 'Dioptrica nova' (1692) on optics and philosophy, he wrote 'The Case of Ireland's Being Bound by Acts of Parliament in England' (1698), a work on the legislative independence of Ireland, which created a considerable sensation.

MOMBASA, mŏm-bä'sä, East Africa, principal seaport of Kenya Colony, situated on an island of the same name 150 miles north of Zanzibar. The coralline island, three miles long by two miles wide, lies half a mile from the mainland, to which it is connected by a causeway and railway bridge. The town of Mombasa, two harbors, and several coconut plantations are included within the island's eight square miles. The old harbor, on the northeast of the island facing the town, can accommodate vessels drawing up to 30 feet and is used by dhows (native sailing craft) trading between the East African ports, Iran, India, and Madagascar. Kilindini (the deep place), the principal harbor, is at the southwest end of the island; the anchorage, which is landlocked, covers an extensive area, and modern deepwater wharves have made Kilindini the finest harbor on the east coast of Africa.

The native (Kiswahili) name for Mombasa is *Kisiwa Mvita,* meaning Isle of War, and many times in its long history it earned this appelation; the name Mombasa is that, also, of a port in the Arabian sultanate of Oman. Arabs were in possession of the East African island of Mombasa when Vasco da Gama (q.v.) visited it in 1498. During the 16th and early 17th centuries it was held by the Portuguese, who built the great red Fort of Jesus, still extant, and made the town the capital of their vast East African domains; the sultan of Oman captured the fort in 1698 after a three years' siege, putting to death the 11 men and two women who survived. The Portuguese again occupied Mombasa during 1728–1729, only to lose it to the sultan of Muscat, and thereafter it remained for nearly 100 years in the hands of Arab rulers, the last of whom repudiated allegiance to Oman. The town was under British protection during 1824–1826, and thereafter it was part of the sultanate of Zanzibar. In 1887 it became headquarters of the Imperial British East Africa Company, which leased part of the mainland possessions of Zanzibar (q.v.); and when, in 1895, the territories of the chartered company were taken over by the British government, Mombasa became the capital of the East Africa Protectorate. The capital was transferred to Nairobi in 1907.

MOMENT of a dynamical quantity is the importance of that quantity in regard to its dynamical effect relatively to a given point or axis. The moment of a force about a point is the product of its amount into its perpendicular distance from the point. The tendency of the action of such a force is to cause rotation about an axis perpendicular to the plane passing through the point and containing the force. Thus, in the case of a pendulum, the effectiveness of the force in causing rotation is measured by the moment W*l*, where W is the weight of the pendulum, and *l* is the distance of the line of action of the force W from the center of rotation C, or the distance of the center of mass G from the vertical line through C.

The term moment enters into several other phrases, all of which relate either directly or indirectly to rotation. Thus, there is the moment of momentum, or angular momentum, whose rate of change is the measure of the moment of the force producing the change. To obtain it for any given body rotating with angular speed ω about an axis, we first imagine the body broken up into a great many small portions of masses m_1, m_2, m_3, etc., at distances r_1, r_2, r_3, etc., from the axis, multiply the momentum ($mr\omega$) of each mass by its distance, and then take the sum of all these products. The angular speed w being the same in every expression, the moment of momentum takes the form $\omega\ (m_1r^2_1 + m_2r^2_2 + \text{, etc.})$, which it is usual to write in the symbolic form $\omega\Sigma\ mr^2$. The quantity $\Sigma\ mr^2$, which is the sum of the products of each mass into the square of its distance from the axis, is called the moment of inertia about that axis. It is the factor in the moment of momentum which depends upon the distribution of matter in the body. It enters into all questions of mechanics in which rotation is involved, from the spinning of a top or the action of an engine governor to the stability of a ship. By an obvious extension, the word moment is also used in such combinations as moment of a velocity and moment of an acceleration. Such phrases correspond to nothing truly dynamic, unless we regard velocity as meaning the momentum of unit mass and acceleration as the rate of change of that momentum.

If the mass of every small portion of matter in a body be multiplied by the square of its perpendicular distance from a straight line, the sum of all such products is called the moment of inertia of the body about the line regarded as an axis. The radius of gyration of the body is the distance from the axis at which all the matter of the body might be concentrated without altering the moment of inertia. Thus, if I is the moment of inertia of the body, M its whole mass and k its radius of gyration, $\mathrm{I} = \mathrm{M}\ k^2$. We see that the moment of inertia of a body about a line is found by adding a great number of products of small masses and squares of distances; if the body can be defined mathematically as to shape, size and density, finding its moment of inertia is a problem of the integral calculus.

MOMENTUM, in mechanics and physics, the product of the mass and velocity of a body. Like velocity, momentum is usually regarded as having a definite direction, as well as a definite numerical magnitude. See MECHANICS.

MOMMSEN, môm'zĕn, **(Christian Matthias) Theodor,** German classical scholar and historian: b. Garding, Schleswig, Nov. 30, 1817; d. Charlottenburg, Prussia, Nov. 1, 1903. He was the son of a pastor located at Garding and was educated at the University of Kiel, where he studied jurisprudence and philology and in 1842 was granted his Ph.D. With his brother, Tycho Mommsen (1819–1900), and his friend Theodor Storm (1817–1888) he published in 1843 a volume of verse which was scathingly condemned by the reviewers. His career as historian, however, began more successfully with publication of the treatise *De Collegiis et Sodalitiis Romanorum* (1843), commended for its thoroughness and a clarity of style new to German works of the kind. From 1844 until 1847 he traveled through France and Italy, under commission of the Berlin Academy, collating manuscripts and inscriptions. Professor of Roman law at Leipzig (1848), he was dismissed as a liberal. He taught at Zürich (1852) and Breslau (1854), and from 1858 was professor of ancient history at Berlin. A Liberal member of the Prussian lower house (1873–1882), he bitterly attacked Bismarck's domestic policy. In an election

speech at Charlottenburg in 1882 he characterized the Iron Chancellor's tariff measures as a "Politik von Schwindel." Such boldness could not go unrebuked, and Mommsen was brought to trial for slander. His acquittal by both a lower and an appeals court was one of his great triumphs. He sternly advised the Teuton element in Austria in the struggle with the Czechs; made some caustic observations in a *North American Review* article on British treatment of minor nations; to the last was quite as belligerent as ever.

But he was only incidentally the politician. He has been called "the greatest scholar of our times, well nigh the greatest scholar of all times." He was distinguished as a epigraphist, historian, jurist, numismatist and philologian. None in the 19th century, which he almost spanned, has, as Freeman goes on to say, "taken in so wide a range of subjects, all brought with the happiest effect to bear upon and to support one another." To the educated reader at large he will probably continue to be best known for his *Römische Geschichte* (3 vols., 1854–56; 8th ed., 1889), to the battle of Thapsus; together with Vol. V on the provinces from Caesar to Diocletian (1885). Volume IV, on Imperial Rome, was unfinished at his death. There are English renderings by W. P. Dickson (Vols. I–III 1862–66; Vol. V 1886). This work opened a new epoch in historiography. Though written with great spontaneity, without even references to original sources, it was based on unrivaled knowledge, and presented its material with extraordinary clearness and at times with brilliancy. It is of course somewhat dogmatic, is certainly unfair to Cicero, and has been blamed, by Freeman among several, for undue glorification of mere power and success. To scholars Mommsen is above all the editor of the great *Corpus Inscriptionum Latinarum* (1863 et seq.; Vols. I, III, VIII, IX, by himself; others under his immediate supervision). Every inscription of this monumental collection was taken down from the original. The errors and falsities of predecessors were cleared away, and a scientific foundation was supplied for the study of Roman antiquities. Mommsen's preface to the series is said to be thought by critics one of the finest specimens of Latin prose written in modern times. For a complete list of his writings, Zangemeister's *Mommsen als Schriftsteller* (Heidelberg 1887; new edition by Jacobs, with additions, 1905) should be consulted. Mention may be made of *Römisches Münzwesen's* (1860), *Römische Chronologie* (1859) and *Römisches Staatsrecht* (1899). All are standard, but the last, particularly, by the breadth and completeness of his exposition of the Roman constitution, places Mommsen among the foremost of constitutional writers. He also edited the *Res Gestae Divi Augusti ex Monumentis Ancyrano et Apolliensi* (1865; new ed. 1883); the *Digesta* in Vol. I of the *Corpus Juris Civilis* (6th ed., 1893), and many other publications. His library, when partially burned in 1880, was replenished by gifts from foreign scholars. In 1902 he was awarded the Nobel prize in literature.

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MOMORDICA, a genus of plants of the gourd family, remarkable for their strangely marked seeds. Two or three species are cultivated in the United States as ornamental plants, one of which (*M. charantia*) produces a food for the Chinese in the pulp about the sculptured seeds; another Oriental food, the golkokra of India, is the fruit of *M. cochinchinensis;* and the balsam-apple (*M. balsamina*).

MOMOTOMBO, mō-mō-tōm'bō, Nicaragua, an active volcano rising 4,128 feet from the northwestern shore of Lake Managua. Eruptions took place in 1852, 1902 and 1905. The nearby village of Momotombo is connected by rail with Chinandega.

MOMPOS, mōm-pŏs', Colombia, a town of the department of Magdalena on an island formed by the Rio Magdalena about 180 miles south of the deltaic mouth. The streets, which extend parallel to the river, are well laid out, but the houses are badly built. Mompos is a depot of foreign goods, but the changes in the river's course rendering it unnavigable have seriously injured its prosperity. Pop. (1939) 6,694.

MOMUS, in Greek mythology, the god of satire and mirth. He is generally represented raising a mask from his face and holding a small figure in his hand. His mother was Nyx, the goddess of night. As a mocking censor and carping critic Jupiter cast him out of heaven.

MONA, mō'nä, (1) a West Indian islet belonging to the United States since 1898. It lies 42 miles east of Puerto Rico, in the middle of Mona Passage, to which it gives its name; seven miles long by two miles broad, its area is nearly 10,000 acres. It is of coral formation, with a general level about 60 feet above the sea. A range of hills on the east side of the island runs from north to south, the highest peak of which is 175 feet above the water. Vegetation is luxuriant and all kinds of tropical fruits grow in profusion. It is the nesting place for green turtles, and the surrounding waters teem with the finest varieties of fish. There are no inhabitants beyond lighthouse keepers and guards. (2) the ancient name mentioned by Tacitus for the island of Anglesey (q.v.), Wales, also applied by other ancient writers to the Isle of Man.

MONA, a West African monkey (*Cercopithecus mona*), remarkable for its brilliant coloration, the head being olive-yellow, with a black stripe on the forehead; yellowish whiskers and a purple face. The back is chestnut-brown; the undersurface is white and there is a white spot on each side near the root of the tail, which is black. It is constantly seen in menageries.

MONA LISA (Monna Lisa), a portrait of Lisa Gherardini, third wife of Francesco del Giocondo, painted by Leonardo da Vinci (q.v.) possibly between 1500 and 1504, although some critics date it between 1503 and 1506.[1] The painting, also known as *La Gioconda* (Fr. *La Joconde*), is a half length, life-size portrait on a canvas 30″ x 20″. Francis I is said to have bought it a few years after completion for 4,000 scudi, an equivalent of about £1,800 ($8,000). It remained at Fontainebleau until it was removed to Versailles by Louis XIV, probably after 1694, and it was not exhibited at the Louvre, where it now hangs, until after the French Revolution. It disappeared on the morning of Aug. 21, 1911, when Vincenzo Peruggia, an Italian painter who was frequently employed at the Louvre, removed the canvas and kept it in a closet of his room. On Dec. 12, 1913, he took it to an art dealer in Florence who notified the police. After a short exhibition at the Uffizi Gallery, it was returned to the Louvre, unchanged. During World War I

[1] Almost all the details of this picture have been disputed. Although Lisa Gherardini has been traditionally accepted as the sitter, Adolfo Venturi, the Italian art critic, in the *Enciclopedia Italiana,* believes that she was Costanza d'Avalos; others maintain that it is not a portrait at all. Few dates in da Vinci's life are certain, and the dates of his paintings are often estimated from the development of his style in coordination with scanty biographical data. Giorgio Vasari, an Italian art historian who wrote within a few years of da Vinci's death, states that the picture was in process for four years.

and II it was put in storage for safekeeping, and was again returned to the center gallery in October 1947. The portrait has not been well preserved.

The picture aroused little attention for some three hundred years, but criticism awoke in the romantic period, for this painting appealed to the sensuous rather than the rational nature. Walter Pater, in contrast to Vasari's appreciation of the artist's technique, expressed his criticism in his essay *The Renaissance:* "From childhood we see this image defining itself on the fabric of his dreams; and but for the express historical testimony, we might fancy that this was but his ideal lady, embodied and beheld at last . . . It is a beauty wrought out from within upon the flesh, the deposit, cell by cell, of strange thoughts and fantastic reveries and exquisite passions. . . . She is older than the rocks among which she sits; like the vampire, she has been dead many times, and learned the secrets of the grave . . ." Much has been written about Mona Lisa's smile, but many critics find nothing unusual about it. Pater notes that "the unfathomable smile, always with a touch of something sinister in it" was a technique of Leonardo da Vinci's master, Verrocchio, and had been copied many times.

There are two *Mona Lisa's* attributed by experts to Leonardo da Vinci, neither of which is a copy of the other. Since no original sketch exists for Mona Lisa, it is not thought improbable that da Vinci first painted one portrait directly on canvas before working on the final copy. The Isleworth version, in England, is admitted by many to be more beautiful than the Louvre painting. It is thought to be the final, unfinished portrait since it is much richer in shading and tone, and is probably the one from which Raphael made his famous sketch. See also PAINTINGS OF THE GREAT MASTERS.

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MONACO, mŏn-ă'kō, the smallest sovereign principality in Europe with an area of 395 acres (.61 square miles). Bordering on the Mediterranean coast, it lies nine miles east of Nice and is surrounded on the north by the French department of Alpes Maritimes. The principality includes three districts: Monaco Ville (pop. 1950, 1,860), La Condamine (pop. 1950, 9,858) and Monte Carlo (pop. 1950, 8,484). There is only one municipal government for the three districts and it has its seat in Monaco Ville. Some coins are minted by Monaco but the language and most of the currency are French.

From the 10th to the 5th century B.C., Monaco belonged to the Phoenicians, who were replaced by the Phoceans in the 4th century B.C. During the early Christian era it was dominated by Rome until the barbarians and Saracens erected a fort on the rock about the 9th century. Emperor Otho I conferred Monaco on a Genoese prince of the house of Grimaldi in the 10th century. The first prince of Monaco was Rainier I who ascended the throne in 1304. In 1731 the male line became extinct with Antoine I, and his daughter Louise Hippolyte succeeded to the throne. She was followed by her husband, Jacques de Goyon-Matignon, count of Thorigny, who took the name Grimaldi. In 1792 the line was deposed during the French Revolution but re-established in 1814 under the protection of the French with Honoré I on the throne. He was succeeded by Honoré II (1819–1841), Florestan I (1841–1856), Charles III (1856–1889), and Albert I (1889–1922). Louis II (1870–1949) was prince of Monaco until 1949. Rainier III (b. May 31, 1923), son of Princess Charlotte Louise Juliette, daughter of Louis II, ascended the throne in 1949 and is the current ruler.

In 1815 by the Treaty of Vienna, Monaco was placed under the protection of Sardinia, but in 1848 Menton and Roquebrune revolted and became independent until 1861 when they were attached to France. The country remained an absolute monarchy until 1911 when a constitution provided for a National Council of 12 members elected by male suffrage for a term of four years. Executive power rests in a ministry assisted by a Council of Government.

Tourist trade is of chief importance. The gambling establishment at Monte Carlo furnishes less than 3 per cent of the revenue. Among the places of interest are the Cathedral of St. Nicholas and its art treasures, the famous Oceanographic Museum built by Albert I, the Palace of the Prince, the Exotic Gardens, and the gardens of St. Martin. Perfumes and cosmetics are exported and local industries include the manufacture of electrical appliances and radios, pharmaceuticals, and printing establishments. Pop. (1950) 20,202.

MONAD, mŏn'ăd, *in philosophy,* is derived from the modified pluralism of Gottfried Wilhelm von Leibnitz (q.v.) and is used to refer to individual units which constitute reality. Each monad is in itself a small universe and has an infinite possibility for development. No two are alike but each works in harmony with the other.

In biology, a term for the simplest organism or organic unit; *in zoology,* a primitive organism, a flagellate protozoan such as the Mastigophora.

In chemistry, a monovalent element, radical, or atom, such as H, OH, CH_3, or NH_4.

MONADNOCK, mŏ-năd'nŏk, New Hampshire, an isolated mountain of a typical erosion character, near the southwest corner of the state, in Cheshire County, 10 miles southeast of Keene, area five miles by three, altitude 3,186 feet above sea level.

MONAGAS, mŏ-nä'gäs, **José Tadeo,** Venezuelan soldier: b. Maturin, Venezuela, Oct. 28, 1784; d. El Valle, Venezuela, Nov. 18, 1868. He served in the War of 1812–1821 under Bolívar. In 1835 he supported a revolution but made his peace with the government a few months later and in 1847 was elected president. His administration was at first marked by liberal measures, but his policy becoming arbitrary he was deserted by his party, whereupon he abolished Congress and assumed a dictatorship. In 1846 he defeated Paez who led a revolutionary movement, imprisoned him, and in 1851 took command of the army, the presidency being held by his brother, José Gregorio (1851–1855). In 1855 he was reelected, but a revolution followed and he was compelled to leave the country in 1858. He returned in 1864 and in 1868 headed a successful revolution and was elected president by Congress, but died before being installed in the office.

MONAL. See IMPEYAN PHEASANTS.

MONARCHIANISM, a doctrine of the second or third century stressing the unity or

oneness of God in opposition to the orthodox doctrine of the Trinity (q.v.). There are two types: the Dynamic Monarchians believed that Christ was a mere man who became the Son of God by adoption (q.v.); Monarchial Modalism taught that the Trinity was but three modes of God's manifestation. Praxeas (q.v.) and Sabellius (q.v.) were its adherents. The dynamistic type is represented by Theodotus of Byzantium, Paul of Samosata (q.v.) and Zenobia, queen of Palmyra.

MONARCHY (Fr. *monarchie,* from Lat. *monarchia,* from Greek *μοναρχία,* rule of one, sole power). In the course of history, the word monarchy has been subjected to so many interpretations and has been applied to so many different kinds of governments that an exact definition or a classification of its main divisions is difficult. Strictly speaking, the word means undivided sovereignty or rule of a single person, and hence it has been used to describe states in which the sovereign or supreme authority is vested in a single individual, the monarch, who in his own right is the permanent head of the state. The king or chief magistrate of a state may properly be termed a monarch only when he possesses the entire ruling power, but the term monarchy has outlived this original meaning and in popular language is used somewhat loosely to designate that form of government in which the chief authority is exercised by a hereditary sovereign as distinguished from republics with elected presidents, or for the "monarchial principle" as opposed to the republican. Still more loosely the term is used to designate any government in which the political head is called king or prince, regardless of the authority he may exercise or the manner in which political power is distributed. The changes in the power exercised by the monarchs of Europe have necessitated the invention of new terms for general use in describing the various forms of government, but these terms in themselves are a contradiction of the true meaning of monarchy. We now have "limited" or "constitutional monarchy" as opposed to "absolute" or "autocratic monarchy," and a distinction is also made between "hereditary" and "elective monarchy," though the distinction is unimportant since these terms do not indicate the nature of the government.

As stated above, the absolute monarchy is the only real monarchy in the strictest interpretation of the word, since it is the only government in which the ruler is absolutely supreme. (See Absolutism). A mixed or limited monarchy is one in which the ruler, though still possessing the status and dignity of royalty, shares the supreme governmental powers either with a body of nobles, or with a popular representative body, or with both. A constitutional monarchy is one in which the power of the ruler is restrained by a constitution. Woolsey says: "Mixed monarchies are something more than limited ones. There may be a limited monarchy where king and people, the former restricted by a constitution, the latter organized and invested with certain means of preventing illegal government, are the only forces. This may be called mixed, perhaps, yet the term rather inclines to embrace only such states as have three or more political powers, as king, nobles and people, united in the government, or the same powers with the clergy, as in many mediæval states. Thus all mixture contains limitations but all limited governments are not mixed." There are now no constitutional or limited monarchies wherein the sovereign possesses power to legislate by decree and in such a monarchy the democratic element is the only authority directly exercising any great degree of actual power. Monarchies are usually hereditary though they sometimes have been elective, but in the latter case they have generally been attended with disastrous feuds, and great confusion in the elections, as in Poland. Of the elective monarchies the most conspicuous were the papal states, the Pope being elected by the cardinals; but the states of the Netherlands were termed republics even though in some of them the office of stadtholder was hereditary. In Europe all monarchies were originally elective, within certain limits; and subsequent to the introduction of Christianity kinship with the reigning family did not count so much as the essential condition of the assumption of sovereign power as the "sacring" by the divine authority of the Church. Constitutional monarchs in their origin may be elective or they may combine both systems, as when one family is disinherited and the supreme power under certain conditions declared hereditary in another. The purely hereditary principle is of comparatively late origin, the outcome of obvious convenience which became a religious or quasi-religious dogma. Absolute monarchies disappeared following the World War, the last survivors being Siam and Afghanistan; and the limited monarchies are Belgium, Great Britain, Denmark, Italy, Japan, The Netherlands, Norway, Persia, Rumania, Jugoslavia, Bulgaria and Sweden.

The conception of monarchy was derived through Christianity from the theocracy (q.v.) which was the earliest form of state and which was developed in Asia and northern Africa. The theocracy was ruled by a high priest or by a king or prince who represented within the limits of his dominions the monarchy of God over all things; hence religion was the bond of union and the idea culminated in the 17th century in the doctrine of divine right of kings. Therefore, when later transformed from a divinely ruled state into one with a human king, the distinguishing mark was despotism. But this barbarous form of monarchy was rejected by the people of Aryan origin who gave some recognition to individual and class rights apart from the rights of kings and princes. Though at first the monarchies were absolute, yet the absolute monarchs were not always tyrannical but in many cases ruled for the good of their subjects. Among monarchs of this class were Henry IV, Saint Louis, Canute, Charlemagne and others of the early centuries of European history and the "enlightened" or "benevolent" despots of the 18th century. The essential basis of the feudal monarchy (which followed the decline of Carolingian authority) was the bond of fealty between the king or supreme lord and his vassals, who derived from him their rank, power and property. The mediæval monarchy was followed by the modern absolute monarchy which first made its appearance in France, proclaiming the doctrine of divine right of kings and culminating in the absolutism of Louis XIV. The Stuarts of

England held this doctrine but the monarchic principle was shaken by the execution of Charles I and the English Revolution of 1688 and was further damaged by the execution of Louis XVI in 1793. Since that time the surviving monarchies of western Europe have been transformed into constitutional or limited monarchies, the growth of democratic ideas having greatly reduced the former powers of the king or emperor. Monarchy remains a political issue in Spain and Italy; the role of the British sovereign, as symbol and as constitutional pivot of the commonwealth, transcends this monarch's very limited political powers. See also ABSOLUTISM; FEUDALISM; GOVERNMENT; KING; SOVEREIGN; STATE; THEOCRACY; and descriptions of governments of the various nations.

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MONASTERY. See MONASTICISM.

MONASTERY, The, an historical romance by Sir Walter Scott, one of the later novels of his *Waverley* series, published in 1820. The scene is mid-16th century Scotland in the last days of Catholicism, and the story concerns the noble Mary Avenel and her suitors. A losing claimant to her hand becomes a monk and other monastic characters are shown; hence the title. An apparition or spirit, the "White Lady" or "White Spirit," works outright miracles. Perhaps because Scott failed to portray the miraculous convincingly, the book was not as successful as its sequel, *The Abbot,* published the same year, which introduced Mary Queen of Scots as a character.

MONASTIC ART AND ARCHITECTURE. So great was the role played by the several monastic orders in western Europe during the thousand years after the fall of the Roman Empire that the very preservation of civilization may be credited to them. Especially was this true during the Dark Ages and through the Romanesque period of the 11th and 12th centuries. Indeed in large measure medieval art, until the Gothic period at least, was indistinguishable from monastic art. For example, the Irish monasteries in the 8th and 9th centuries produced such manuscripts as the Lindisfarne Gospels and the Book of Kells with their peculiarly northern linearism, energy, and decorative quality, surely among the great artistic triumphs of the Dark Ages. The portals of the Cluniac churches of Moissac and Vézelay are outstanding examples of Romanesque sculpture. During the later Middle Ages, the monasteries played a less dominant role and, with the growth in importance of cities and of the royal power, secular craftsmen arose to supplant them.

Similarly in architecture, the monastic churches and buildings illustrate the successive changes of style neither more nor less than do non-monastic churches or secular buildings of the same time. The differences stem from two considerations. First, a monastic establishment comprised not only a church but dormitories, refectories, infirmaries, chapter houses for formal meetings of the members, shops, and farm buildings of all sorts. The 9th century plan of the Benedictine Monastery of St. Gall in Switzerland is an early example that demonstrates the self-sufficient nature of such institutions. The monks and lay brethren of the order worked the land, did their own tanning and blacksmithing, their own brewing and baking. According to the rules of the order, hospitality was provided for travelers; guest houses were therefore required. Thus it is clear that the architectural problem of a monastery was quite similar to that of a feudal manor house, save that it was even more complicated, and revolved around the monastic church as its all important center.

A second reason that sometimes distinguishes monastic from other churches is found in the particular liturgies required by the monks. Although not unique to the monastic orders, elaborate processions played an important role in their services. In 1132, a procession of 1,212 monks was held in the Abbey of St.-Pierre at Cluny. The widespread influence of the monastic orders may be indicated by the striking similarity of five great churches built on the routes leading to Compostela (Santiago de Compostela) in northwestern Spain, those churches were St. Martial, Limoges; St. Étienne, Nevers; St. Foy, Conques; St. Sernin, Toulouse; and St. James at Compostela. Moreover, several important features of medieval architecture were essential to monasteries but might be omitted or minimized in non-monastic churches. For example, the cloister provided a sheltered walk for the monks, and often also incorporated, as at Gloucester, niches (carrels) where individuals might study or write. Since more than half of the great English cathedrals were monastic in origin, mostly Benedictine, the cloister was almost universal there, but is less often found in the French Gothic cathedrals. The cloister was, however, common in churches governed by secular canons even though they were not members of an order. The origin of the English churches also explains their setting, surrounded by the lawns and trees of the monastic grounds instead of, like the French, crowded by the houses of the towns. A second feature of monastic churches was the necessity of stalls in the choir for the individual monks. The stalls were ranged in rows facing each other. The number of rows, two or three on each side of the aisle, determined the width of the choir, and the number of seats in each row, dictated by the size of the monastery, fixed its length. Where, as was often the case in the larger churches, the laity had rights to part of the church, a screen separated the nave from the choir and preserved the latter, including the sanctuary with the high altar, for the exclusive use of members of the order. Finally some few of the monastic orders had such specific needs that they required particular types of churches. Of these, the most important was the Cistercian, founded in 1098 as an offshoot from the Benedictine Order. The typical plan had a short rectangular sanctuary without aisles. This was entered directly from the transept, also without aisles, but with its eastern wall lined with chapels. Since the rules of this order compelled manual labor, the Cistercian monks were distinguished above all others as masons. The Knights Templars and the Knights Hospitallers expressed their mission by designing their churches in a circular form inspired by the Church of the Holy Sepulchre, Jerusalem.

EVERARD M. UPJOHN.

MONASTIC ORDERS, Costume of. See COSTUME, ECCLESIASTICAL.

MONASTICISM, or **MONACHISM,** is a state of life in retirement from the world adopted for motives of religion. It is not peculiar to Christianity, for in many religions, as that of Israel, and in those of India, China and Tibet, the same motive has led men to withdraw themselves wholly or in part from converse with worldly society and to seek in seclusion and retirement opportunity to lead a purer or higher life. The Nazarites, the Rechabites, the Essenes, the Therapeutæ were separatists from society in a greater or less degree, and in this respect were the precursors of the ascetæ of the earliest Christian age and of the hermits or anachoretæ and the cœnobites of the 3d and 4th centuries.

In the middle of the 3d century, during the persecution of the Christians by Decius, Paul of Thebes in Egypt (Saint Paul the first hermit), withdrew to a wilderness, and during the remainder of his long life lived in absolute solitude in a cavern of a mountain, deriving his food and his vesture from a neighboring grove of palm trees. Many others fleeing from persecution or from the contagion of a profoundly corrupt society, flocked to the wildernesses of the Nile country; among them was Antony (Saint Antony), who after many years of the strictly solitary life of an anchorite was in a manner compelled by circumstances to adopt the cœnobite rule. He was by choice an anchorite like Saint Paul the Hermit, but the fame of his virtues and his miracles brought to his cell in a remote wilderness many who desired to devote themselves to the service of God under such a master; and as he could not refuse their prayer he became, in fact if not in name, the Father or Abbot of a pretty numerous cœnobium; hence he is called the Father of Monachism, that is, of the life-in-common of those who retire from the world for reasons of religion; they retain the title of monk, *monachus* (a solitary), though since Saint Antony's day they are no longer solitaries but cœnobites.

Antony's cœnobites occupied each a separate hut or a separate grotto; but Saint Pachomius, a contemporary of Antony, introduced a further development of the community life. The cells or huts were now to hold three brethren; meals were eaten in common; the labor of the monks was regulated; the brethren were graded according to their spiritual proficiency; the community was presided over by an abbot, with inferior officers; in addition to the primitive industries of petty agriculture, basket-making and mat-weaving, the monks practised the trade of the smith, of the tanner, etc.; there were daily assemblies of the community for prayer and conference. When Saint Pachomius died, about the middle of the 4th century, 7,000 monks were subject to his rule.

From Egypt monachism soon spread into Syria, Palestine, Mesopotamia, Asia Minor and Armenia.

The introduction of monachism in the Western countries of the Roman Empire dates from a little after the middle of the 4th century when a few small communities of monks, under the Pachomian rule, were founded at Rome and in Northern Italy. Later, when the rule of Saint Basil had been translated into Latin, communities of Basilian monks sprank up in Southern Italy. Saints Jerome, Augustine and Ambrose were zealous promoters of monachism in Italy and Africa, Saint Martin of Tours in Gaul; when Saint Martin died (397) his body was followed to the tomb by 2,000 monks.

Whether under the Pachomian or the Basilian rule or under modifications of these, monastic establishments multiplied rapidly in the West. But the disorder which attended the decline of the Western Empire and the barbarian invasions, had its effects upon monachism, and the monastery exhibited the same anarchy as did civil society.

Early in the 6th century Benedict of Nursia, who had already led for three years the life of a strict recluse in a cave at Subiaco, about 40 miles distant from Rome, was chosen by the monks of a monastery in the same place as their abbot; but very soon, his new subjects having deposed him, he returned to his solitude and commenced that reform of Latin monachism which made his name illustrious. He gave to his monks a rule which, variously amended and modified, has been the law of the monastic life of Western Europe ever since. In its preamble Benedict recognizes two and only two legitimate classes of monks — cœnobites and anchorites — those who lead the life in common and those who live in solitude — usually now called hermits.

Two other classes he names, but only for condemnation, namely, sarabaites — professing monks who live two or three together without any superior or any fixed rule; and *gyrovagi* or *circulatores,* tramps, wandering beggars who wear the cloak of a religious profession. To do away with these scandals of the monastic life, Benedict's rule requires that the postulant for admission to a monastery shall take in addition to the usual monastic vows of poverty, chastity and obedience, a further vow that he will remain all his days in the community in which he makes his profession, and never be absent from the monastery save by leave of his superior.

Besides monasteries for men Benedict instituted also monasteries for women, and the first abbess of a community of Benedictine nuns was his sister Scholastica.

The Benedictine order was for a long time a powerful agency in the civilization and christianization of the barbarian nations of Europe Wherever a Benedictine foundation was made there the face of the country was quickly changed: forests were cleared, marshes drained, the arts of husbandry developed. peace and civil order maintained, science and learning fostered, schools, hospitals and refuges established.

Monastic institutions founded in Britain, France, Switzerland, Italy and Germany by Celtic monks prior to Benedict's reform conformed to the Benedictine rule The Carthusian order, founded in the end of the 11th century, was a reversion to the anachoretic type of monachism — the solitary or eremitical instead of the cœnobitic life. In the same century arose the order of the Camaldoli, another order of hermits.

The beginning of the 12th century saw the rise of that singular development of monachism, the knightly orders, the members of which besides the usual three vows of the monk took a fourth vow, of making war on the infidels for the defense of Christendom. The Knights Hos-

pitallers were originally a religious society bound by vow to harbor in health and in disease pilgrims visiting the holy places in Jerusalem; their house in the holy city was a "hospital" or guest-house. The full title of the Knights Templar is "pauperes commilitones Christi templique Salomonis"— poor knights-companions of Christ and of Solomon's temple. Another military order contemporary with these was the Teutonic order. History records the titles of over 90 military orders or of bodies styling themselves so.

The chronic state of war between Christendom and the Mohammedan power led to the institution of the order of Trinitarians and that of Our Lady of Mercy. The mission of these orders was the redemption out of slavery among the Mohammedans of Christian captives. Bearing the alms and gifts contributed by the charity of Europe, the members of those orders visited the Mohammedan countries on the Mediterranean and procured the liberation of the enslaved Christian captives and restored them to their native countries. The Trinitarians had at one time 250 houses; the Christians redeemed by them, from first to last, numbered over 30,000. The order of Mercy was at first a military order, but in 1218 it put off its military character, and devoted itself wholly to the charitable work of redeeming the captives.

There seemed to be now a sufficiency of religious orders to satisfy all needs. But at this very time, the beginning of the 13th century, two new orders were instituted — and that by Pope Innocent III. who in the Lateran Council had procured the enactment of a decree forbidding the creation of new monastic orders. The new institutes were the order of the Friars Minor (Franciscans) and that of the Friars Preachers (Dominicans); and to these very soon were added two more — the order of Austin Friars (Augustinians) and that of the Carmelites. These are the four mendicant orders, so called because by their rule they renounce all property and all endowments and subsist on the alms of the faithful.

The membership and the establishments of these mendicant orders increased with astonishing rapidity throughout the whole of Europe. Dominican and Franciscan friars were soon the great lights of the theological schools — Albertus Magnus, the Doctor Universalis, as he was styled by his contemporaries, and Thomas of Aquinum, the Angelic Doctor, being the foremost of the Dominican divines, and Duns Scotus, the Doctor Subtilis, and Roger Bacon holding the first rank among the Franciscans. The friars were also effective missionaries both among the poor and the rural populations at home and among the heathen and the infidels.

The Company of Jesus is the latest of the great religious orders; it was founded in 1534 and its mission was to resist the onward march of Protestantism, directly by combating the Protestant assault on the Catholic Church and by instructing the Catholic populations in the grounds of their religious faith and practice; indirectly by organizing a system of higher education for Catholic youth, and offering educational advantages superior to those afforded by Protestant universities and academies. The Company of Jesus took also as its special field of labor the evangelization of the heathen.

Nearly all the later religious orders and institutes have had for their object the Christian education of the young, the reformation of the fallen, or the relief of the poor and distressed; among the orders established for these ends are those of the Nuns of the Good Shepherd, the Sisters of Charity and of Mercy, the Brothers of the Christian Schools, and numerous other congregations.

The Reformation was hostile to monasticism, and in those countries where it obtained, the monasteries were suppressed and the monastic life disappeared. Henry VIII seized upon the monastic properties throughout his realm and applied them for his own religious or secular purposes. In Protestant Germany, Scandinavia and Switzerland, the monastic institution ceased to exist shortly after the triumph of the Reformation. In the 18th century a concertedly hostile movement against monasticism took shape in all the countries under Bourbon rule. The governments of Portugal, France, Spain, Sicily and some of the Italian principalities expelled the Jesuits and brought such political pressure to bear upon the Papacy that Clement XIV reluctantly signed the decree suppressing that famous Society in 1773. Pius VII restored the Society in 1814. During the latter half of the 19th century a recrudescence of hostility on the part of the governments of the Latin countries against the religious orders manifested itself. In Spain, France, Italy, Mexico and some of the South American republics expulsion for some orders and hampering restrictions upon freedom for others have contributed to retard their growth and development. The reasons usually alleged for these coercive measures by these governments are political and economic, the merits of which it would be out of place to discuss here. In the opening decade of the 20th century the French government aimed a deadly blow at monasticism in that country in its Associations Law. Germany admits all the religious orders except the Jesuits. In Great Britain full freedom is now given in the establishment and development of monastic institutions. In the United States, where there are absolutely no legislative restrictions upon the freedom of monastic life, the religious orders are in a flourishing condition. In this country there are 8,400 male and over 50,000 female members of religious orders.

In the Church of England within the last 50 years there has been a revival of the monastic idea with no inconsiderable results. Dr. John Mason Neale and Canon Carter promoted the establishment of sisterhoods (of Saint Margaret and of Saint John Baptist), in which life vows of poverty, chastity and obedience were taken, and a mother house of the Sisters of Saint John Baptist was founded in New York as a branch of the central house in England. There is also the Protestant Episcopal sisterhood of Saint Mary and many others in the United States. Among the male orders of Protestant monasticism must be mentioned the Cowley Fathers, founded by Dr. Benson, and in the United States the Order of the Holy Cross, a preaching order founded by J. O. Huntingdon, son of Bishop Huntingdon. An order of monks was also founded by Rev. Joseph Leycester Lyne in 1870 at Llanthony Abbey, Wales, and the strict rule of Saint Benedict was adopted. It is no exaggeration to say that the

monastic movement is now flourishing, both in the Church of England and in its daughter church, the Protestant Episcopal Church in the United States. For further details see the articles on the various orders, also ABBEY; AUGUSTINE, ST.; BASIL, ST.; BENEDICTINES; CISTERCIANS, etc.

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MONASTIR, mŏn-ăs-tĭr′ (ancient RUSPINA), seaport town, North Africa, in northeastern Tunisia, on the Gulf of Hammamet. It is strongly fortified with surrounding walls surmounted by towers and has a castle, 13 mosques, a high school for the natives and beautiful gardens in the vicinity. Its chief industries are soap-making and the oil trade. Pop. (1946 est.) 11,000.

MONAZITE, mŏn′ă-zīt, a rare earth mineral, comprised essentially of an anhydrous phosphate of ceria, lanthana, neodymia, praseodymia (formula: Ce, La, Nd, Pr) PO_4, and usually thorium (ThO_2). It occurs in certain granitic and gneissic rocks but the most concentrated deposits are of an alluvial nature. It crystallizes in the monoclinic system, most of the crystals being the size of sand grains, though some as long as five inches occur in the Ural Mountains and Norway. The crystals, usually yellowish to reddish-brown, are about 5 to 5.5 in hardness, with a specific gravity of about 4.9 to 5.5. Monazite is found in many parts of the world, but the monazite sands of the seacoast of Brazil, India, Indonesia, and to some degree the South Mountain region of North Carolina, have provided the chief commercial supply. Monazite, which first came into commercial use about 1886 as a source of supply of thoria required for the manufacture of the Welsbach incandescent gas mantle, is used in the manufacture of radio and X-ray equipment, highly refractory crucibles, sun lamps, and sparking flints; also for stabilizing the arcs in carbon arc lamps, coloring topaz-yellow glass, mothproofing fabrics, opacifying enamels, etc.

MONBODDO, LORD (JAMES BURNETT). See BURNETT, JAMES.

MONCLOVA, mông-klō′vä, town, Mexico, in Coahuila State, 110 miles northwest of Saltillo. Monclova dates from the 17th century and was formerly the capital of the dual state of Coahuila and Texas. It has railroad works, copper, silver, zinc, and lead mines, coffee plantations, stock raising interests, and a trade in the agricultural produce of the region. Pop. (1940) 7,181.

MONCRIEFF, mŏn-krēf′, SIR **Alexander,** British ordnance expert, inventor of the disappearing gun system: b. Edinburgh, April 17, 1829; d. Bandirran, Aug. 3, 1906. He was educated at Edinburgh and Aberdeen; apprenticed to a civil engineer; served in the Scottish Royal Artillery; during the Crimean War planned the Moncrieff ordnance system, also called the protected barbette, or the disappearing system, for the invention of which he received $50,000 from the British government. The important point in this system is that the recoil of the gun is utilized to drop it out of sight after firing and to raise it again when necessary, a contrivance which did away with the cumbrous and expensive system of steel-plated forts. It substituted for them the simple, inexpensive Moncrieff pits, mere slight excavations for the masking of coast batteries. He received the honor of knighthood in 1890.

MONCTON, mŭngk′tŭn, city, Province of New Brunswick, Canada, a railway and industrial city in Westmorland County, on the Petitcodiac River which after an easterly course here bends sharply to the south and flows into Shepody Bay, the latter an extension of Chignecto Bay at the northeastern end of the Bay of Fundy. Moncton has a harbor of 30-foot depth at high tide equipped with Dominion government and private docks. One of the "sights" of the locality is the "bore," a wall of water sometimes 5 feet high, which periodically rushes up the river from the tides of the Bay of Fundy. Railways and highways connect Moncton with all parts of the Maritime provinces and beyond. It is also on the Trans-Canadian highway and has a Trans-Canada Air Lines and Maritime Central Airways airport. The principal local industries (only very partially based on the lumbering and agricultural resources of the neighborhood) are a large railway and rolling stock industry, closely followed by slaughtering and meat packing. Biscuit and miscellaneous plants (steel products, chemicals, paints, woolens, aerated waters, etc.) make up the remainder of establishments. There are 11 churches, 3 parks, the Hotel Dieu and the Moncton Hospitals, a public library of 10,000 volumes, 3 daily newspapers (one French) and a semi-weekly newspaper, 7 banks, a Board of Trade and a junior Chamber of Commerce. Pop. (1941) 22,763; (1950 est.) 25,000.

MOND, mŏnd, **Ludwig,** German industrialist and chemist: b. Cassel, Germany, March 7, 1839; d. London, Dec. 11, 1909. He was educated at the Cassel Polytechnic and the universities of Marburg and Heidelberg; went to England in 1862. He became a naturalized British subject in 1867. He entered the employ of the Leblanc soda works, where he introduced his method of recovering sulphur from alkali waters. In 1872 (with Sir John T. Brunner) he started the alkali works, Brunner, Mond, and Company, which introduced the Solvay process of manufacturing ammonia soda into England; and continually improved this process. His alkali works at Northwich are the largest in the world. He invented a means of manufacturing chlorine as a byproduct of the ammonia soda process, and devised new gas batteries, new processes for manufacturing nickel based upon his discovery of nickel carbonyl, and a new method of producing gas for power and heating, ammonia being a by-product. In 1896 Mond endowed the Davy-Faraday Research Laboratory at Royal Institution. He also formed the Mond Nickel Company with mines in Canada. His remarkable collection of paintings, bequeathed mainly to the National Gallery, London, has been described by J. P. Richter in *The Mond Collection, an Appreciation,* 2 vols. (London 1910).

MONDAY (*moon* and *day;* Saxon, *Monandaeg;* German, *Montag;* Latin, *lunae dies*), the second day of the week, formerly sacred to the moon. See also CALENDAR.

MONDOVI, môn-dō-vē', commune, Italy, in the Province of Cuneo, Piedmont, 58 miles by rail south of Turin. Its chief building is the 15th century cathedral of San Donato crowning the steep height of the upper town. Paper, pottery, machinery, etc., are among its manufactures, and it has a school of industrial arts and handicrafts. Near the city the Sardinians were totally defeated by Napoleon, April 22, 1796. Pop. (1943) 19,621.

MONER, mō'nēr, the simplest form of protozoan, regarded as the simplest known animal organism, and included among the rhizopods in the order Lobosa.

MONET, mô-nĕ, **Claude,** French painter: b. Paris, Nov. 14, 1840; d. Giverney, France, Dec. 5, 1926. He opened a new road to landscape painting by application of scientific principles deduced from the laws of light. His work, a magnificent verification of the optical discoveries made by Hermann Helmholtz and Michel Chevreul, forms the very basis of the impressionist movement with all its chromatic demonstrations of light and color. Suppression of local color and the study of reflections by means of complementary colors and division of tones by the process of pure, juxtaposed colors are the essential principles of impressionism. Monet's first luminous studies date from about 1885. For years he remained unknown.

Light is the real subject of his pictures. He often treated one and the same site in a series of pictures painted from nature at all hours of the day. The most famous of this series are the *Hay-ricks,* the *Poplars,* the *Cliffs of Etzetat,* the *Golfe Juan,* the *Coins of Rivière,* the *Cathedrals,* the *Water Lilies,* and the *Thames.* Monet painted this series from nature. He noted, for example, from 9 to 10 o'clock the most subtle effects of sunlight upon a hayrick; at 10 o'clock he took up another canvas; and so on from hour to hour, he followed step by step the modifications of the atmosphere. He finished almost simultaneously the whole series. He painted a haystack in a field 20 times over and the haystacks were all different; and when this series is exhibited the beholder can follow, led by the magic of his brush, the history of light playing on one and the same object, a dazzling display of luminous atoms, a presentation of atmospheric vitality. The shadows, true to nature, are lights where certain tones—blue, purple, green or orange—predominate exactly as happens in optic science.

Usually his subjects or motifs were simple; a hayrick, some slender trees, a cluster of shrubs or group of rocks. No one knew better than he how to place a rock amidst tumultuous waves, how to construct an enormous cliff or how to give the sensation of a group of pine trees blown and bent by the wind. Most unexpected tones play in the foliage and on the ground. On close inspection the beholder sees the canvas striped with orange, red, blue, and yellow touches of the brush, but seen from a distance the freshness of the green foliage appears as in nature. The eye of the beholder recomposes what the painter's brush has analyzed and dissociated. Monet is considered one of the greatest of all landscape painters. He understood and depicted with equal facility the true character of every soil and the true character of every kind of vegetation. Monet was also able to turn like all great artists from demonstrations of power to displays of tender charm. His studies of the austere rocks of *Belle-Isle en mer* where heavy waves and blinding spray dash with fury over the granite rocks are unparalleled, while his series of *Water-lilies* express the melancholy and quiet beauty of sequestered pools where the water is thick with tangled stems and sleepy blossoms. Monet also painted the woods in autumn where the sunlight plays on tones of bronze and gold and red; chrysanthemums, dazzling sunflowers, tulip gardens in Holland; sailing boats on sunny rivers; and many portraits and other studies.

The series called *The Cathedrals* is famous. It consists of 17 studies of the west front of Rouen Cathedral, the towers of which fill the whole space of the picture. The gray stone, worn by time and blackened for centuries, is for 17 times made the theme for the painter's vision. Pale and rosy at sunrise and differently rosy and glowing at sunset, purple at midday, shrouded in mist or ethereal under the moonlight, the superb façade is reconstructed in the boldest way, yet producing the effect of its thousand details of architectural beauty and exhibiting the most dazzling and poetic atmospheric harmonies.

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MONETARY COMMISSION OF THE UNITED STATES CONGRESS, a commission appointed in August 1876, by the 44th Congress, to inquire into the causes and economic effects of the decline in silver, the best means for resuming specie payments and other national monetary questions. The commission consisted of three senators, three representatives, and three monetary experts. Meetings were held in Washington and New York, during a period of six months. The results of the conferences were published by the government in monographs issued by the Treasury Department.

MONETARY CONFERENCES, INTERNATIONAL, meetings between nations for the purpose of reaching international agreements on monetary and banking problems.

In addition to the successful international monetary conferences held in 1865 and 1873, which respectively resulted in the Latin Monetary and the Scandinavian Monetary unions (see MONETARY CONVENTIONS), numerous less fruitful monetary meetings have been held. Encouraged by the success of the Latin Union (q.v.), of which she was a member, France in 1867 invited all the powers to participate in the First International Monetary Conference at Paris, for the purpose of relieving problems of international exchange, and possibly to attract further membership in the Latin Monetary Union. Eight meetings were attended by representatives of 18 European nations and the United States. One of the principal topics of discussion involved the question of establishing uniformity of coinage. Two important decisions were reached: (1) that it would be more practicable for the nations involved to adopt as a uniform standard some already existing monetary system than to invent a new standard; and (2) that gold was the only standard which was adapted to international money. However, no formal treaties involving conference recommendations were contracted, and little was actually accomplished except to open the way to further discussions.

Throughout the 19th century the struggle between gold and silver constituted a major fiscal problem, in connection with which the United States government solely or jointly initiated three international monetary conferences. The first of these, called the Second International Monetary Conference, was launched by an act of the United States Congress on Feb. 28, 1878, which directed the president to invite European nations to join in a "conference to adopt a common ratio between gold and silver for the purpose of establishing internationally the use of bimetallic money, and securing fixity of relative value between those two metals." Behind the conference lay the need to offset a potentially serious depreciation in the value of silver, caused, among other factors, by the increasingly large production of silver in the United States. Twelve nations participated in the conference, held in Paris. The United States submitted proposals calling for the unrestricted coinage of silver and its use as legal tender, and advocated a bimetallic standard on the basis of a fixed ratio between gold and silver. The attending European nations rejected the American requests by insisting that conditions within individual nations should determine the monetary functions of both silver and gold, and that the selection of either currency or both "should be governed by the special position of each state or group of states." The discussions ended without mutual agreement respecting American proposals.

In the next few years England and France met with seriously diminished gold reserves; the United States was being forced to import gold, which upset the European market; and Germany was unable to find a satisfactory means of disposing of her stocks of silver. To handle the problems posed, the French and American governments joined in calling the Third International Monetary Conference, which 19 nations attended in Paris in 1881. The nations recommended the establishment of a 15½ to 1 ratio of silver and gold and then adjourned to allow the various nations to consider the proposition before reconvening on April 12, 1882. The conference was not reassembled.

The Fourth International Monetary Conference was called by the United States to consider what measures might be taken "to increase the use of silver as money in the currency system of nations." Twenty nations were represented at sessions held in Brussels during November 1892. Lengthy discussions produced various schemes for a bimetallic standard and for the wider circulation of silver through a cooperative system. The conference finally adjourned without formal agreements, although a subsequent meeting was set for May 30, 1893, but was never held.

In 1922 another international monetary conference was held at Genoa to combat postwar inflationary trends. It accomplished little, primarily because of the effects of unstable monetary conditions in Germany. However, it was followed by a London conference, beginning on July 16, 1924, which involved 10 nations in discussions regarding monetary difficulties, particularly in Germany. The conference agreed on the so-called Dawes plan (see DAWES, CHARLES GATES), which had earlier been accepted on April 16 by Germany and was later signed on Aug. 16, 1924.

From June 12 to July 27, 1933, the famous London Monetary and Economic Conference was held, at which American Secretary of State Cordell Hull (q.v.) presided. The conference sought to reach an agreement on currency stabilization but virtually disregarded the equally important problems of war debts and reparations. On July 3, President Franklin D. Roosevelt issued his unexpected "bombshell" message, which expressed disapproval of the course of action taken by the conference. After this setback, the meetings wavered on for a few weeks, but ended in failure.

Before the conclusion of World War II, the United States, in planning to meet postwar reconstruction needs, called a monetary and financial conference which met in June 1944 at Bretton Woods, N. H. This meeting differed from earlier monetary conferences in emphasizing international banking rather than international currency agreements. Here plans were made for the creation of the International Monetary Fund and of the International Bank for Reconstruction and Development.

See BIMETALLISM; GOLD STANDARD, THE; PACTS AND CONFERENCES: WORLD WAR II.—*United Nations Monetary and Financial Conference (Bretton Woods)*.

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MONETARY CONVENTIONS, conferences between European nations for the regulation of their coinages. Two such conventions have been held which resulted in the Latin Monetary Union (see LATIN UNION) and the Scandinavian Monetary Union. The former included France, Belgium, Italy, and Switzerland, by an agreement of December 1865, under which these nations' coinages became of uniform weight and fineness. Greece joined the union subsequently. Spain, Austria, Finland, Rumania, Bulgaria, and other European nations later also coined large amounts of either or both gold and silver money, which were identical in weight, fineness, and value with the standards established by the Latin Union.

MONETITE, mŏn'ē-tīt, a native acid phosphate of calcium, $CaHPO_4$, occurring in massive and in small, triclinic crystals, in the islands of Moneta and Mona, in the West Indies. The mineral is found in limestone, beneath a deposit of guano.

MONEY. In an economic sense, money is any medium of exchange which is widely accepted in payment for goods, services and debts without reference to the standing of the person offering it in payment.

In our highly specialized modern economy with its extreme division of labor, money is as necessary in the exchange of goods and services as language in the exchange of ideas. It is truly indispensable; in fact, if it does not function properly production, distribution, employment, and our very standard of living and well-being are directly affected. Because of this great importance, authorities in many fields have devoted much study to the nature, functioning, and phenomena of money with the result that views and definitions are legion—and vary as widely as the divergent aims and different backgrounds of their sponsors.

Some authorities maintain that use of the term *money* should be restricted to whatever serves as

the standard of value; others insist that "money is what money does," therefore, they say the term should encompass all the instrumentalities, especially the obligations, which affect exchanges, such as checks, notes, drafts, mortgages, charge accounts, etc. Admittedly, it is very difficult to differentiate a complex concept such as money from all other economic and social concepts but it can be fairly said that all monetary concepts stress the aspect of standard of value, or that of medium of exchange, or both.

Relation of Money and Credit.—One of the main difficulties in getting a clear-cut concept of money is the overlapping of *money* and *credit*. Practically all modern money has an element of credit—in fact, a great deal of it is 100 per cent credit. This characteristic and the indiscriminate use of the words *cash, money,* and *credit* compound the confusion. In view of this, it is important to develop a workable (if not absolutely perfect) concept of credit, which will differentiate it from money.

The term *credit* is used in many different connections and with many different meanings. For the purpose of an understanding of money, however, credit may properly be defined as a promise to pay money. It must be immediately admitted, however, that most such promises are redeemed with credit rather than with money. This is understandable, as in an important sense credit is merely a postponed payment of money; that is, it is the term applied to a common and important use of money, namely, that of deferred payment.

Relation of Money, Credit, and Prices.—In the first half of the 20th century, the relation of money, credit, and prices was by far the most active field of economic inquiry. The "dance of the dollar," as the fluctuating price level was sarcastically characterized, became the preoccupation of economists, bankers, and politicians alike. Pressure groups were organized, books written, and political campaigns fought on different theories of eliminating the upward and downward swings of prices and business activity. The social injustice of the transfers in purchasing power from debtors to creditors, and vice versa, through changes in the price level, became generally recognized. The wide variations between *nominal* purchasing power and *real* purchasing power became more fully comprehended through the development and wider usage of index numbers. Steadily the conviction developed that the price level should be made to serve man rather than the contrary. Laws were passed and policies developed in an effort to make money a *means,* rather than an *end,* or *result,* of economic activity.

A clear idea of the terms *price* and *value* will be helpful in securing a better understanding of the relation between money and credit and price behavior. The *value* (exchange value) of a thing is its purchasing power over all other goods and services. In this sense, value is measured by the quantity of other things for which a thing can be exchanged. For example, a bushel of wheat may be exchanged for two bushels of rye, or three bushels of corn, or ten gallons of gasoline, or two hours of common labor, and so on. These and countless other ratios measure the value of wheat, in the limited sense (exchange) in which value was used above; so, the complexity of value determination—even of such simple value as exchange value—is obvious.

The price of a thing is its purchasing power over money, that is, the amount of money for which it can be exchanged. In other words, price is value expressed in terms of money. Money, therefore, has no price—it has only value. It follows that a general rise or fall in prices merely reflects a change in the value, or purchasing power, of money. The value of money falls as the general price level rises, and rises as the price level falls. This behavior pattern is summarized by the economist in this fashion: "The value of money is inverse to the level of prices."

There are many theories of the relation between money and price behavior. The boom of the 1920's, and the great depression of the 1930's, with their vast monetary experiments, conclusively demonstrated that all such theories leave much to be desired. The imponderability of the so-called human element, in fact, the perversity of human reaction, is so great that the relation between money and prices cannot be reduced to the comforting certainty of a principle or law. The explanations are still very much *theories.*

The quantity theory of money, which holds that the value of money (that is, the general price level) depends on its quantity and that *ceteris paribus* (other things being equal) prices will vary directly with the quantity of money in circulation, has the virtues of seniority, simplicity, and surface logic. It also enjoys the widest acceptance of any of the theories. Nonetheless, in its simplest form it leaves much to be desired. In particular, through the *ceteris paribus* device, it overlooks the basic importance of *demand.*

Irving Fisher's mathematical presentation of the factors which affect the general price level is a much more comprehensive and acceptable concept of monetary and price behavior. His basic formula is: $MV + M'V' = PT$. In this statement, M is the quantity of money, V is the velocity of its circulation (turnover), M′ is the total of demand deposits subject to check, V′ is the velocity of such deposits, P is the price level and T is the volume of trade.

Although frequently called the mathematical statement of the quantity theory of money, Fisher's formula is more properly *the equation of exchange.* It is, in fact, a mathematical statement of any theory of money, since it is a truism. This equation clearly indicates that an increase or decrease in velocity, or an increase or decrease in goods may affect prices just as much as a change in the quantity of money. Thus, it would be just as logical to call this the goods theory of prices or the velocity theory of prices. Moreover, it obviously does not explain why people decide to change from money to goods, in the first place—from an economic standpoint, it is an after-the-event presentation.

This overemphasis on quantity was at the bottom of the government "pump-priming" of the 1930's; but it failed, as it disregarded the basic fact that velocity (turnover) is largely controlled by the public. In fact, as the government increased the quantity, the public decreased the *velocity.*

The overemphasis on quantity inherent in the quantity theory causes people to overlook the great effect of prices on the quantity of credit (M′) in the modern economy. In fact, the amount of M′ brought into existence by the banker is determined by the price level rather than the opposite. As a practical matter, the amount of a loan (quantity) is calculated by multiplying the number of units desired by the

market price of each unit. To be sure, after the credit is brought into existence, it will probably affect prices; but not necessarily: the public may commensurately slow up velocity or even increase the quantity of goods.

Kinds of Money.—Basically, there are three kinds of money: (1) commodity money, (2) credit money, and (3) fiat money.

Commodity money is money the monetary value of which approximates the value of the material it contains. Its value as a commodity is substantially the same as its value as money. Thus, with gold at $35.00 an ounce, a five-dollar gold coin containing one seventh of an ounce of pure gold would be commodity money. By the same token, with the market value of silver at seventy-five cents an ounce, a silver dollar containing one and one third ounces of silver would be commodity money.

Commodity money is usually, although not necessarily, metallic money. As a result of their widespread usage for this purpose, gold, silver, and copper are known as the monetary metals.

Because of greater convenience, and resulting public preference, commodity money usually circulates in representative form. For example, instead of a heavy silver dollar, a piece of paper giving title to the same amount of silver kept in the United States Treasury circulates. The same is true of gold if a country is on a gold basis. By means of *representative money,* commodity money circulates, it might be said, by proxy.

Many writers treat *representative money* as a distinct kind of money. In view, however, of the almost universal modern practice of keeping the monetary metal in one common pool (reserve) and having it circulate by proxy, it seems more realistic to consider representative money as the form in which commodity money generally circulates.

Credit money is the term used to designate all credit instruments widely accepted in payment for goods, services, and debts without reference to the standing of the person tendering them. Credit money, being itself a promise to pay money, presupposes the existence of another kind of money in which it may be redeemed. This money of redemption is known as standard money whereas credit money is frequently termed fiduciary money because of the element of trust.

Quick and easy redemption is the key to the general acceptability of credit money. So long as no barriers are placed in the path of redemption its value will naturally be the same as that of the money in which it can be redeemed, even though redemption never takes place. Any restriction on redemption will cause credit money to depreciate in terms of standard money to the extent of holders' estimates of the extent and duration of the limitation.

It should be noted, however, that complete loss of all faith in ultimate redemption will not necessarily mean that the inconvertible money will lose all of its value. This is because the monetary use itself creates a demand for the money and thus gives it a value. This is especially true if the quantity of credit money is controlled so that there is a scarcity of it relative to the demand for it for monetary purposes. The value of such inconvertible money is often further increased by the willingness of the government to accept it in payment of taxes at face value or some relatively high percentage of such value. In addition, the government may further bolster its value by making it *legal tender* for private debts, that is, by requiring creditors to accept the money at par in payment of all debts and claims.

Credit money is ordinarily paper money, although, as will be seen in the next section, not all paper money is credit money. Much of the paper money issued by governments and all bank notes are credit money.

It should be added that the subsidiary coins are usually made with a disproportionate weight or of a cheaper metal than the standard money so that the express, or implied, promise to redeem them contributes to their value. To the extent that their value derives from the promise rather than the silver, copper, nickel, etc. they contain, these subsidiary coins are credit money. This is true of all our minor coins (such as pennies and nickels). It is also true of our silver coins as they contain less silver by weight than the ratio of their fractional value to the unit indicates. In short, a half-dollar does not have one half as much silver as a silver dollar, nor does one quarter have one fourth as much silver as the silver dollar. This reduction of weight, of course, affects the value but the overvaluation of silver for coinage purposes causes an even greater spread between its value as a commodity and its monetary value. The reasons our coins are credit money are thus quite obvious.

Fiat money is the term used to designate money by government command. The name pointedly indicates this as the Latin word *fiat* means: let it be done. Since it becomes money only through fiat, it must be issued by government, or under the specific order and protection of sovereignty. For example, when a government takes a piece of any material and stamps or prints on it that it is so many units of money, regardless of its value as a commodity, and without making it redeemable, or convertible into other money, then forces such pieces into general circulation, that is fiat money. The essential feature of all fiat money is that its value is independent of the material from which it is made, as well as independent of any promise of redemption in other money.

Fiat money usually starts out as credit money issued under varying degrees of good faith. As redemption or maintenance of other promises becomes burdensome, increasing limitations and restrictions are introduced until repudiation is a tacit, even though not admitted, fact. Because of custom, tradition, and social inertia, such money will continue to circulate, although at a lower value. The value it will have will be affected by the extent to which it has been made legal tender and by its acceptability by the government for public dues. In addition, of course, its value will be affected by the quantity issued relative to the demand for it for monetary purposes, as that is the most important determinant in the value of all inconvertible, or fiat moneys.

Paper Money.—In its narrow, and correct, sense, paper money is merely the *form* in which most of the other kinds of money circulate. In the public mind, however, it is more closely associated with fiat than with either credit or commodity money. This may well be a folk memory, as the history of "paper money" is more interesting than reassuring!

Although paper is supposed to have been invented in China in the year 177 B.C., the Chinese

did not get around to using it for money until more than a thousand years later. In the early part of the 9th century, what is thought to have been the first issue of true paper money was put out for the ostensible purpose of avoiding the difficulty of carrying around the heavy iron and copper coins used in the trade of that day. Since that time the evils, abuses, fraud, and economic dislocation flowing from the unprincipled and unwise use of paper for money have caused even more suffering than that other famous Chinese invention, gunpowder.

It is the indisputable lesson of history that sooner or later, and usually sooner, all paper money declines in quality—representative money becomes credit money, credit money becomes fiat money, and fiat money becomes the epitome of worthlessness. Even to this day, the "not worth a Continental" term which arose from the extreme depreciation of the Continental currency of revolutionary times, indicates complete lack of value. The final destruction of value, of course, comes from the excessive issue of the paper "money."

In paper money, the evil of overissue must be fought continuously. It is so tempting and so easy to print more unsupported "paper" money that it is fed into circulation in such excessive amounts that sharp depreciation, and even utter collapse of value, become inevitable. Overissue, or currency inflation, as it is commonly known, is easily recognized by those honest enough to face facts; and the remedy is well understood. But it is like a narcotic: those that should stop the inflation lose all desire to do so. The artificial economic well-being engendered by the expansion causes men to act as if the millennium had arrived until the day of reckoning descends upon them and their economic world collapses.

Some 150 years ago the French blazed such a spectacular downward trail with their *mandats* and *assignats* that it should have served to end currency tinkering for all time; but not so. Since then the nations of the world have trod this trail into a well-beaten downward road. To mention but a few outstanding cases, the Confederate money of Civil War days, and the German mark, Italian lira, French franc, and other currencies, too numerous to mention, of the post-World War I period conclusively demonstrate that it requires more than *fiat* to make *money* out of paper. Yet nations continually try to do so, even though history indicates that the ultimate consequences are foredoomed.

The great tragedy of currency inflation is that it is practically impossible to reverse the depreciation process. Once a nation sets its feet upon the economic primrose path of "easy money," it finds the descent ever steeper, the going ever more slippery, and the downward rate ever faster and faster. Because of this, paper money has been bitterly assailed as the greatest affliction ever visited on mankind. But such criticism is misdirected. It is the abuse, not the use, of paper money which causes the suffering. Properly used, paper money is undoubtedly the greatest convenience ever devised by the wit of man. It should be treasured as one of our blessings and protected from those who would misuse it, for whatever purpose.

Deposit "Money."—Demand deposits (those subject to check) are considered as money by many modern authorities. Certainly, they constitute by far the most important medium of exchange, especially in the more advanced countries. Economists estimate that more than 90 per cent of the dollar volume of all monetary transactions in the United States and Canada is through the medium of bank deposits, so they truly do a large part of the medium of exchange work of money. But it also must be admitted that checks, the form in which they do this money work, do not pass from hand to hand as does money. Checks can, of course, and do frequently, continue to pass from hand to hand by *endorsement* (they could be drawn to *bearer* and pass by delivery but this is rarely done) but generally they are deposited in a bank at the first opportunity. In fact, if not promptly presented, payment may be contested on the equitable ground of *laches* (delay in exercising rights). They not only do not circulate freely by delivery as does true money, they are also not accepted without reference to the credit standing of the issuer. Checks and bank deposits are thus credit, and not money, even though they do the major part of our exchanging and even though bank deposits constitute the largest store of liquid value in a country with a modern banking system like that of the United States or Canada.

Functions of Money.—The many services rendered by money may be grouped under four functional headings: (1) standard of value; (2) medium of exchange; (3) standard of deferred payments; and (4) store of value. Although these are basic functions, they vary greatly in relative importance from time to time and country to country. For instance, during the 1930's in the United States, it was thought necessary to restrict certain functions so that a managed money could be introduced.

In reading the following explanations of specific functions, the dynamic nature of money should be kept in mind. Money is dynamic; its functions are dynamic. This is necessarily so as the economy it serves is highly dynamic.

Standard of Value.—It is as a common denominator of value that money renders its greatest service. Without such a pecuniary language device, modern business would not be possible. Record-keeping, accounting, and finance stem from this function of money.

As can be readily seen by referring to the article on CURRENCY, man's standards of value down through the years have been legion, in fact, almost infinite. It is difficult to find anything in common usage in the past which has not served some time, some place, as the standard of value. Why a particular thing was used at a particular time is for the anthropologist and sociologist to determine; sufficient for the student of money is the fact that it was so used.

The necessity of a standard of value, even in the earliest times, is apparent because of the utter inconvenience of barter (exchange of one good for another good). The difficulty of finding the necessary double coincidence of demand and supply made it imperative to devise a separate standard so that the division of labor with its many benefits could develop.

In its earliest forms, money was a commodity with such scarcity and such utility (whether for adornment, as in the case of shells, or for further production, as in the case of the cow) that it was generally desired. The fact that some commodity became the standard of value does not mean that it did not change in value. On the contrary, crop failure, wars, and other disasters fre-

quently caused great changes in the value of the standard itself. In addition to the changes in value flowing from physical factors, even greater changes frequently came from psychological factors. Without apparent "rhyme or reason" people sometimes just decided they did not like a thing as well as they did before. They still do this at times, so it is fair to say that there never has been, and conceivably never will be, any standard of value which will be immutable and unchangeable. At least, as long as people can change their minds, the so-called standard of value will fluctuate in purchasing power. The problem is people; not the standard.

Even though no perfect standard of value seems possible, the evils of severe or violent changes in the price level make it highly desirable to use the most stable money substance and, in addition, to do everything possible to keep upsetting psychological pressures to a minimum. Admittedly it is well-nigh impossible to keep people from acting "bullish" when they feel "bullish" and from acting "blue" when they feel "blue"; but the attempt must be made; and if it fails, the blame should be placed where it belongs.

In modern times the standard of value has often been separate and distinct from the medium of exchange. In other words, the unit used for the standard of value need not be used widely, nor even at all, as a medium of exchange. Accounts may be kept in any money specified by law or dictated by tradition. A good example of the complete separation of the "money of account" and the medium of exchange is the United States gold dollar. Other than for memorial and exposition purposes, the gold dollar has not even been coined since 1889, much less freely circulated. Nonetheless, it is the unit in which all records are kept and calculations made.

It has been said sarcastically that it is as a standard of value that money functions most poorly, yet that is the only function which has not declined markedly in importance in recent years. The evils of severe and catastrophic changes in prices are not as great as those of attempting to function without a common denominator of value. Truly, this is the indispensable function of money.

Medium of Exchange.—Through its function as the medium of exchange, money made possible the "division of labor" with its tremendous increase in production. In this respect alone, money has rendered incalculable service to mankind. In our time, as was explained above, this function has largely been taken over by checks, or "deposit money."

From the money side itself, the use of gold, or even gold certificates, as a medium of exchange in the United States was prohibited by Executive Order on April 5, 1933. This was done even though the gold dollar then, and thereafter, was declared by law to be the standard of value. In particular, the Gold Reserve Act of 1934 provided that all gold coin should be withdrawn from circulation and melted into bars and prohibited further coinage of gold in the United States except for foreign account.

Money is thus no longer *the* medium of exchange in the United States; in its true form it is no longer even *a* medium of exchange; it is, however, in its credit form a minor factor as a medium of exchange. But even though this is the case, this function should not be "written off." Economic disorganization, banking difficulties, or any other factor which reduces public confidence would make the medium of exchange services of this credit money an extremely important function again.

Standard of Deferred Payments.—Modern man differs from his ancestors in increased ability to plan ahead and increased ability to borrow. The pledge of anticipated income to secure goods and services for immediate use and enjoyment is characteristic of business and individuals. This ability of the active, enterprising members of society to command the capital and credit they need for their ventures is an outstanding advantage of our competitive capitalism. It is made possible by several factors, but the basic one is the existence of a standard of deferred payment.

Such a standard permits planning and encourages saving. All manner of contracts extending far into the future can be made in confidence if the deferred portion of the performance can be put on a standard basis. Prior to 1933, in the United States, such contracts were usually made payable in "gold dollars of the present standard of weight and fineness" and sometimes even in gold as a commodity by weight without reference to the monetary unit. Now all of this has been changed by Joint Resolution of Congress, approved June 5, 1933, which forbade the use of a "gold clause" and provided that "every obligation, heretofore or hereafter incurred," whether or not it contains a gold clause, "shall be discharged upon payment, dollar for dollar, in any coin or currency which at the time of payment is legal tender for public and private debts." This means that the money of circulation will be the money of payment in the future. The extent to which that will be a standard from one period to another period remains to be seen.

Store of Value.—The other three functions of money naturally lead to its use as a store of value. As deposit banking has developed to a high degree in many countries and as hoarding has been made illegal in most countries with positive steps taken by governments to keep it at a minimum, the store of value function has declined in importance in recent years. It has, also, declined because in most countries money no longer has commodity value, nor can it with certainty, and under all circumstances, be changed into the money commodity, or other commodities, at a specific rate.

In ordinary times, individuals keep on hand comparatively small amounts of "pocket money" for small purchases, carfare, etc. Likewise, business organizations keep small amounts on hand as petty cash and for making change. Larger amounts are needed for payroll purposes if a cash payroll is used but that usually comes directly from the bank to the payment window. Banks of course have to keep substantial amounts of money on hand to cash checks and otherwise serve their depositors.

The demand for money, or currency, varies with the swings of the business cycle, with the ups and downs of public confidence, and with the seasons. Thus, the need for additional money during the Christmas shopping season is well known. Nonetheless there really was little excuse for the wide swings and the great increase in money in circulation in the United States which characterized the period after World War II, as demand deposits were freely convertible into money and more than half of the assets back of these deposits were government bonds.

In fact, as stated earlier, bank deposits constitute the principle store of liquid purchasing power in the United States. As they ordinarily total some six times the amount of money in circulation outside of the banks and the Treasury, they have, for the reasons enumerated, largely taken over the store of value function formerly rendered by money.

Qualities of Good Money.—By definition, general acceptability is a prerequisite quality of money. Relative stability of value is also extremely important. Serious maladjustments between debtors and creditors, savers and enterprisers, pensioners and organized workers, and between the many other classes in society arise when the purchasing power of money fluctuates sharply or changes permanently. Complete stability is, of course, unattainable as that would mean that the effective supply (actual units multiplied by the turnover) would have to vary sensitively and perfectly with each change in the demand for it for monetary or any other uses to which it is put. The necessary exact adjustment between supply and demand has never been achieved in practice. Many promising theoretical plans to achieve the desired stability have been advocated but, so far, none has succeeded.

The other qualities of good money apply primarily, or solely, to coins, which are treated elsewhere, so they will only be briefly mentioned here. Portability, or relatively high value per unit, is an important quality. Divisibility, or the ability to divide the monetary commodity into exact fractions without waste or difficulty and later recombine them, is another essential quality. These divisions must be equal in all respects or *homogeneous.* (Metals such as silver and gold have the qualities of divisibility and homogeneity in high degree; cows and diamonds do not.) The money substance must be malleable enough to be shaped properly, easily recognizable, and sufficiently durable to hold its design during long periods of use.

Summarizing, the eight more important qualities of good money are: general acceptability, stability of value, portability, cognizability, divisibility, homogeneity, malleability, and durability. In practice, gold has demonstrated that it possesses these qualities in higher degree than any other substance although it must be admitted that it has proved distressingly unstable in value.

Monetary Standards.—The expression monetary standard refers to the money in which credits are ultimately redeemable in a country. If gold is the money of redemption, the country is said to be on a gold standard. *The standard money must be either commodity money or fiat money; it cannot be credit money because it is, itself, redeemable in some other kind of money.*

Although various metals have been used as standard money, the special qualities of gold and silver have made them preferred above all others since the beginning of the Christian era. In more recent times increased production and economies in its monetary use have enabled gold to far outstrip silver as a monetary base. The way in which the monetary commodity is utilized is an integral part of the monetary standard. The relative scarcity of the monetary metals has caused considerable ingenuity in their utilization. In the following explanations of the physical details of the various standards, gold will be used for the single metal standards, as it is the conventional monetary base; but it should be understood that silver, platinum, copper, or any other metal could be similarly used if public preference focused on it.

Gold Coin Standard.—The essentials of a full gold coin standard are: (1) adoption of a definite quantity of gold of a certain fineness as the unit; (2) full legal tender for the gold coins; (3) all legal tender money redeemable on demand in gold coins at par; (4) unlimited and free coinage of gold (with no more than nominal seigniorage, that is, deductions); (5) unrestricted exportation and importation of gold in any form.

Disregard or violation of any of these essentials limits the full gold coin standard by just that much. Because of the danger of public hoarding, nations in recent times have so restricted this standard that in its true form it has become merely a historical curiosity.

Gold Bullion Standard.—This monetary standard, which is the one used by most of the advanced countries, is exactly the same as the gold coin standard except that coinage is dispensed with, that is, the gold is kept in bars. In practice, however, the gold bullion standard is always modified by restrictions on the minimum amount of bullion which will be issued for other forms of money. This is often put quite high to "economize in the use of the gold"! In addition, nations usually specifically reserve the right to determine whether a particular use of the gold is in "the public interest." Thus, on the specious basis that gold is not needed by the domestic population as either a medium of exchange or a store of value, it may be released only to fill the demonstrated needs of industrial users and only for exportation. Although all such limitations constitute a departure from the full gold bullion standard, they are inherent in this standard, in practice. After all, the purpose in adopting a gold bullion standard, rather than a coin standard, is to remove all gold from internal circulation and reserve it solely for use in meeting the needs of industry and in settling international balances.

Gold Exchange Standard.—This standard is the same as the gold coin standard except that, instead of coin or bullion, gold exchange (a demand draft on a country on a gold standard) is used for the redemption of legal tender money. The gold exchange standard was quite popular among the "have not" and politically dependent nations for a while after World War I; but the wholesale departures from the international gold standard in the 1930's gave this monetary device a blow from which it will probably never fully recover.

Bimetallic Standard.—In this system the monetary standard is defined as either of two metals, a definite quantity and fineness of each being stipulated as the unit. It has the same features as the gold coin standard with respect to redemption, legal tender, free coinage, and unlimited exportation and importation. Although the bimetallic standard could be on either a coinage or a bullion basis, so far only coinage has been tried. The results have, in general, been unsatisfactory. Rather than enumerate the theoretical advantages and disadvantages, the heretofore insuperable problem in the actual operation of a bimetallic system will be explained. This fatal handicap is the tendency for cheap money to drive dearer money out of circulation. This is commonly known as Gresham's Law, after Queen Elizabeth's master of the mint, Sir Thomas

Gresham, who was one of many to call attention to the phenomenon.

In a bimetallic system Gresham's Law operates in this fashion: After the mint ratio of the two metals is fixed, any change in the world market value of one with relation to the other would cause the metal with the higher value to begin disappearing from circulation. This is so because of the obvious fact that people will hold the more valuable money and pass on the less valuable whenever they have a choice. The fixed mint ratio gives them exactly such a choice. This was conclusively demonstrated on a vast scale in the American experience with the bimetallic standard through the 19th century. One or the other of the metals was always disappearing from circulation. Thus, during the first period of legal bimetallism in the United States (1792–1834), gold went out of circulation, but in the second period (1834–1873) silver went out. Following 1873, however, the political power of the silver bloc was so great in legislative halls, that silver was usually overvalued, so it circulated while gold "did the disappearing act"!

Symmetallic Standard.—In this proposed system, the monetary standard would consist of a definite quantity of a combination of two or more metals. Redemption would be in symmetallic coins or bars, or in all of the component metals separately; likewise, issue would require presentation of definite quantities of all the component metals. Although this method would reduce the hazards of Gresham's Law to a minimum, it has so many obvious disadvantages that it has never been tried in practice.

Compensated Standard.—This new term for Irving Fisher's "stabilized dollar" is another scheme to secure more stability in the standard of value. The method proposed is that of periodically varying the quantity of metal in the unit, which would, because of this variation, be kept on a bullion basis. The proposal has the virtue of simplicity: as the unit becomes more valuable and prices decline, its metallic content would be decreased; as the unit becomes less valuable and prices rise, its metallic content would be increased.

The reduction of the gold content of the United States dollar from 25.8 grains of gold .9 fine to 15 5/21 grains .9 fine in January 1934 and the temporary permission given the president to further alter the gold content within certain limits is an instance of a passing "flirtation" with the compensated dollar idea. An important part of this "flirtation" was the gold buying activity through the Reconstruction Finance Corporation in the months *before* the approval of the Gold Reserve Act on Jan. 30, 1934. This is as near as the compensated standard has ever come to being adopted. It should be added that although the proposal has been made only in connection with gold, it would be equally adaptable to any of the other metallic standards.

Fiat Standard.—A fiat standard is whatever the government makes it. The essential difference between it and any other standard is that the monetary value must be substantially higher than that of the material contained in it and it must not be a promise to pay some other kind of money, that is, no assurance is given on redemption. In short, a substantial portion of the value of the standard must flow from the power of government. The characteristics and defects of such a monetary unit are given in the section on fiat money; those defects are likewise inherent in a fiat monetary system. In passing, it should be noted that Gresham's Law outlined in the section on bimetallism, operates in this field, too, as some fiats are worse than others.

Managed Money.—A large degree of management or control is attempted in practically all modern monetary systems. In a country like the United States, where bank deposits are freely interchangeable with money, such management is, in reality, credit management. Money behavior in this country is almost entirely corollary to developments on the credit side. The monetary authorities, therefore, concentrate their attention on credit control and, in general, permit the "chips to fall where they may" on the money side. Unfortunately, "money management" carried to the extreme, as has been the case in many countries, usually forces a country downhill to a fiat basis.

In a narrower sense, the establishment of exchange stabilization funds and similar direct government intervention may be termed money management.

Monetary System of the United States.—The unprecedented outpouring of monetary legislation and executive orders in the 1930's changed the basic character of the United States monetary system. Gold was "nationalized"; contracts calling for payment in gold were abrogated; the weight of the dollar was drastically reduced; and many other things were done with the result that it could be fairly said that a new monetary system was inaugurated.

In essence, this new monetary system is based on a highly restricted, international, administrative, gold bullion standard. Gold is no longer coined; nor is it available for domestic monetary use. Moreover, no currency is redeemed in gold for any purpose except such as the treasury may permit by regulation or special license. The Federal Reserve banks no longer own gold; they have instead "gold certificates" which in the language of the law "shall be redeemed at such times and in such amounts, as in the judgment of the Secretary of the Treasury, are necessary to maintain the equal purchasing power of every kind of currency of the United States."

The automatic regulation features of the old gold standard have thus been abandoned. In its place, there has been substituted government discretion and expediency. Inherent in such a system is the possibility, even probability, of tremendous inflation. As a practical matter, control of the monetary system has been given to the executive branch of the government instead of the central bank authorities. Only the future can tell whether such a "managed" money can be managed.

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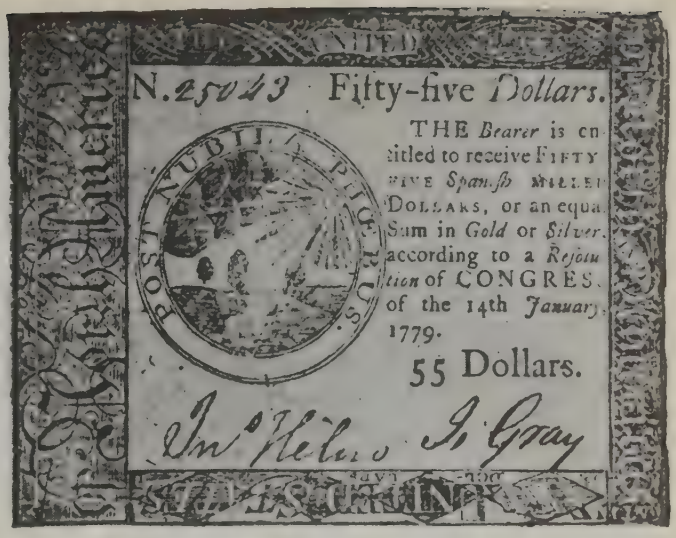
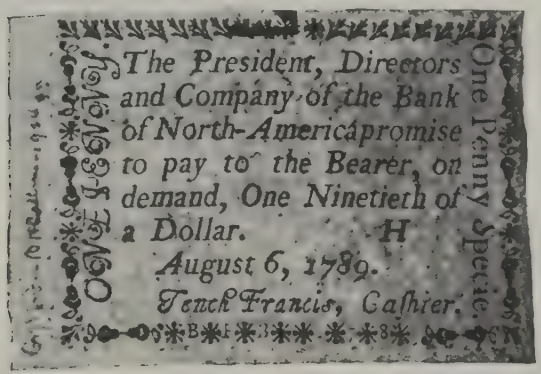
MONEY, History of Paper.—Although coins were used before paper money, the latter was known among the ancients. Corn, cattle, iron, leather, shells, tobacco, and other commodities

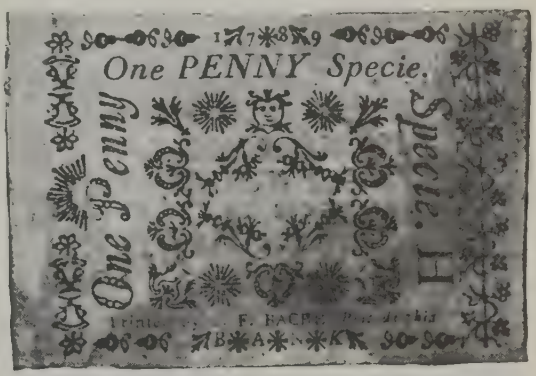
MONEY, PAPER

Three Pence.
THIS BILL shall pass current for Three-pence, within the Province of Pennsylvania, according to an Act of Assembly, made in the 4th Year of the Reign of King GEO. III. Dated the 18th Day of June, 1764.
Threepence.
J. Wharton


N. 25043
Fifty-five Dollars.
THE Bearer is entitled to receive FIFTY FIVE Spanish MILLED DOLLARS, or an equal Sum in Gold or Silver, according to a Resolution of CONGRESS of the 14th January 1779.
55 Dollars.

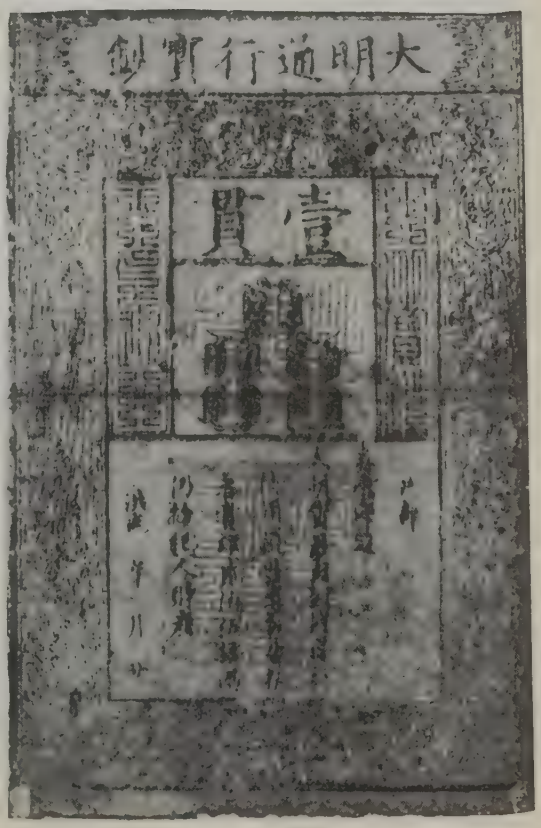
Top left: Three-pence note, Pennsylvania, 1764. *Top right:* A $55 Continental Congress currency note, 1779, typical of issues to finance the Revolution. After 1781, the currency depreciated and was "Not worth a Continental."


The President, Directors and Company of the Bank of North-America promise to pay to the Bearer, on demand, One Ninetieth of a Dollar.
August 6, 1789.
Tench Francis, Cashier.
One Penny Specie.



Center, left and right: Obverse and reverse of penny note issued by first United States chartered bank, 1789.

Above: A 1,000 franc assignat note of the French Revolution. The republic issued these bills for a time, on the security of appropriated lands.



Right: The oldest known paper money dates from China, Ming dynasty, between the years 1368 to 1399. This piece bears a stern warning to counterfeiters.

Courtesy The Chase National Bank Museum of Moneys of the World, New York

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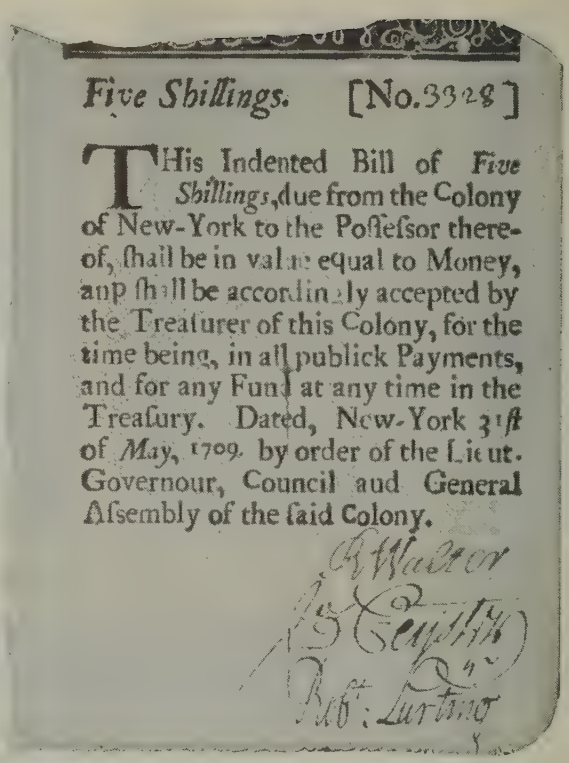
MONEY, PAPER


Five Shillings. [No. 3328]
THis Indented Bill of Five Shillings, due from the Colony of New-York to the Poſſeſsor thereof, ſhall be in value equal to Money, and ſhall be accordingly accepted by the Treaſurer of this Colony, for the time being, in all publick Payments, and for any Fund at any time in the Treaſury. Dated, New-York 31ſt of May, 1709. by order of the Lieut. Governour, Council and General Aſsembly of the ſaid Colony.

Top left: A 24-shilling note, Massachusetts, 1775, engraved by Paul Revere.

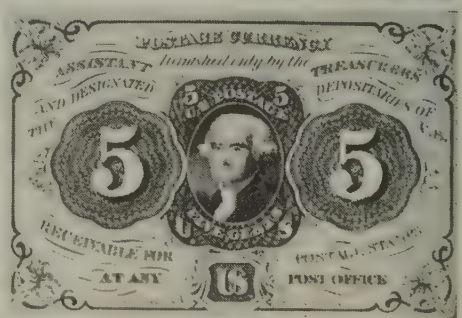
Top right: A 5-shilling note, New York, 1709. First paper money of New York.

Left: Dix or $10 note, Louisiana, 1856.

Right: Hungarian inflation currency, a 100 quintillion note, 1946, highest denomination note issued in the history of currency.

Bottom left: United States fractional currency note worth 50 cents, 1875.

Bottom right: United States postage currency in the amount of 5 cents, 1862.



Courtesy The Chase National Bank Museum of Moneys of the World, New York
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were all, in point of fact, used as money, in different ages and different countries; but they have long ceased to be so used, by commercial nations. The high estimation in which the precious metals have been held, in nearly all ages and all regions, made it practicable to use them as money. The scarcity of gold and silver, the need of bills of exchange and the want of a money more convenient for the individual to carry, and lastly, the issuance of government credits forced on bankrupt nations, brought about the use of paper money in European countries, and Colonial America early adopted this medium of exchange from the English.

Provincial Paper Money.— In the earliest days of America paper money was first issued by Massachusetts in 1690. The object was not to supply any supposed want of a medium for trade, but to satisfy the demands of some clamorous soldiers. Other issues were subsequently made, partly with a view of defraying the expenses of government and partly with a view of making money plenty in every man's pocket. The ill-judged expedition of the Carolinas against Saint Augustine, in 1702, entailed a debt of £6,000 on that colony, for the discharge of which a bill was passed by the provincial assembly for stamping bills of credit, which were to be sunk in three years by a duty laid upon liquors, skins and furs. For five or six years after the emission the paper passed in the country at the same value and rate as the sterling money of England. To defray the expenses of an expedition against the Tuscaroras and to accommodate domestic trade the legislature of South Carolina established a public bank in 1712 and issued £48,000 in bills of credit, called bank-bills, to be lent out on interest on landed and personal security, and to be sunk gradually at the rate of £4,000 a year. Soon after the emission of these bank-bills the rate of exchange and the price of produce rose, advancing in the first year to 150 and in the second to 200 per cent. By the year 1731 the rate of exchange rose to 700, at which it continued with little variation upward of 40 years. In the year 1723 the province of Pennsylvania made its first experiment of a paper currency. It issued in March £15,000 on such terms as appeared likely to be effectual to keep up the credit of the bills. It made no loans but on land security or plate deposited in the loan office; obliged the borrowers to pay 5 per cent for the sums they took up; made its bills a tender in all payments, on pain of confiscating the debt, or forfeiting the commodity; imposed sufficient penalties on all persons who presumed to make any bargain or sale on cheaper terms in case of being paid in gold or silver, and provided for the gradual reduction of the bills by enacting that one-eighth of the principal as well as the whole interest should be annually paid. These early specimens of provincial paper money were large notes, printed from copper-plates, having engraved borders on three sides. The inscriptions on the bills were in type, with arms or motto engraved in the left side centre. The signatures of the province officials were signed in red ink.

Continental Money.— The first issue of paper money under the authority of the Continental Congress was dated 10 May 1775, but the notes were not actually placed in circulation until the August following. On 31 May 1781 the continental bills ceased to circulate as money, but they were afterward bought on speculation at various prices, from 400 for one, up to 1,000 for one. The value of continental paper was not the same in different parts of the country. The exchange was, for example, at 35 for one in New England, New York, the Carolinas and Georgia, and at 40 for one in Pennsylvania, New Jersey, Delaware, Maryland and Virginia. An account taken from the books of merchants in Virginia shows that the depreciation there regularly followed that in Philadelphia, though, toward the close, it sometimes lagged a month or more behind. Thus when exchange was in Philadelphia at 100 for one, in January 1781 it was in Virginia at 75 for one. As late as May 1781 speculations were entered into at Philadelphia to purchase continental money at 225 for one and sell it at Boston at 75 for one. It is worthy of remark that the depreciation of continental money never stopped the circulation of it. As long as it retained any value at all it passed quickly enough, and would purchase hard money or anything else as readily as ever when the exchange was 200 for one, and when every hope or even idea of its being ultimately redeemed at nominal value should have entirely vanished. The facility of raising ways and means, in the early part of the Revolutionary War, by issues of paper, led to much extravagance in the commissary department and prevented the establishment of a sound system of finance. It is said that when a proposition was before Congress to establish a regular revenue system one member exclaimed, "Do you think, gentlemen, that I will consent to load my constituents with taxes, when we can send to our printer and get a wagon load of money, one quire of which will pay for the whole!"

Connecticut.— Under date of 4 March 1762, Connecticut issued a series of colonial notes of the following values: 9 pence, 1 shilling, 2 shillings and 6 pence, and 10, 20, 30 and 40 shillings. There were 19 regular issues, the last being dated 1 July 1780. There were also three single bills in the nature of treasury notes, the last dated 26 Jan. 1791. Over 100 different bills were issued by this colony. The smaller values were for 2, 3, 4, 5 and 7 pence, issued 11 Oct. 1777. In Connecticut the 6 shilling bill was not infrequently raised by clever counterfeiters to the value of 10 shillings.

Delaware.— In this colony paper money was issued in 1735. One value only of these notes has been preserved; the denomination is 10 shillings. The designs of the early issues are all about the same, a type body with a border of the same and wood cut of the royal arms. On 28 Feb. 1746 a new series was issued of the same general design, but noteworthy from having been printed by the celebrated Benjamin Franklin and his partner D. Hall. On bills of this colony we first get the information that "To Counterfeit is Death," which is repeated in every possible form. The 2 shilling 6 pence bill of January 1776 issue is adorned with pillars, and probably to show that the edifice supported can stand any sort of usage, one is placed upside down. The last series issued, May 1777, contains bills from 3 pence to 20 shillings, and changed the cut of the royal arms

for that of the State. Sixty bills emitted by this colony are known.

Georgia.— The earliest bill printed in Georgia was of the value of 2 shillings 6 pence and was dated 7 March 1749. The Georgia bills were printed on one side of white paper and were usually made attractive by copper-plate vignettes printed in various colors. The vignettes represented figures of liberty, soldier, deer, hog, rattlesnake, palmetto tree, etc. The last issue was dated 16 Oct. 1786. There are over 110 varieties from 3 pence to £5.

Maryland.— The first bill of this colony is dated 1740 and of the value of one shilling. This was followed by a series of five values in 1748 and from then a regular succession of issues until their final extinction in 1781. The design of the early issues may be described as the arms of Lord Baltimore supported by two men in the costume of the day, one with a fish and the other with a spade. This is differently placed on the various bills. The lettering or form of contract is in the following words, "This indented Bill of Eight Dollars shall entitle the bearer to receive Bills of Exchange payable in London, at the Rate of Four Shillings and Six Pence Sterling per Dollar for the said Bill, according to Directions of an Act of Assembly of Maryland, Dated in Annapolis, this 1st day of January, Anno Domini 1767," followed, of course, by two signatures. The quaint idea of scalloping the end of a legal document to show that it has been prepared with due care and thought and not cut off in a hurry is carried out on these bills. In some values even the word "indented" is printed in a wavy line, and that there should be no mistake as to what is meant by a dollar a minute representation of a Spanish dollar is inserted in the text. The values of the Maryland bills were 3, 4, 6 and 9 pence, and so on up to £3. There were over 100 varieties issued.

Massachusetts.— Prior to 1775, some 13 examples of paper money were issued in this colony. One of these is a copper-plate engraving said to have been the work of the noted patriot, Paul Revere, of Boston. The series was issued by order of the general assembly of the Colony of Massachusetts Bay, 7 Dec. 1775. The reverse of these bills bear the figure of a man in continental dress, with a drawn sword in one hand and a copy of the Magna Charta in the other, above "Issued in defence of American Liberty," below in Latin, "He seeks by the sword calm repose under Freedom." The series of 16 Oct. 1776 repudiates the title of Colony for that of State. Coin must have become scarce, as more than half of the denominations are under one shilling. The codfish was the principal design on these bills. The next issue of eight values was of interest-bearing notes which are guaranteed by the United States. Upward of 135 bills were issued by Massachusetts.

New Hampshire.— The design of the New Hampshire bills was usually the British arms with inscriptions in elaborate frames. The earlier issues were type-set. About 60 varieties are known.

New Jersey.— The issues in this colony began in March 1724 and continued regularly to May 1786. In shape the bills were a small, narrow oblong. The high value notes were printed in blue and red. In 1781 the royal arms became the arms of the State, the type reading as follows: "State of New Jersey, Five Shillings, This bill shall pass for Five Shillings agreeably to an Act of the Legislature of this State, passed the ninth day of January, One Thousand Seven Hundred and Eighty-one." An entire collection of New Jersey bills would number 185.

New York.— The first bill issued was in 1709, and then followed a series of four dated 18 Dec. 1737. In the next issue the form reads "By a Law of the Colony of New York this Bill Shall Pass current for Three Pounds New York the 20th April 1756." A set of United States guaranteed notes appeared 15 June 1780.

North Carolina.— The earliest notes were dated 1748, and upward of 120 varieties were printed up to 1780. The most of the North Carolina bills bore motto inscriptions such as "Virtuous Councils the Cement of States"; "A Righteous Cause the Protection of Providence"; "A Lesson to arbitrary Kings and wicked Ministers"; "Liberty and Peace the Reward of Virtuous Resistance"; "Persecution the Ruin of Empires"; "Union of Hearts the Strength of Interests"; "American Virtue Triumphant," etc.

Pennsylvania.— The earliest known bill was dated 10 Aug. 1723 and was printed by Benjamin Franklin. The general style of the notes is the same as used in Delaware, bearing the royal arms, or in 1756 those of William Penn, with his motto, "Mercy Justice." In 1764 a curious notion was adopted of spelling the name of the colony differently on each bill, thus on the series we find Pennsylvania, Pensylvania, Pennsilvania and Pensilvania. This was perhaps designed as a protection against counterfeiting. On some of the notes issued in 1771 is the signature of Francis Hopkinson, and on the bills of April of the following year that of John Morton, both signers of the Declaration of Independence. In 1777 the shape of the bill changed to the oblong form, and the arms of Pennsylvania took the place formerly devoted to those of Great Britain. This series are found both in black and red with black type. In 1780 a set guaranteed by the United States, of the same design as issued for other States, was put in circulation, and on 16 March 1785 the last of the series saw the light, the denominations running from 3 pence to £4, 16 values in all. The varieties issued by this colony were over 250.

Rhode Island.— The paper money of Rhode Island was similar in design and value to that of Connecticut. The first issue was in 1715 and the last in 1786. There were about 75 varieties.

South Carolina.— There were various notes issued in this colony from 1712 to 1770. The bills dated 6 March 1776 were supposed to have the value of silver, equivalent in currency is given thus, 6 Spanish milled dollars=£9 15s. currency. In 1779 appeared the handsomest notes heretofore used in the country, the backs of the $50, $70 and $90 bills representing Atlas, Prometheus and Hercules being especially noteworthy. The total number of bills for South Carolina was 105.

Vermont.— In this colony there were but two series, the first issued in February 1781 is an ordinary type-printed note, with engraved border on three sides with the State seal about the centre. This consists of a pair of scales

and a chain of 14 links (the only instance where the number is carried above the original 13) enclosed in a circular band inscribed "Vermont Calls For Justice." The second issue is in the form of treasury notes, the amounts being filled in with ink.

Virginia.— The first issue for this State was in 1755. The notes are of two varieties, the first a fine, large bill after the English style, and then something between a draft and a bank-bill, being probably made to fill a pressing want. The bills are copper-plate engravings filled out in ink. On the issue of 1775 are the royal arms of Virginia in an engraved frame. The lettering reads "Three Pounds Current Money of Virginia Pursuant to Ordinance of Convention Passed 17 July 1775." The following year introduces the "sic semper tyrannis" in place of the arms.

Bank Notes.— From the Revolutionary period to the days of the Civil War and to the present time many issues of paper money have been made by the government and by national, State and local banks. See BANKS AND BANKING.

Confederate Paper Money.— During the Civil War the Southern States in secession issued millions of dollars in paper money, beginning in July 1861, with bills of from $5 to $100. On these were designs of the Confederate flag, a train of cars, cotton bales, etc. In September 1861 appeared at least 50 varieties of bills in value from $5 to $100. They were of various designs. A $20 bill showed a head of Alexander H. Stephens in one corner; a $10 bill pictured General Marion offering a breakfast of sweet potatoes to a British officer. Portraits of Davis, Hunter, Memminger, Stephens, Mrs. Pickens, Mrs. Davis, Benjamin, General Jackson and others appeared on the high value notes. There was an issue of $1 and $2 bills in 1862 and in April 1863 appeared a series in value from 50 cents to $100. Some of these bore designs of the capitol buildings at Richmond, Nashville, Montgomery, etc. The last issue of bills from 50 cents in value to $500 appeared 17 Feb. 1864. Many of these are still in existence, and in 1917 some one with an accumulation sold them on the streets of downtown New York at five cents a bill.

Postal Currency.— The United States government printed a paper money as a substitute for fractional currency during the Civil War, owing to the scarcity of silver. This was the suggestion of General Spinner, United States Treasurer under Lincoln, and was commonly known as "shin-plaster" money. The issue was in small scrip of the denominations of 3, 5, 10, 25 and 50 cents. It disappeared from general circulation about 1870.

Greenbacks, Silver and Gold Certificates. — The more recent issues of American paper money in circulation at the present day are printed at the Bureau of Engraving and Printing at Washington. The engravers are specialists, and the figures and intricate designs of their work are often marvels of artistic skill. Portraits of living persons are never put on the notes, and all the figures, vignettes, borders, lettering, etc., are engraved separately before they are put on the plates. First the engraver works out his design and after transferring it by hand to a plate of soft steel the plate is hardened and a soft steel roller takes the impression from it. After this roll is chilled another impression is taken on another steel plate and after this latter has been hardened it is ready for use. The geometric lathe which makes the border is a complete and wonderful piece of mechanism. The lines for the borders, backs and other conventional designs seen on the notes are made by this machine. The paper for printing the bank-notes is manufactured under the supervision of government officials. It has various lines of short, uneven colored silk threads running through it.

Foreign Paper Money.— The notes of the Bank of England are five by eight inches in dimensions and are printed in black ink on Irish linen water-lined paper, plain, white with ragged edges. The notes of the Bank of France are made of white water-lined paper, printed in blue and black, with numerous mythological and allegorical pictures. South American currency is about the size and appearance of the American, but is commonly inferior in appearance and easier to counterfeit, being produced by a cheaper lithographic process. The German notes are printed in green and black. The Chinese paper money is in red, white and yellow, with gilt lettering and various devices. Italian notes are printed on white paper in pink, blue and carmine and ornamented with a vignette.

Bibliography.— Sumner, 'History of American Currency' (New York 1884); Johnson, J. F., 'Money and Currency' (Boston 1906); United States Mint, 'Monetary Systems of the Principal Countries' (Washington 1912).

MONEY ORDER SERVICE. See POSTAL MONEY ORDER SERVICE.

MONEYWORT, CREEPING CHARLEY, CREEPING JENNY, or HERB-TWOPENCE, are popular names for *Lysimachia nummularia* of the primrose family. The plant, which is a native of Europe, is a perennial with roundish leaves and axillary flowers borne from early summer until autumn. It is very popular for planting in rookeries, vases, hanging-baskets and shady situations, and has become naturalized in the eastern United States. Propagation by seeds or cuttings is very simple, and the plants seem to thrive in any moist, shaded garden soil, cool greenhouse, or window. Several other plants are sometimes called moneywort; for example, *Anagallis tenella, Dioscorea nummularia,* and *Thymus chamædrys.* See LOOSESTRIFE.

MONGE, môñzh, **Gaspard,** French mathematician and physicist: b. Beaune, France, 10 May 1746; d. Paris, 18 July 1818. He was educated at Beaune and Lyons and at 16 was a teacher. He made rapid progress and some valuable discoveries in engineering, and in 1783 was called to the professorship of hydrodynamics in the Paris Lyceum. He was a supporter of the French Revolution, became Minister of Marine and was temporary Minister of War and one of the signers of the death warrant for Louis XVI. He resigned soon after the king's death and was engaged in manufacturing arms and gunpowder for the army. He founded the Ecole Polytechnique under the Directory and was professor of mathematics there, but was later sent to Italy to assist in the removal to France of the art treasures captured by French

armies, and there gained the friendship of Napoleon whom he accompanied to Egypt in 1798, continuing his scientific researches. He resumed his position in the École Polytechnique upon his return to France and in 1805 was elected senator. Napoleon gave him an estate in Westphalia, and the title of Count of Pelusium, but the downfall of the emperor resulted in reverses for Monge who was expelled from his positions in 1815. He is renowned principally as the founder of descriptive geometry, and one of the earliest scientists in modern geometry. He published *Traite élémentaire de statique* (1788); *Leçons de géométrie descriptive* (1795).

MONGOLIA, a vast tableland region in east central Asia, covering an area of about 1,000,000 square miles, south of Siberia and north of China Proper. Geographically, it comprises former Outer Mongolia, the Gobi Desert (Shamo), and former Inner Mongolia. The Gobi Desert (q.v.), occupying the central portion (nearly a fourth of the entire area), is a sandy plateau with a few spots of pasture and brushwood. The region as a whole is intersected by lofty granite mountain ranges, including the Altai, Tien Shan, Khingan, and Yinshan (Inshan). Only the north has large rivers—the Selenga, the Orkhon, and the Kerulem. The climate presents extremes of intense winter cold and summer heat, and sharp variation between day and night temperatures. The whole population does not exceed 8,000,000. Yet despite its unfavorable climate, the region has been for centuries a strategic trade transit area between China and central Asia, and is now an important link between the Chinese Republic and the Soviet Union. The various nomadic tribes which lived in the northern border regions of China up to the 13th century came to be known collectively as Mongols; but the name Mongol is much older than the time of Genghis Khan (q.v.), under whose leadership the nomads were united to form the first Mongol kingdom. The rise of the Mongol Empire is inseparably associated with his name and that of Timur (q.v.).

Early in the 13th century the Mongols established a world empire which included a great part of Russia, part of eastern Europe, and China. From 1260 to 1368 the Mongols ruled China under what was known as the Yuan dynasty. After the Chinese drove the Mongols back to their homeland, Mongolia came under Chinese suzerainty. The Mongols spread over a number of regions, from what later became the provinces of Kirin and Heilungkiang in the east, to the Ili and Altai regions in Sinkiang in the west, and over all the territory north of the Great Wall and south of Siberia. Their lands became divided into two political units—Inner and Outer Mongolia. Today the former Outer Mongolia is divided into the Mongolian People's Republic and Tanna Tuva or Urianghai, which has become part of the Soviet Union. After the establishment of the Chinese Republic in 1912, Inner Mongolia was divided into four provinces: Jehol, Chahar, Suiyuan, and Ningsia, and the term Inner Mongolia disappeared from the map of China. Following the outbreak of the Chinese-Japanese war the Japanese set up a puppet Inner Mongolian regime in November 1937, which was called the Mongolian Federated Autonomous Government in 1939, with Prince Teh Wang, a lineal descendent of Genghis Khan and leader of the Young Mongol Movement, as president. Prince Teh Wang's government collapsed immediately after Japan's surrender in August 1945. Subsequently the Chinese National Government and Communists both sought to control the provinces of former Inner Mongolia.

Prior to World War I both Outer and Inner Mongolia were subject to Czarist Russia penetration. Taking advantage of the international situation, the Mongols in Outer Mongolia proclaimed their independence from China when the Chinese overthrew the Manchu dynasty in 1911. As a result of the negotiations between China and Russia and Outer Mongolia, the latter was recognized as autonomous under Chinese suzerainty in 1933. In 1921, after the defeat of a German-led White army which had used Urga (now Ulan Bator Khoto) as its base, a separate government was set up under Soviet auspices. In January 1924 the Soviet Union sent its first diplomatic representative to the Mongolia People's Revolutionary Government. On the death (in July 1924) of the Living Buddha (Hutukhtu), the hereditary theocratic ruler, at Urga, the Mongolian People's Republic was proclaimed. In 1936 its representatives and those of the Soviet Union signed a protocol under which the two states pledged mutual military assistance in the event of an attack upon their territories by a third party. An important development since the close of World War II has been the separation from China of the Mongolian People's Republic, which under the name of Outer Mongolia had formerly comprised about one sixth of China's total area. After the Yalta and Potsdam conferences in 1945, at which China was not represented, China and the Soviet Union signed, in conformity with the Yalta decision, a treaty of friendship and alliance whereby China promised to recognize the independence of Outer Mongolia if a plebicscite of the people of that region confirmed this desire. The plebiscite was held in October 1945 and only a few negative votes were registered. In January 1946 China formally recognized the independence of the Mongolian People's Republic. The latter applied in the summer of 1946 for membership in the United Nations. China supported its application but the United States and United Kingdom voted against it. On June 5, 1947 an armed conflict between the Mongolian and Chinese forces took place in Peitashan in Sinkiang, nearly 100 miles from the border. When the Committee on the Admission of the New Members of the United Nations discussed again in the summer of 1947 the application of the Mongolian People's Republic for membership, the Chinese delegation opposed it on the ground that the Mongolian Republic is not a peace-loving state. On the other hand, the Soviet delegation which supported the application stated at the Committee on the Admission of the New Members that it was China who invaded Outer Mongolia in order to divert world attention to her northern border. The application was again rejected.

The Mongolian People's Republic has an area of about 622,744 square miles, with a population (roughly estimated in 1946) of about 1,000,000. The most important resource is livestock. Minerals include coal, antimony, copper, gold, iron, quicksilver, and sulphur. Major exports are livestock, wool, hides, meat, furs, and animal hair; major imports are flour, petroleum, metal goods, tobacco, cotton goods, and tea. Trade re-

lations of the Mongolian People's Republic are largely with the USSR.

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MONGOLS, a general name originally applied to the different nomadic tribes which lived in the northern border regions of China. According to some historians, the name Mongol was derived from the Chinese word Mong meaning brave. It was believed to have been given to the tribes under the control of Genghis Khan. Under his leadership they were united and formed the first Mongol kingdom. However, because of the unparalleled Mongol conquest under Genghis Khan and Kublai Khan, the name has been liberally but inaccurately applied to a majority of the people of Asia. This is also due to the classification of human races by Johann Frederick Blumenbach, the German scientist and the founder of modern anthropology, who on the basis of the distinction of color, hair, and descriptive features of skull and face, first distinguished about a century ago five races of man: Mongolian, Caucasian, Ethiopian, Malayan, and American. Therefore, it is traditionally maintained that the physical features of the Mongolian race are distinctive. The head of the Mongolian is square; the face flattish, nearly as broad as long, the parts not well distinguished from each other; the eyelids narrow, obliquely turned up at their outer angle; the space between the eyes flat and broad, the nose flat, the cheeks projecting, the chin somewhat prominent. The hair is straight, the color black, that of the face and body yellowish (sometimes inaccurately called olive, which implies an admixture of green).

The Mongols have their own language, which is classified as one of the Altaic languages. Generally speaking there are three Mongol dialects and they differ only slightly. Roughly these dialects correspond to the geographic distribution of the Mongols in the three regions: the Northeastern Mongols (Khalkhas), the Western Mongols (Kalmuls), and the Central Mongols (Buriats). As the large part of Mongolia lies in the Gobi and the rest of it is made up of barrier mountains to the north and west and since the majority of the Mongols are wandering nomads, the Mongol literature is comparatively undeveloped. Truly native literature is in the colloquial. During the Mongol rule of China the Chinese language incorporated many Mongolian vocabularies, and when the whole of Mongolia was a part of China under the Manchus the Chinese language was used as an official language in Mongolia. Since the declaration of the independence of Outer Mongolia many Mongols have learned the Russian language.

The prevailing religion of the Mongolian region, aside from the sects of the immigrant Chinese, Japanese and Russians, is Lamaist Buddhism, closely resembling that of Tibet. Lamaism developed originally from Indian Buddhism, and was introduced to the Mongols when they still ruled in China. Lamaist Buddhism, which dominated the thinking and life of the Mongols, is declining. The castes in Lamaism are divided into: (1) Fuyeh Lama, the head of all the Lama monasteries, generally known as the living Buddha; (2) Jassab, the religious and political head of a district; (3) Da Lama, the head of a temple or monastary; (4) Miu Lama, an ordinary Lama; (5) Hue, widows and widowers before they become Lama. Generally there are ten Lama monestaries in every banner.

The Mongols had traditionally been divided into many units called banners, and these are grouped into tribal leagues, chief of which are: (1) the Khalkhas, the Mongolians proper; (2) the Ordos, and (3) the Tsaktar, both of Mongolian blood; and (4) the Ouryanti and Darkhat, who are Mongolized Turks. The basic unit of a banner was the *bak,* ruled by an elected elder, and a number of *baks* were united under an hereditary prince in a banner, several banners forming a confederacy or league under an hereditary princely house, or occasionally in more recent times, under an elected prince. In 1933 various Mongolian leagues in Inner Mongolia petitioned for the right of self-government and since then they have been directly under the control of the Executive Yuan of the Chinese National Government instead of the provincial governments. The impact of Soviet influence in Outer Mongolia, of Japanese penetration in Eastern Inner Mongolia before and during the Chinese-Japanese War of 1937–1945, and of Chinese cultural influence in the Mongol region, has shaken the foundations of the Mongol social system.

The main population element in former Outer Mongolia (now the Mongolian People's Republic) is the Khalkhas, who have had less contact with the Chinese than the other Mongols, and remain the core of the Mongol people. The Khalkhas are largely nomadic, periodically shifting their quarters in search of new pastures for their cattle, camels, horses, and sheep. They live under the vourte (yurt), a tent dwelling with a domed top, consisting of a light circular framework covered with pieces of felt, which stands about 10 feet high. The fireplace is situated in the center, the household gods being placed usually opposite the door, and the housekeeping utensils along the walls. Around the fireplace are spread pieces of felt, for which the well-to-do substitute carpets. The princely *yourtes* are furnished with board floors and are decorated with silken hangings. Since the Soviet influence extended to Outer Mongolia, the nomadic life of the Mongols there has been diminishing.

MONGOOSE, an ichneumon (*Herpestes griseus*), common in many parts of India, and closely akin to the Egyptian species ichneumon (q.v.). The mongoose is a burrowing, nocturnal, weasel-like animal, tawny yellowish-gray, 16 or 17 inches long, and with a long thick terete tail. It kills numerous birds, sucking their blood and leaving the body uneaten. It also with great adroitness seizes and kills many snakes, the formidable cobra included, usually avoiding the serpent's stroke by its quickness. Its excitement and ferocity in these encounters is almost indescribable. Mongooses have been imported into many regions where the climate is suitable, in America notably in the Antilles, for the purpose of exterminating poisonous snakes.

MONICA, Saint, mother of Saint Augustine (q.v.): b. Africa 332; d. Ostia 387. A Christian who, in accordance with the wishes of her parents, also Christians, married a pagan. She devoted nearly all her life to the conversion of her husband and son Augustine. Her self-

sacrifice was at last rewarded; her husband, Patricius, became a Christian, and Augustine, seeing the error of his ways, reformed. After the baptism of Saint Augustine at Easter, 387, she set out with her two sons for Africa. Arriving at Ostia she became ill and here died. A friend asked her in Ostia if she were not afraid to be buried in a place so far from her own country. She replied: "Nothing is far from God." Her eminent son preserved many of her holy sayings which he often repeated in his sermons. In the Roman Catholic Church she is regarded as the model and patroness of wives and mothers. Her feast is 4 May. In 1430 her relics were brought to Rome, and were later deposited in the Church of Saint Augustine. Consult 'Saint Augustine's Works' edited by Tillemont; Butler, 'Lives of the Saints.'

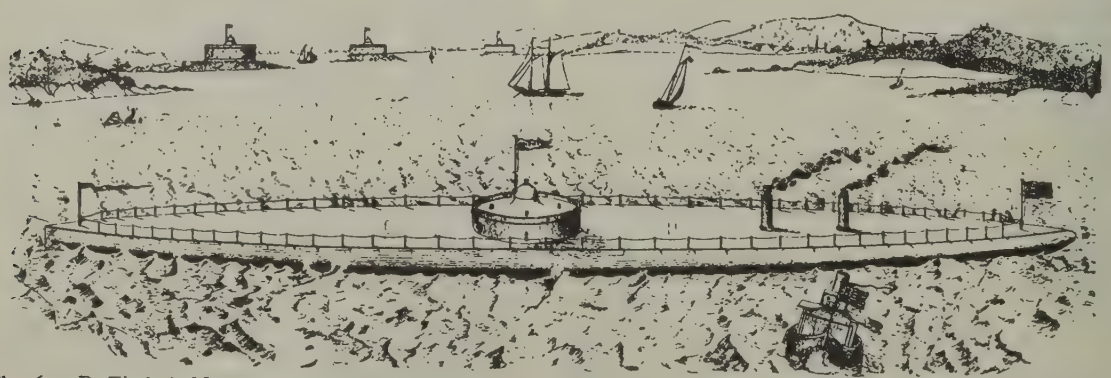
MONIER-WILLIAMS, Sir **Monier,** English Sanskrit scholar: b. Bombay, 12 Nov. 1819; d. Cannes, France, 11 April 1899. He was a son of Monier-Williams, surveyor-general. He was educated at Oxford, and was for a short period a student at the East India College, Haileybury. He was professor of Sanskrit at Haileybury from 1844 to the extinction of the college in 1858, and in 1860 became Boden Sanskrit professor at Oxford, a post which he held till his death. Among his numerous works are 'Practical Sanskrit Grammar' (1846); 'English-Sanskrit Dictionary' (1851); edition with notes, translations, etc., of the Sakuntalā (1853); 'Introduction to Hindustani' (1858); 'Indian Epic Poetry' (1863); 'Sanskrit-English Dictionary' (1872; 2d edition 1899); 'Indian Wisdom' (1875); 'Hinduism' (1877); 'Modern India and the Indians' (1878); 'Religious Life and Thought in India' (1883); 'The Holy Bible and the Sacred Books of the East' (1886); 'Brahmanism and Hinduism' (1889); 'Reminiscences of old Haileybury College' (1894). He traveled extensively throughout India in order to study the native religions, and to further his scheme of an Indian institute, which he succeeded in getting established at Oxford.

MONISM, a philosophical term which may be briefly translated by "doctrine of unity." The word was coined by Christian von Wolff, a German philosopher of the first half of the 18th century, and is derived from the Greek monos which means "single; alone; lonely; unique; existing in only one copy." Wolff, the inventor of many happy terms that acquired currency in philosophy, introduced the word to characterize such philosophies as recognized the existence of one ultimate form of reality only, be it spirit or matter, and he contrasted it with "dualism," that is, doctrine of duality, held by all those thinkers who believe that both spirit and matter are ultimate forms of existence. Monism is also opposed to a view like that of Leibnitz, which maintains the existence of many substances; the latter is called *pluralistic.* The word "monism" has come to be applied to views maintaining a unity of a non-substantial nature. It has been adopted as the label of a certain type of positivistic theory that emphasizes the owners of things. (See Dualism and Pluralism). Consult Haeckel, E. H., 'Riddle of the Universe' (New York 1900); Walker, W. L., 'Christian Theism and Spiritual Monism' (New York 1906); Worsley, A., 'Concepts of Monism' (London 1907). Discussions of monism will also be found in any of the numerous introductions to metaphysics.

MONITEUR, mō-nē-tėr, **Le,** French journal, established 5 May 1789 by Panckoucke under the name *Gazette Nationale, ou le Moniteur Universel.* Under the title of *L'Ancien Moniteur* the issues for 1789–99 were published in 32 volumes by Gallois (Paris 1840–45). In 1800 the *Moniteur* published the official Actes du government. The name in 1811 was changed to *Moniteur Universel.* Four years later the government publications were omitted from the paper and printed separately in the *Journal Officiel.* Its policy again changed and it continued as the government organ until 1868, when the *Journal Officiel* was again published separately.

MONITITE. See Monetite.

MONITOR, The, an ironclad, the first of a class of naval vessels designated as monitors (see Warships). It was designed and built for the United States government in 1861–62 under direction of the engineer John Ericsson (q.v.), who adopted as the most essential feature of its construction the revolving gun-turret devised by the American inventor, Theodore Ruggles Timby (q.v.). The *Monitor* was launched at Greenpoint, L. I., 30 Jan. 1862, only 100 days after the laying of her keel. She put to sea 6 March following, under command of Lieut. John L. Worden (q.v.), arriving on the night of the 8th at Hampton Roads, Va. Extraordinary energy had been displayed by the builders to meet a grave emergency of the government, then weak in naval resources, for making effectual the blockade of Southern ports



Theodore R. Timby's Model sent to China by Caleb Cushing in 1843, which suggested to J. Ericsson the Low Freeboard.

which President Lincoln had proclaimed, as well as for aggressive action and coast-defense. This emergency soon became a dire peril which threatened the destruction of the Union through superior sea power acquired by the Confederacy with foreign aid or connivance. How this danger was first averted is shown in the account of the famous action in Hampton Roads (see MONITOR AND MERRIMAC).

The *Monitor* was built by a company of men, John F. Winslow and John A. Griswold of Troy, N. Y., and their associates, who were actuated by patriotic motives. With T. R. Timby, who had taken out patents "for revolving towers for offensive or defensive warfare whether placed on land or water," they entered into a contract for the use of his inventions covering the revolving turret, paying him $5,000 as royalty on each turret constructed by them. They built the *Monitor* at their own risk, Winslow and Griswold furnishing 90 per cent and C. S. Bushnell of New Haven, Conn., 10 per cent of the cost. Ericsson, for his services as engineer, received 5 per cent of the gross sum paid to the company for the *Monitor* and kindred vessels built by them. A contract with the government was made by the company and Ericsson, and the government paid for the *Monitor* $275,000, the actual cost being $195,000.

Ivory model of the turret made by T. R. Timby in 1841; now in possession of the Patriotic League of the Revolution.

The contract with the government provided for the building of "an iron-clad, shot-proof steam battery of iron and wood combined," and the hull of the *Monitor* was of iron with wooden deck beams and side-projection. Her dimensions were:

Extreme length	172 ft.
Extreme breadth	41 ft. 6 in.
Depth of hold	11 ft. 4 in.
Draft	10 ft. 6 in.
Inside diameter of turret	20 ft.
Height of turret	9 ft.
Thickness of turret	8 in.
Thickness of side-armor	5 in.
Thickness of deck-plating	1 in.
Diam ter of propeller	9 ft.
Diameter of steam cylinders (two)	36 in.
Length of stroke	2 ft. 2 in.
Displacement	1,255 tons

Armament, two 11-in. shell-guns, each 15,668 pounds.

In all the models, drawings and plans of his invention made by T. R. Timby himself, the pilot house or "lookout" was placed on top of the turret. "For some inexplicable reason," he has said, "the *Monitor* had her pilot-house placed upon the deck, forward of the turret, in the way of her own guns."

The success of the *Monitor* aroused much interest in all maritime nations, and was the direct cause of many modifications in the construction of vessels in the navies of Europe, though nowhere except in the United States navy was the monitor adopted as a distinct type of warship. During a gale off Cape Hatteras, 31 Dec. 1862, the *Monitor* was sunk.

JOHN H. CLIFFORD.

MONITOR LIZARD, the type of a family of pleurodont lizards (*Varanidæ*). They are found in Africa, the Eastern Archipelago, etc., and are the largest of modern lizards, some species attaining a length of six or eight feet. The skin is covered with very small juxtaposed scales and tubercles dorsally, while ventrally the scales are square and arranged transversely. The tail is long, cylindrical in the terrestrial, but compressed laterally in the aquatic forms, and possesses a sharp underridge or keel. The limbs are well developed and the toes provided with claws. Most of these great greenish-gray lizards inhabit rivers and ponds, and are active and fierce enemies of all lesser aquatic life. They feed upon eggs and young of crocodiles, turtles and aquatic birds; and on fishes, amphibians, swimming-birds, anything in fact, small enough to be mastered. There is one genus and nearly 30 species. The most familiar species, probably, is that of the Nile and other African rivers (*Varanus niloticus*), upon which the English name "monitor" was first fastened by a ridiculous misinterpretation of the Arabic word *ouaran* (lizard); it is aquatic and frequently exceeding five feet in length. An equally well known kind is the East Indian monitor (*V. salvator*), which is to be met with from Ceylon and western India to the Philippines, and is equally at home in the water, on land or in trees. Its rapacity is great and varied; and it is connected with many extraordinary rites and superstitions among the natives, some of which are given in Fennent's 'Sketches of the Natural History of Ceylon' (1861). Australia has a large species (*V. gouldi*).

MONITOR AND MERRIMAC. The contract for the construction of the *Monitor* was entered into by the Navy Department in the hope that she could be completed before the *Merrimac,* then building by the Confederates at the Norfolk navy yard, could be finished, and that the *Monitor* would be able to cope with this formidable ironclad. The *Merrimac,* called by the Confederates the *Virginia,* was being reconstructed upon the hull of the United States frigate *Merrimac,* of 3,200 tons, which had been sunk, when the Norfolk navy yard was abandoned, by the Union forces, and was subsequently raised by the Confederates. Her armament was two 7-inch rifles, two 6-inch rifles and six 9-inch smooth-bores.

Each side was aware of the effort of the other to be first ready for active service. The Confederates won by a day. At noon 8 March 1862, the *Merrimac,* attended by two gunboats, *Raleigh* and *Beaufort,* each one gun, was discovered coming out of the Elizabeth River into Hampton Roads (q.v.) and standing toward the Union fleet off Newport News and Fort Monroe, composed of the steam-frigates *Minnesota, Roanoke* and *Congress,* each 50 guns; the sailing-frigate *Saint Lawrence,* 12 guns, and the sloop *Cumberland,* 24 guns. Their armament was mainly 8-inch and 9-inch guns, with several 10-inch pivot guns. These vessels had the

heaviest batteries which the government had been able to assemble to watch the *Merrimac*. The latter bore down directly upon the *Congress* and *Cumberland*. At less than a quarter of a mile the *Congress* delivered her broadside, her heaviest shot making no impression. The return-fire of shells crashed through her sides with terrible effect. Passing the *Congress* at 300 yards, the *Merrimac* received the fire of the heaviest guns of the *Cumberland* without the slightest harm resulting, and without replying she drove her iron prow through the side of the Union frigate, crushing it, and at the same time pouring in a fire of shells. Leaving the *Cumberland* rapidly sinking, the ironclad steered for the *Congress*, which had been run ashore, and from a point 150 yards astern raked her decks with shells which caused general destruction and set the ship afire. The *Congress* was obliged to surrender. The *Cumberland* fired a broadside as the water reached the gun-deck, and went down with her flag flying. As she sank, the Confederate steamers *Patrick Henry*, 12 guns, and the *Jamestown*, two, came out of the James River and joined the *Merrimac*. The *Minnesota* had grounded where the *Merrimac* could not approach within a mile, and her firing was so bad that only one shot struck the frigate. The other Confederate vessels were finally driven off after inflicting much damage with their rifled guns. After several hours' ineffectual attempts to reach the *Minnesota*, the *Merrimac* and attending gunboats returned to Norfolk. Several shore-batteries which had attempted to help proved as useless as the batteries of the frigates had been. The *Congress* continued to burn, and finally blew up. Over half the crew of the *Cumberland* were lost. The crew of the *Congress* were made prisoners, but, with the exception of the officers, were released. The total loss was some 250, the Confederate loss was nominal. The battle of an afternoon had ended the day of wooden navies.

The reports of the destruction by the *Merrimac* caused consternation at Washington, and in the coast cities and, indeed, throughout the North. Secretary Stanton ordered all preparations made for obstructing the channel of the Potomac far below the capital, and warned those in charge of coast-defenses to use every means that could be devised for protection.

Meantime the *Monitor*, in command of Lieut. John L. Worden, had left New York and after a rough voyage entered Hampton Roads at 9 o'clock the night after the battle. At 2 o'clock on the morning of the 9th she had anchored alongside the *Minnesota*. At 6 o'clock the *Merrimac* appeared bearing down on them, but at first passed by, gained the channel in which the *Minnesota* lay, and then steamed directly toward her. The *Monitor* swept in between the two and steered for the *Merrimac*. At close quarters the latter brought her bow-guns to bear and missed. There was little to fire at except the low turret with a cross-section of 20 feet. The first reply of the *Monitor* was a solid 11-inch shot which shook the *Merrimac* from stem to stern. The answer was a broadside, some of the shot of which struck the turret, either glancing or falling as harmless as the shot of the frigates the day before had proved against the *Merrimac*. Then followed broadside after broadside without producing the slightest effect on this «cheese-box on a raft,» as spectators described it. At every opportunity of maneuver the *Monitor* closed in and smote with her 11-inch solid shot, bending the heavy armor and straining the timbers of her adversary. Finally the *Merrimac* left the *Monitor* and crowded steam for the *Minnesota*. Upon reaching point-blank range she received a full broadside, and a shot from a 10-inch pivot gun, without suffering the slightest damage. In reply she raked the *Minnesota* with a shell, set her afire, blew up a tug alongside, and but for the *Monitor*, which had followed under full steam, and now swept in between the two, the *Minnesota* would have shared the fate of the *Congress* and *Cumberland*. In changing position to meet the *Monitor* the *Merrimac* grounded, and the *Monitor* continued her hammering with 11-inch shot. As soon as the *Merrimac* was floated she started rapidly down the bay, pursued by the *Monitor*. Suddenly she turned and attempted to run the *Monitor* down. The blow she struck with her prow glanced, and the *Monitor* was unharmed. The *Merrimac* then started for the *Minnesota* for the purpose of ramming her; but when within easy range the *Merrimac*, with all the Confederate ships, changed course at noon headed for Norfolk. Her officers subsequently gave as a reason that in attempting to ram the *Monitor* her iron prow was broken, and their vessel was leaking. The armor was reported damaged, the stem twisted, the muzzles of two guns shot away and the steam-pipe and smokestack riddled. The casualties were only two killed and 19 wounded. The consternation of the day before at Washington and the North was transferred to Richmond and the South. Preparations were hastily made by the Confederates for blocking the channels in the Elizabeth and Nansemond rivers, and to obstruct the channel of the James.

The *Merrimac* did not again engage the *Monitor*, and after the evacuation of Norfolk, which occurred 9 May, she was destroyed by the Confederates.

The *Monitor* had hurried direct from her shipyard to Fort Monroe and fought without a previous trial-trip, and before she had been accepted by the government. Her five hours' battle settled many questions, and once again in American history had been fired a «shot heard round the world.»

MONITORIAL SYSTEM. See LANCASTERIAN SCHOOLS.

MONK, mŭnk, or **MONCK, George,** DUKE OF ALBEMARLE, English general and naval commander; the restorer of the Stuart dynasty: b. Potheridge, Devon, 6 Dec. 1608; d. Newhall, Essex, 3 Jan. 1670. At 17 he enlisted and served in the Cadiz expedition under Sir Richard Grenville, a relative; then entered the Dutch army; and returned to England in 1639, fought brilliantly in Scotland and after 1640 in Ireland, and on the outbreak of the Civil War kept his commission in the king's army. But in 1644 he was captured by the Parliamentarian forces, and after two years' imprisonment in the Tower, joined the victors, for whom he went to Ulster as governor. Accused of exceeding his powers by arranging a truce (which was almost an alliance) with Owen O'Neil, he was recalled to England in 1649 and repri-

manded at the bar of the House of Commons. At the victory of Dunbar in 1650 he did good service; a year later he was made lieutenant-general of ordinance and in Cromwell's absence was commander-in-chief of Scotland. In 1652 he was made a general of the fleet. He introduced the elements of land tactics into naval formation and administered two crushing defeats to the Dutch, Maarten Tromp being killed in the latter battle. In 1654 he again was sent to Scotland on the Royalist rising as commander of the army, and acted there with much more prudence and success. After Oliver's death and Richard Cromwell's resignation Monk set himself to effect the Stuart Restoration, quietly shifted the forces in England until all was so arranged that there was no chance of armed resistance, and then (1660) brought back Charles II—a bloodless revolution meeting with general favor. He was made Duke of Albemarle, received other high honors, maintained order and showed rare courage in London during the Plague, but with an empty treasury in 1667 could not keep the Dutch from burning the shipping in the Thames. Short, fat, fair and wrinkled, Monk was not a winning personality, being cold, prudent past a virtue and rather unprincipled; but he was a wonderfully able general, with technical skill rare in one so lacking in theoretical training. His life was written by his chaplain, Dr. Thomas Gumble (1671).

MONK. See MONASTICISM.

MONK SEAL, a seal of the genus *Monachus,* the species properly so called is that (*M. albiventer*) of the Mediterranean; but the West Indian seal (*M. tropicalis*) is very similar to it.

MONKBIRD. See FRIAR-BIRD.

MONKEY BREAD, the fruit of the baobab tree (q.v.).

MONKEY FLOWER, any of many plants of the genus *Mimulus* (figworth family), so called because the face of the fox-glove-like corolla suggests that of a cheerful monkey. They are erect, tall herbs, with opposite, clasping, lanceolate dentate leaves, which bear in late summer solitary, axillary irregular blossoms of showy colors. The genus contains some 50 North American species, of which the most familiar is the square-stemmed of the Eastern and Central states (*M. ringens*). Its flower is violet. A common species in California and on the Pacific Coast (*M. guttatus*) has the corolla yellow, often blotched with red or purple.

MONKEYPOT, the fruit of a forest tree of the genus *Lecythis* of Brazil and British Guiana. See BRAZIL NUT; SAPUCAIA NUT.

MONKEYS comprise all the tailed members of the Anthropoidea. Perhaps it should be stated here that the Anthropoidea, as a great suborder of the order Primates, is much more inclusive than the term "anthropoid apes," or the family Pongidae, as it includes all monkeys, apes and also man. It might be supposed that the monkeys would form a unified natural group; but such is not the case. The American or New World monkeys and the Old World forms constitute two separate groups, with many significant differences which are obscured by more obvious general likenesses of less diagnostic importance. The Old World monkeys are actually closer zoologically to the great apes and even to man, than they are to the American monkeys. As early as 1820, American monkeys were designated as Platyrrhina (flat nosed), in reference to the fact that their nostrils are widely separated and open laterally, while in all Old World monkeys, as in apes and man, the nostrils are closely approximated and are directed downward; hence all these forms were grouped as Catarrhina (downward nose). The terms platyrrhine and catarrhine are still in common use, but usually as descriptive terms rather than as taxonomic group names. Today all platyrrhine monkeys are grouped as a superfamily Ceboidea, while all Old World catarrhine monkeys are placed in the superfamily Cercopithecoidea. To mention a few of the features common to the two superfamilies, attention may be called to the general humanlike appearance, especially of the face, which everyone must have noticed; also the use of the hands and the habit, in most monkeys, of sitting erect; also their alertness and apparent intelligence. It may also be noted that nearly all monkeys are adapted to arboreal life. The fore and hind limbs are not greatly unequal in length. The fore feet are obviously "hands" in structure, with a more or less well-formed thumb or pollex. The pollex is reduced or lost in a few cases to be mentioned below. The hind feet have a widely divergent great toe, or hallux, which, in most cases, is capable of opposing the other toes to form a grasping foot which is functionally almost a hand, and of great service in grasping branches of trees. As this type of foot characterizes not only the monkeys, but practically all members of the order Primates except man, the nonhuman forms were grouped by Johann Friedrich Blumenbach in 1791 as Quadrumana (four-handed), while man was made the sole representative of the Bimana (two-handed). But any likeness of a monkey's grasping hind foot to a hand is functional, not structural, and "Quadrumana" and "Bimana" have long been obsolete in zoological literature. Other common features of both groups of monkeys are a single pair of mammary glands located on the thorax, a tail, often long, sometimes short, and entirely lacking in one species. There are always four incisor teeth in both upper and lower jaws, and the canines are frequently of great length, especially in the males, and, except in one family (Marmosets), there are three molars in each half of both jaws. The eyes are directed forward so that monkeys, like apes and man, have binocular vision, and careful studies of the visual mechanism and behavioral experiments on living monkeys have shown that they have true stereoscopic vision and color perception, which are lacking in other mammalian orders. The brain is surprisingly similar in both groups of monkeys. Formerly it was believed that the Old World forms were superior in intelligence to their American relatives, but experimental laboratory studies have shown the American Cebus monkey to be able to solve problems which were prevoiusly believed to be beyond the mental capacity of any animal below the manlike apes.

To contrast some of the features in which the two groups differ: in the Ceboidea, including the two families, Cebidae, the "typical" American monkeys, and the Callithricidae (Hapalidae) or the marmosets and tamarins, there are three pre-

molar teeth, while the superfamily Cercopithecoidea have only two. The American forms have no bony auditory meatus to the tympanic bone, while Old World monkeys have. The number of chromosomes in the cells in the two groups is also different, though it must be admitted that they have been counted in very few genera. In the rhesus monkey of India the diploid number was found to be 48 as in the chimpanzee and in man, whereas in an American Cebus it was 54. In their blood chemistry also the Old World monkeys are closer to apes and man. Old World monkeys are also essentially similar to apes and man in the menstrual function of the females. This has been studied with great care in the rhesus monkey. In the Ceboidea menstruation is usually considered to be absent, though something of the sort has been asserted to occur in some cases. Thus in all the comparisons here cited it is seen that the Asian and African monkeys have a closer likeness to the superfamily Hominoidea than to Ceboidea.

To consider first the family Cebidae, which include all American monkeys except the marmosets, they inhabit the tropical forest regions of South and Central America, and some extend into southern Mexico. Many of them spend their entire lives in the trees. In none of them is the pollex, or thumb, actually opposable to the other fingers. Some of the smaller Cebidae, such as the titis, the sakis, and night monkeys which have nonprehensile tails, feed largely on insects, birds' eggs, and small birds, in addition to fruit. The night monkeys are the only thoroughly nocturnal monkeys. The best known genus is *Cebus,* formerly familiar as the companion of itinerant organ grinders. Its tail is somewhat prehensible, though far less so than in the large howling monkeys, woolly monkeys, and spider monkeys, in which the tail is often compared functionally to an extra hand. The spider monkeys have lost the thumb. The howlers have a remarkable expansion of the hyoid bone and the thyroid cartilage of the larynx, which function as a resonance apparatus for the animal's vocalization. The diminutive marmosets and tamarins of the family Callithricidae (= Hapalidae), have sharp curved claws on all the digits except the hallux, which bears a flat nail. See also MARMOSET.

The superfamily Cercopithecoidea, the Old World monkeys, are in general larger than the Ceboidea. They are widely distributed in Asia, Africa, and the Malay Archipelago. Most of them have cheek pouches for temporary storage of food, and all have ischial callosities or seat pads on the buttocks. The tail is never prehensile. The baboons are large ground-living monkeys with elongate doglike heads, inhabiting Africa and Arabia. The Colobidae, a family represented by the langurs of Asia and the Malay Archipelago, and the guerezas of Africa, lack the cheek pouches and have sacculated stomachs, which apparently represent adaptations to leaf-eating habit. In the guerezas the thumb is reduced to a small vestige or absent entirely, thus paralleling the condition in the American spider monkeys. Noteworthy examples of the langur group are the snubnosed monkeys of northwestern China and Tibet, but the most remarkable of all is the large proboscis monkey (*Nasalis larvatus*) of Borneo, in which the nose, in adult males, attains grotesque proportions and hangs down over the mouth. The color of the face, including the proboscis, is a reddish brown flesh color.

Fossil material of monkeys is sparse and fragmentary, but there is strong reason to believe that the American and Old World groups evolved separately from tarsioid ancestors in Eocene or Paleocene time, and that the striking similarities in the two groups of monkeys represent parallel evolution. In America the oldest fossil monkeys are from the Miocene of Argentina, too late to throw light on origins, and in 1949 others were found in Colombia. In Egypt fragments of jaws and teeth from the Lower Oligocene seem to indicate that both Cercopithecoid monkeys and small anthropoid apes flourished at that time. See also BABOON; PRIMATES.

Consult Elliot, D. G., *A Review of the Primates* (New York 1913); Zuckerman, S., *The Social Life of Monkeys and Apes* (New York 1932); Boulenger, E. G., *Apes and Monkeys* (New York 1937).

JAMES H. MCGREGOR,
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MONKFISH, or **ANGELFISH,** a broad, flattened fish (*Squatina angelus*), closely allied to the sharks, but more like a ray in appearance, five or six feet long, having enlarged, wing-like pectoral fins which are separated from the head by a notch. It is found near the coast in the warm seas of Europe and North America; it usually stays near the bottom, is slow in motion, dull, voracious and useless, except that some shagreen may be obtained from its skin.

MONKHOUSE, mŭngk'hous, **William Cosmo,** English author, poet and art critic: b. London, March 18, 1840; d. Skegness, Lincolnshire, England, July 2, 1901. He received his education at St. Paul's School in London and in 1857 became a junior clerk in the Board of Trade office with which he was connected with advancement for the remainder of his life. Although not a great poet his work enjoys a high reputation among the works of the minor poets and as an art critic he won considerable attention. His work for the *Dictionary of National Biography* takes within its scope practically all of British art. He published *A Question of Honor,* novel (1868); *The Works of John Henry Foley* (1875); *The Italian Pre-Raphaelites* (1887); *British Contemporary Artists* (1899), etc. Among his poetical works are *A Dream of Idleness* (1865); *Corn and Poppies* (1890); *The Christ upon the Hill* (1898); and *Pasiteles the Elder,* published after his death.

MONKSHOOD. See ACONITE.

MONLUC, môn-lük', or **MONTLUC, Seigneur de** (BLAISE DE LASSERAN-MASSENCOME), French marshal and military writer: b. Sainte Gemme, near Auch, 1501?; d. Estillac, near Agen, July 1577. He entered the army as an archer, fought (1525) at Pavia, accompanied the campaign of Francis I against Charles V and aided much in the outcome by improvements in tactics and in the artillery and engineering. His defense of Siena (1555) was brilliant, but he became hated, as governor of Guienne, for his severity against the Protestants. He was first to recommend the introduction of caring for the wounded and the testing of officers. His *Commentaires,* which takes in from 1521 to 1574

and Henry IV, and often called the "Soldier's Bible" have considerable value in the history of warfare. The standard edition of the *Commentaries* (*Commentaries de Messire Blaise de Montluc*) is that of the Société de l'Histoire de France, edited by A. de Ruble, 5 vols., and published in 1865–1872; another edition, with critical comments, was published by P. Courteault in 1911–1914. Both editions were published in Paris.

Consult Courteault, P., *Blaise de Montluc, historien* (Paris 1908); de Broqua, J. J., *Le Maréchal de Monluc, sa famille et son temps* (Paris 1924).

MONMOUTH, mŏn'mŭth, DUKE OF (JAMES SCOTT), royal pretender and claimant to the English throne: b. Rotterdam, Holland, April 9, 1649; d. London, England, July 25, 1685. He was the natural son of Charles II and Lucy Walters, as seems certain from the king's open recognition of him, although he so closely resembled Robert Sidney, whose mistress his mother had been, that Sidney has been supposed his father. Placed under the guardianship of Lord Crofts, he assumed the name of James Crofts and was brought up in France under the care of Henrietta Maria, the queen dowager. He was recognized and summoned to England by his father after the Restoration; was married to Anne Scott, heiress of Buccleuch, and made duke of Monmouth; and served in Holland in 1673.

His Protestant sympathies, his clemency to the Scottish covenanters whom he defeated at Bothwell Bridge (1679), and a story persistently circulated (and denied before Privy Council by the king) that Charles had secretly married his mother in Holland, made him popular with the Protestant party; and Lord Anthony Shaftesbury repeatedly urged the king to legitimatize him and ensure a peaceable Protestant succession.

After the Rye House Plot he escaped to Holland. Thence after the accession of James II he invaded England, possibly with the complicity of William of Orange, called the people to arms, raised a large force of Protestants, was proclaimed king at Taunton, but was defeated by the earl of Feversham (Louis Duras or Durfort) at Sedgemoor. Taken prisoner he begged for his life from the king to no purpose, and was executed at the age of 36. He was handsome, weak, fickle, and in his claims to the throne no doubt entirely under the control of political plotters. The diaries of John Evelyn and of Samuel Pepys give the setting of Monmouth's career. Consult also Roberts, G., *Life of Monmouth* (London 1844); and Fea, A., *King of Monmouth* (New York 1902). The latter work outlines the popular legend that Monmouth was not executed, a substitute having taken his place, and tells how the country people long expected his return.

Consult article in *Dictionary of National Biography*, "Scott, James," vol. 17 (London 1937–38).

MONMOUTH, city, Illinois, and Warren County seat; altitude 762 feet; 14 miles west-southwest of Galesburg; 27 miles east of Burlington, Iowa. It is served by the Burlington; Rock Island Southern; and Minneapolis and St. Louis railroads, and has an airport. The surrounding country is principally agricultural, specializing in the cultivation of soybeans and grain, dairying and livestock. There are coal mines and deposits of clay nearby. The city's industrial products are pottery, sheet metal specialties, farm machinery, and furnaces. The county maintains its library here, and Monmouth is the seat of Monmouth College. First settled in 1831, Monmouth was incorporated as a town in 1836, and in 1852 as a city. It has mayor and council government. Pop. (1940) 9,096; (1950) 10,193.

MONMOUTH, Battle of, in American history, a celebrated engagement between the American and British forces, the former commanded by General Washington and the latter by Sir Henry Clinton, which took place at Freehold, Monmouth County, N. J., June 28, 1778. On June 18 Sir Henry Clinton, acting under peremptory orders from the British Ministry, evacuated Philadelphia, which had been occupied by his army since the preceding September, and proceeded across New Jersey toward Brunswick, with a view of embarking on the Raritan. On hearing of this movement, Washington broke up his camp at Valley Forge, and having sent forward some light troops to harass the enemy started in pursuit. Excessive heat slowed the march of both armies.

At Allentown, Clinton turned to the right by a road leading through Freehold to Sandy Hook, to embark at the latter place; and Washington, who had hitherto been deterred by the advice of his officers, and particularly of Gen. Charles Lee, from attacking the enemy, determined at once to give him battle. The evening of the 27th found the main body of the enemy encamped on high ground near Monmouth courthouse, while the American advance, about 4,000 strong, under Lee, was posted at Englishtown, five miles distant, with the main body about three miles in the rear.

The command of the advance had originally been given to General Lafayette, with the consent of Lee; but the latter subsequently applied for and obtained it. Early on the 28th Lee engaged the rear division of the enemy, his orders being to hold it in check until the main body under Washington could come up. The Americans were at first successful, but owing to causes which have never been satisfactorily explained, the whole body soon after fell into a confusion and commenced a disorderly retreat, closely followed by the British. Washington, who was advancing hastily with the main body, received the first intimation of this movement in the crowds of fugitives who poured along the road. Exasperated at the failure of Lee to execute his orders he rode up to that general and reprimanded him. Then he re-formed them, and hastened back to bring up the main body. Lee, resuming his command, held his position with spirit until compelled to retire and brought off his troops in good order. The main body, which had meanwhile taken a favorable position on an eminence, with a morass in front and a wood in the rear, opened an effective cannonade upon the British. The latter, after an ineffectual attempt to turn the American left under Lord William (Alexander) Stirling, directed their chief efforts against the right commanded by Nathanael Greene, where Anthony Wayne, under cover of an orchard, was harassing their center by a severe fire. To dislodge him Colonel Moncton advanced with a column of royal grenadiers, but fell at the head of his troops, who were repulsed with considerable loss. The enemy at length fell back to the ground occupied by Lee in the morning, whither Washington was preparing to follow them when the approach of night and the exhaustion of his men induced him to defer the execution of his plan until the morning. During the night Clinton effected a

noiseless retreat, and at daybreak was many miles away from the scene of battle. The excessive heat of the weather and the fatigued condition of the troops rendered a pursuit impracticable, and the royal army was suffered to proceed unmolested to the place of embarkation. The American loss in this engagement was 69 killed and 160 wounded; the British 300 killed and 100 prisoners including wounded. Their total loss by desertions and the casualties of battle during their march through New Jersey has been estimated at 2,000. For his conduct in this battle Lee was court-martialed and suspended for one year from his command. Consult Carrington, H. B., *Battles of the American Revolution* (New York 1876); Dawson, H. B., *Battles of the United States* (New York 1858).

MONMOUTH COLLEGE, in Monmouth, Ill., a coeducational institution, under the auspices of the United Presbyterians. It was founded in 1856. At present the college is under control of the Presbyterian Synods of Illinois and Nebraska, the second Presbyterian Synod (Ohio and Indiana), the Presbytery of Keokuk, Iowa, and the Alumni Association. The college courses lead to the B.A. and B.S. degrees. There are some 45 scholarships, various prizes, and four endowed professorships. The endowment fund of the institution is definitely given as $1,750,000. Enrollment in 1947 was 835 students.

MONMOUTHSHIRE, a county in England, bounded on the west by Wales, on the north by Herefordshire, on the east by the river Wye, and on the south by the river Severn (q.v.). The Monnow River which rises in the Black Mountains flows into the Wye at Monmouth (q.v.) and forms the northeast boundary. The Wye then joins the Severn at Chepstow (q.v.). The Usk River begins in the Breconshire hills and flows into the Severn below Newport (q.v.). Geologically, the county is divided into two divisions, the sandstones and the limestones. Old Red Sandstone is the predominant formation, but there is a small central portion of Silurian rocks, and a western section of Carboniferous stratum. The alluvial soil near the mouth of the Usk and the Severn and the eastern half of the Usk Valley are rich agricultural districts. Coal mining and ironworks near the seacoast facilitate transportation for export. Other industries include limestone quarrying and brick-making.

Monmouthshire was occupied by the Romans and formed the division Britannia Secunde. In 43 A.D. Aulus Plautius established a Roman colony at Camalodunum (now Colchester), and in 47–50 Ostorius Scapula advanced across England to conquer Wales. For sometime Caratacus (q.v.) son of Cunobelinus (Cymbeline), king of Trionobantes, successfully opposed these Roman invasions, but in 78 A.D., Julius Frontinus finally conquered Wales. During the three centuries of Roman rule, military roads and fortresses, such as those at Caerwent and Caerleon (q.v.), were constructed. In 408 A.D. the Roman legions withdrew and took with them many young Britons. The Anglo-Saxons invaded the country before the close of the 6th century, and in the 8th century, Offa's Dyke (q.v.) was built. The Danes made their appearance in the 9th century and in 976 destroyed Caerleon where the mythical King Arthur is credited with having built his dominion. In 1034, Canute (q.v.) overran Gwent, as Monmouthshire was then named, and in 1063, Harold conquered the district in order to put an end to Welsh incursions along the border. After the Norman conquest under William, duke of Normandy, the barons governed the country under the name of the Lords of the Marches and erected many castles, many of which are still standing today. The famous Tintern Abbey (q.v.) was built in 1131.

In 1535, Monmouthshire was joined to England by Henry VIII, but was considered a Welsh county for administrative purposes until the reign of Charles II. The lords marchers' legal authority was ended by an act of William and Mary in 1689. The county has still retained many Welsh names and customs, and church services are frequently performed both in English and Welsh.

According to the latest (1931) census, the administrative county including the associate County Borough of Newport has an area of 349,569 acres (as constituted June 30, 1936), and a population of 434,958.

MONN, Georg Matthias, Austrian musician: b. Austria, 1717; d. Vienna, Oct. 3, 1750. He was the organist at the Karlskirche and later became known for his compositions which inaugurated the transition from the classic to the modern style which was perfected by Johann Wenzel Anton Stamitz.

MONNA VANNA. In 1902 Maurice Maeterlinck, who for a dozen years had been composing tenuous dramas of the imagination, expressive of vague fears, and symbolic of the coming of death, turned in *Monna Vanna* to a more usual type of play. In place of an airy plot but half suggested, he developed a close-knit story; in place of shadowy figures uttering childlike phrases and implying as much by their silence as by their talk, he presented living figures engaged in rhetorical debate; and in place of the merest impressionism of mood, he displayed a sudden practical interest in problems of conduct. Two such problems, in particular, he considered: first, as to whether a woman might ever honorably sell her honor; and, second, as to whether her husband's disbelief in the purity of her motives might ever justify her leaving him for one who could understand her. Monna Vanna, in order to save the lives of 30,000 starving Pisans, besieged by the Florentines, consents to yield her honor to the commander of the enemy. But the latter, her boyhood lover, refuses to profit from the advantage he has taken of her and, assailed by the state he serves, returns with her to Pisa as her guest. Her husband, who has raged against her decision to go to Prinzivalle in the first place, refuses to believe that this warrior has spared her. She can rescue him from death only by falsely proclaiming his guilt and her own desire for vengeance, thus gaining possession of the keys to his dungeon, from which she will flee with him at the earliest opportunity. Thus Maeterlinck, like Shakespeare in *Measure for Measure* and Phillips in *Pietro of Siena,* though he raises the question of a woman's right to barter her honor for the life or lives of others, does not venture to exact of her the price. Such is his procedure, also, in two other plays, *Joyzelle* and *Marie-*

Magdeleine. Neither of these has been so successful upon the stage as *Monna Vanna,* which may be read in the English versions of A. I. du Pont Coleman (1903), Charlotte Porter (1904) and Alfred Sutro (1907). The piece is discussed in the monographs on Maeterlinck by Gerard Harry, M. J. Moses, Edward Thomas and Una Clark.

FRANK W. CHANDLER.

MONNIER, Henri Bonaventure, French author and caricaturist: b. Paris, June 8, 1805; d. Paris, Jan. 3, 1877. He is best known for the creation of the characters Mme. Gibou and M. Prudhomme. He illustrated Béranger's *Chansons* (1828) and La Fontaine's *Fables.* In 1831 he became an actor for a short time and excelled in his own plays. Later he wrote and illustrated *Scènes populaires* (1835–62) and *Mémoires de Joseph Prudhomme* (1857).

Among his other works are *Les Compatriotes* (1849), *Grandeur et décadence de M. Prudhomme* (comedy, 1853), *Le Roman, chez la portière* (1855), *Le Bonheur de vivre aux champs* (1855), *Peintres et bourgeois* (1855), *Joseph Prudhomme chef de brigands* (comedy, 1860).

MONNIER, Marc, French author: b. Florence, Italy, Dec. 7, 1829; d. Geneva, Switz., Apr. 18, 1885. He became a professór and rector at the University of Geneva, and was best known for his books on Italy, although he also wrote some poetry.

Among his books are *Lucioles* (poetry, 1853), *L'Italie estelle la terre des morts?* (1859), *Garibaldi; Histoire du brigandage* (1863); *La Camorra* (1863), *Poésies* (1878), *Récits et Monologues* (1880), *Gian et Hans; le Charmeur* (1882), and *Histoire générale de la littérature moderne* (1884).

MONO, mō'nō, a lake or "sink" in Mono County, Calif., on the eastern slope of the Sierra Nevada, in a gold and silver mining region, about 150 miles southeast of Sacramento. The lake is circular in form, nearly 15 miles across; area, about 200 square miles, contains almost as a central point, Mono Island. Altitude 6,400 feet.

MONOCACY, Battle on the. A battle in the Civil War, July 9, 1864, at Monocacy River, Md., near Frederick, during the Shenandoah campaign in which 20,000 Confederate troops under Gen. Jubal Anderson Early defeated a small force of 2,700 Union troops under Gen. Lew Wallace. In order to thwart the Union successes in western Virginia and the Shenandoah Valley which had cut Gen. Lee's supply communications, Gen. Early had been ordered to defeat Gen. David Hunter and to move on to Washington. The great importance of the battle, which occurred during this drive, lies in the fact that despite a Union defeat, the day gained by delaying Gen. Early enabled the defenses of Washington to be strengthened. As a result, when the weakened Confederates reached the capital they were defeated and were pushed back into the valley across the Potomac. See also WASHINGTON, EARLY'S ATTEMPT ON.

MONOCEROS, mô-nŏs'ĕr-ŏs, or **UNICORN,** a constellation of modern origin located between Canis Major and Canis Minor and just to the east of Orion. Lying directly astride the Milky Way, it is a relatively inconspicuous asterism, its brightest star, α Monocerotis, being of the 4th magnitude. It is a winter constellation, and is on the meridian at 9 P.M. on February 22.

MONOCHROME, mŏn'ô-krōm (Gr., *monos,* single, + *chrōma,* color), in ancient art, a painting executed in a single color. The word is generally applied to painting in the various shades of the same color. The first specimens of the art of painting were of one tint only, which most commonly was red, made either with cinnabar or minium. Instead of red, white paint was sometimes used. The first four plates in the first volume of the paintings of Herculaneum contain several monochromes upon marble. The most numerous monuments existing of this kind of painting are on terra cotta.

MONOCOTYLEDONS, mŏn-ô-kŏt-ĭ-lē'-dŭn (Monocotyledoneae, sometimes called Alternifoliae), representing the smaller of the two subclasses of the flowering plants (Angiospermae), including about 2,000 genera and some 40,000 species of mostly herbaceous (lilies, grasses, sedges, and orchids) and less commonly treelike plants (such as palms, dragon's blood, and yuccas). As the two subclasses do not differ in the structure and development of their gametophytes (sexual generation) and early embryology, monocotyledons are distinguished from dicotyledons by the following outstanding characteristics: a single, terminal cotyledon that remains usually within the seed (hypogeal) and absorbs nutritive materials from the surrounding copious endosperm; primary root short-lived, soon replaced by adventitious roots; stems without central pith and annual-layers, as the vascular bundles are closed (without cambium) and irregularly scattered; secondary growth in thickness rare and different in mode from that of the dicotyledons and attained either by enlargement of cells or occasional formation of a secondary cambium in the bark; branching habit of aboveground stems poorly developed except in inflorescences; leaves mostly parallel-veined with simple cross-unions, often with broad base and without petiole; flowers frequently 5-whorled with the parts in twos, threes, fours, or sixes, never in fives. Long regarded as more primitive, and placed ahead of the dicotyledons, monocotyledons are now considered as an offshoot coming from primitive types such as belong to the order Ranales (Dicotyledoneae), and placed after the dicotyledons. Fossil monocotyledons appear together with fossil dicotyledons during the Cretaceous period, but are undoubtedly of greater age, as suggested by the fossil palmlike leaf (*Propalmophyllum*) found in Liassic deposits in France. (See DICOTYLEDONS).

MONOD, mô-nō', the name of a French family, many of whose members were Protestant clergymen.

FRÉDÉRIC JOËL JEAN GÉRARD MONOD: b. Monnaz, Switzerland, May 17, 1794; d. Paris, France, Dec. 30, 1863. Ordained in 1818, he assisted his clergyman father in Paris, becoming (1832) titular pastor of the Oratorio. He was an orthodox Calvinist, and after the revolution of 1848, as he favored the separation of church and state, he founded the Église Libre or Free Church, which united the Protestant congregations who had left the state church. Frédéric Monod founded in 1824 the *Archives du Chris-*

tianisme au dix-neuvième siècle, which he edited until his death.

His brother Adolphe Théodore Monod (1802–1856) founded an Evangelical congregation at Naples (1825–1827) and at Lyon (1828–1831). A professor at Montauban from 1836, he was also minister of the Reform Church in Paris from 1847. He was considered one of the foremost Protestant preachers of his time, and he published sermons for whose subject and delivery he was famous.

Two other members of the family, Guillaume Monod (1800–1896), and Wilfred Monod (1867–) were also Protestant clergymen.

MONODY, mŏn′ō-dĭ (from the Gr. *monos,* single, + *ōidē,* song), a song or melody confined to a single voice (homophony) in contradistinction to the song of several or many voices (polyphony). The term has come down to modern times as conveying a sense of melancholy or sadness, as in a funeral song or dirge. Thus in literature a monody is a composition dwelling on some single emotional subject. Its most familiar use, however, is in music, applying to a solo sung in recitative style and instrumentally accompanied. Introduced into Italy at the end of the 16th century, it was an attempt to return to the music of the Greeks. It flourished in the home of Giovanni Bardi, in Florence, and was adopted by such composers as Jacopo Peri (1561–1683), who introduced it in *Dafne* (1594), now considered the first opera. Giulio Caccini (1550?–1618) made a collection of monodies in *Nuove musiche* (1602). The operas of Claudio Monteverdi and Marco da Gagliano were early examples of the effect of monody on music.

MONOGAMY, mō-nŏg′ă-mĭ (from Gr. *monos,* single + *gamos,* marriage), that form of marriage in which the husband has one wife at a time, as contrasted with bigamy and polygamy, and also with polyandry, in which a woman has two or more husbands. Because the natural sex ratio of mankind never departs widely from a one-to-one relationship, there being almost an equality of male and female births, monogamy is more usual in simple primitive societies than polygamy. However, whenever there is a considerable excess of marriageable females over males, due to war or other causes, polygamy is frequently resorted to until the balance is redressed. In more complex societies, monogamy is customary in the lower classes, polygamy in the upper. The possession of more than one wife is in some societies a badge of social distinction. In modern secular states polygamous marriages are illegal. See also Marriage, History of.

MONOGRAM, mŏn′ō-grăm, from the Latin *monogramma,* ultimately from Greek μόνος, single, and γράμμα, letter, is a character or cipher combining two or more letters (rarely a single letter) to represent a name. In Greek and Roman times monograms were extensively used on coins, medals, and public monuments. The most famous monogram undoubtedly is that which was incorporated in the Labarum (q.v.), that is, the intertwined letters chi and rho which are the first two letters of Greek χριστός, Christ. In medieval times there was a proliferation of monograms, especially as used by merchants who were not entitled to display coats of arms. The commercial trading monopolies, like the Dutch East India Company, usually displayed monograms on their house flags. Perhaps the most famous of artist monograms are those of Rembrandt and Dürer. Among royal monograms may be cited those of Charlemagne, Hugues Capet, St. Louis, and the combined monogram of Henry II and Diane de Poitiers.

MONOLITH, mŏn′ō-lĭth, a stone block, usually monumental and of large dimensions. It may be an unhewn menhir; the capstone or support of a megalithic monument; a hewn obelisk; a sarcophagus; a sculptured temple; or a colossal statue. Stonehenge (q.v.) is an example of a monolithic monument. See also Menhirs.

MONOLOGUE, mŏn′ō-lŏg, a term traditionally signifying a dramatic recitation of considerable length in a stage performance by one actor uninterrupted by other performers on the scene. The convention of the monologue, used to acquaint the audience with the situation and the meaning of the drama, is very old. Sophocles used it in his monologue of the dying Ajax, and Shakespeare supplies a famous example in Hamlet's soliloquy, "To be or not to be." Other celebrated monologues are those of Auguste in Corneille's *Cinna,* of Sosie in Molière's *Amphitryon,* and Beaumarchais' Figaro. Victor Hugo used the device in *Hernani,* showing the Emperor Charles V meditating before the tomb of Charlemagne. The monologue and the soliloquy are often synonymous. However, in an extension of the term "monologue" the word is often used with a more limited meaning, to signify a dramatic recitation by one actor who may assume several parts or leave to the listener's imagination responses of an unheard as well as unseen member of a dialogue.

MONOMANIA, mŏn-ō-mā′nĭ-ă (from the Gr. *monos,* single + *mania,* madness), that form of mental derangement which distinguishes itself by an abnormal conception or action on one subject only, leaving the mind sane on all other points.

MONOMETALLISM. See Bimetallism.

MONONA, Lake. See Four Lakes.

MONONGAHELA, mō-nŏn-gă-hē′lă, city, Pennsylvania, in Washington County, 17 miles south of Pittsburgh on the Monongahela River. It is served by the Pennsylvania and the Pittsburgh and Lake Erie railroads, and has an airport. At an altitude of 754 feet, it lies in a coal and gas region with dairy, poultry, fruit, and truck farms. The chief manufactured products are commercial stokers, springs and axles, machinery, fire brick and other clay products, steam producing equipment, chemicals, and costumes. Many of the inhabitants work in the large steel mills near by at Donora and Clairton.

Joseph Parkinson settled here in 1792; and here, in August 1794 at Whiskey Point, Albert Gallatin made the speech that persuaded the men in the Whiskey Rebellion not to resist federal troops. Originally called Parkinson's Ferry, the place was incorporated in 1833 as the borough of Williamsport. Four years later the name was changed to Monongahela City. Monongahela, meaning "river with the sliding banks," is from the Indian word Menaungehilla.

The city was chartered in 1873, but in 1893 the word "City" was dropped from the official title. In 1951 it had a commission form of government. Pop. (1950) 8,922.

MONONGAHELA, river, West Virginia and Pennsylvania, which has its source in the northwestern part of West Virginia, and flows north into Pennsylvania, where it unites at Pittsburgh with the Allegheny to form the Ohio River. The headwaters of the Monongahela are in the Alleghany Mountains near the headwaters of the Potomac. The two headstreams of the Monongahela unite near Fairmont in Marion County, W. Va., and from the point of junction on the north become a swiftly flowing stream, furnishing water power for several manufacturing towns and cities. The whole course is very irregular; the length is about 300 miles. The river was made navigable about 106 miles from its mouth to Morgantown, in Monongalia County, W. Va., by a system of nine locks, and other locks above Morgantown now make the river navigable as far as Fairmont. See also PITTSBURGH.

MONONUCLEOSIS, mŏn-ō-nū-klē-ō′sĭs (also known as GLANDULAR FEVER), a disorder of unknown etiology, but probably of infectious origin. It is characterized by irregular fever, enlargement of lymph glands and spleen, and by the presence in the blood of an increased number of lymphocytes of a peculiar type. It has been recognized as a distinct disease entity only since 1935.

Occasionally it is observed in epidemic form in certain localities. The clinical picture depends somewhat upon the stage of the disease. In the prodromal period (3 to 6 days) symptoms are somewhat vague: chilliness, slight rise in temperature, sore throat, and swollen neck glands. In the middle stage (second week) cervical glandular enlargement is seen in 75 per cent of cases, with the enlarged glands somewhat tender. Soreness of the throat now becomes more pronounced, the mucous membranes being of a bright red color. The throat condition may resemble that of acute tonsillitis, Vincent's angina, or even diphtheria. The occurrence of jaundice is fairly common. After 20 days the stage of convalescence sets in, but recovery may be extremely slow. The patient is often greatly weakened, and relapses are by no means uncommon. The blood count shows a leucocytosis of from 10,000 to 15,000, the count being due to lymphocytosis. Since 1932 the most important laboratory test for this disease has been the heterophil antibody reaction, the clumping of sheep cells by the serum of infectious mononucleosis patients.

HAROLD WELLINGTON JONES, M.D.

MONOPHYSITES, mŏ-nŏf′ĭ-sīts (from Greek *monos,* single, and *physis,* nature), those followers of the opinion in the early Church which ascribes but one nature to Christ in contradistinction to the orthodox doctrine that he was both divine and human, true God and true man.

The Monophysites were mainly confined to the Eastern Church and obtained no footing in the West. The edict called Henoticon, issued by the Emperor Zeno in 482, was not able to quiet the long and often bloody contests incident to this controversy, and the orthodox Church, by its sentences of excommunication, occasioned a formal secession on the part of the Monophysites. This separation took place in the first half of the 6th century. Nor did they remain united among themselves. In 519 controversies arose among them respecting the question whether the body of Christ is corruptible or not.

About 560, a Monophysite, Askusnages, and after him Philoponus, a noted Alexandrian philosopher of that century, conceived the idea of styling the three persons of the Deity three Gods. These Tritheists and their adherents, even in the eyes of the Monophysites, were heretics, and were the occasion of many Monophysites turning Catholics. In Egypt, Syria and Mesopotamia the Monophysite congregations, however, remained the strongest, had patriarchs at Alexandria and Antioch, existing without interruption by the side of the imperial orthodox patriarchs. After the Syrian, Jacob Baradaeus had, about 570, established their religious constitution, they formed the independent churches of the Jacobites and Armenians, which separated from the Greeks as well as the Romans, and have for that reason been able to maintain themselves since the 7th century, even under the dominion of the Mohammedans.

Excepting their doctrine of one nature in Christ, they coincide, in the main points of belief, with the Greek Church; their worship also resembles the Greek rather than the Roman, but has, from their national character and their superstition, received variations, which are most striking in the religious constitution of the Egyptian Jacobites. See also JACOBITE CHRISTIANS; ARMENIAN CHURCH.

MONOPLEGIA, mŏn-ō-plē′jĭ-ă, paralysis of a single limb, muscle, or muscle group. If it involves the face it is designated as *facial,* if the arm, *brachial,* and if the leg, *crural.* It is also termed *central* if arising from a lesion in the central nervous system, and as *peripheral* if occurring as the result of an injury to a peripheral nerve. A monoplegia of central origin is a poliomyelitis affecting the muscles of one leg. See also BRAIN, DISEASES OF THE; PARALYSIS.

HAROLD WELLINGTON JONES, M.D.

MONOPOLI, mō-nō′pō-lē, town, Italy, in the province of Bari, 26 miles east-southeast of Bari on the Adriatic Sea. Interesting for its historic remains and 12th century cathedral, it is a modern industrial center, manufacturing textiles, flour, macaroni, soap, lubricating oil, and exporting olive oil, wine, and olives. Pop. (1951) 22,600.

MONOPOLY, control by an individual, a business concern, a group or government that makes it possible to fix the prices or regulate the output of one or more articles or services. As it concerns price, monopoly means the power to fix the price of a product or a service by arbitrary methods, such as by controlling the supply. It is an exclusive right given to one or more persons to carry on some branch of trade or manufacture.

The most frequent monopolies formerly centered around the exclusive privilege to trade in certain foreign countries, to import or export certain articles, or to practice certain arts or trades. Such monopoly privileges were very common in Great Britain, particularly during the 15th and 16th centuries. Several British companies of an essentially monopolistic nature, such as the Hudson's Bay Company and the East India Company, created to exploit the resources of Great Britain's

far-flung colonial empire, continued to wield considerable influence until well into the 19th century.

In general, monopolies fall into two classes: (1) public, and (2) private. Public monopolies are those undertaken by the government and would include such economic activities as the federal postal service, or the operation of toll highways by the states, or electric power plants by a municipality. Private monopolies are those held by business organizations and individuals. They may originate either from (1) a privilege granted by the government, (2) the possession of superior skill or talent, or (3) from the ownership of capital.

Thousands of private monopolies exist as the result of a privilege granted by the government in the form of a franchise, a patent, or a copyright. A franchise may confer upon a business enterprise the exclusive right to operate an electric power plant, a bus line or a railroad in a given locality. Franchises need not be exclusive; nor are they always given in perpetuity. They are granted because from the point of view of society it is considered desirable to reduce or eliminate ruinous competition in certain lines of business activity.

A patent is a right granted by the federal government (United States Patent Office) to an inventor, giving him the exclusive privilege to manufacture and market his invention for a period of 17 years. A copyright gives an author the exclusive right to his literary efforts for a period of 28 years, and may be renewed for an additional 28 years. Monopolies in the form of patents and copyrights are considered socially desirable because they promote social and economic development by stimulating new inventions and works of literature.

Certain individuals endowed with superior talent in the arts are a monopoly unto themselves. A gifted musician or a talented actor can command large sums of money for a single performance because the absence of competition creates a monopoly for those so endowed.

Quite frequently, the ownership of capital tends to result in the creation of a monopoly. Relatively few people are free to engage in the business enterprise of their choice. In most instances the selection of a business is limited both by the capital resources of the individual and the capital requirements of the enterprise. It is evident, for example, that the amount of capital necessary to organize an automobile manufacturing company or a steel company is so large that the average individual would be prevented from entering either of these lines of endeavor. Thus, the established manufacturers of automobiles and steel need not be concerned, as a rule, over the possibility of additional competition resulting from new entrants into the field. While others are not restricted largely from entering, the lack of capital gives the established firms a partial or total monopoly.

Because monopoly prices usually are higher than competitive prices, it is sometimes assumed that when a monopolist is free to fix his price, he will charge the highest price possible. But such is not always the case. In the final analysis, the motive of the monopolist is identical with that of any other business man in a capitalistic society; namely, to obtain the largest amount of net profit from the operation of his business. To achieve this objective, it may be necessary to reduce the price as a means of broadening the market for the product. Whether the monopolist decides to curtail or expand output depends upon which course of action will increase his profits. In this connection, the cost of production is a controlling factor. Under certain circumstances where the monopolist can lower total unit costs by expanding output and thus spreading his fixed costs over a larger number of units of production, he will do so. Fixed costs include such items as bond interest, real estate taxes and administrative salaries which remain constant in amount regardless of the level of production. Obviously, if production can be increased, the burden of fixed costs which must be borne by each unit of output is lowered. On the other hand, if an increase in production will be accompanied by higher fixed costs per unit, as sometimes happens, the monopolist is reluctant to expand output, unless other considerations alter his decision.

In addition to the profit motive and the cost of production, other factors which will influence the price charged by a monopolist are: (1) the development of substitutes, (2) the fear of competition, and (3) the fear of public regulation.

In addition to competition between goods of the same general type, a substantial degree of competition exists among different products which may be adapted to the same use. For example, shoes can be manufactured from a wide variety of materials other than leather. If a monopoly were to develop in the leather industry, and excessive prices were charged for the product, the consumer might be compelled to forego the purchase of leather shoes for those manufactured from other materials. Recognition of this principle of substitution would undoubtedly set a ceiling on the price that could be charged by the leather monopolist for his product.

If the monopoly is not protected by law, the fear of inviting competition might deter the monopolist from charging too high a price for his product. Potential competitors, attracted by the possibilities for large profits in the industry, might be encouraged to enter the field.

The monopolist readily recognizes the political dangers inherent in charging exorbitant prices. High prices and excessively large profits frequently are an open invitation to government control. The fear of public indignation which might erupt at any time in a demand for public regulation or public ownership often is sufficient to prevent a monopolist from fixing his price too high.

Although the states had sought to regulate monopolistic industries earlier, the first attempt at such regulation by the federal government occurred in 1887 with the passage of the Interstate Commerce Act. Strangely enough, the Interstate Commerce Act was not prompted by a desire to encourage competition among the railroads, but rather by a wish to eliminate the ruinous competition that threatened the solvency of the entire railroad industry. During this period it was possible to purchase a one-way coach ticket from New York to Chicago (a distance of about 900 miles) for twenty-five cents—meals included. The Sherman Antitrust Act of 1890 marked the first attempt on the part of the federal government toward blanket legislation aimed at curbing business trusts and other manifestations of monopoly. The Sherman Act declared illegal any business combination that was in restraint of trade. The Clayton Act of 1914 greatly expanded the government's authority to regulate

"big business," particularly in the banking field; the Public Utility Holding Company Act of 1935 imposed the "death sentence" upon certain types of holding companies in the public utility field.

PATRICK DE TURO.

MONORAIL, mŏn′ō-rāl, a single rail arranged to serve a useful purpose, usually for the transportation of materials by a wheeled carriage or truck. Many industrial monorails are used for the handling of relatively heavy pieces of material or equipment which are moved generally along the same routing and do not require more elaborate crane facilities. These installations frequently depend on hand power for horizontal movement, although monorail may also be the basis of a power-operated conveyor system. Monorail has also been used for the transportation of people, and because of its inherent advantages is being seriously considered for mass transportation in the United States.

In 1901, in the Ruhr Valley, Germany, a monorail transportation system was built between Barmen, Elberfeld, and Vohwinkel, now included in Wuppertal. It was 8¼ miles in length and operated satisfactorily from its original installation, during the first 33 years of operation, carrying an average of 13 or 14 million passengers per year. The supporting structure, shown in Fig. 1, is a system of latticed longitudinal girders, one vertical and two horizontal, assembled into the form of an I section. The main girders form the web of the I, and the lateral girders, which give the requisite lateral stiffness, serve as the top and bottom flanges of the I. Diagonal tie rods extend from the upper panel points of the central girder to a connection with the chords of the bottom lateral girder. The chords consist of steel I beams, and upon their upper flanges is laid the single T rail from which the cars are suspended and on which the trucks run. The girders, which vary in span from about 69 feet to 108 feet, are carried on supports varying in structural design with the locality where they are used. Where the railway is carried immediately above the Wupper River, the A-frame style of support is used; while in towns through which the line passes, the trusses are carried upon substantial inverted U frames. The A frame consists of two rectangular latticed struts which are united at the top by a rectangular plate yoke. The cars are 37.7 feet long, 8.5 feet high, and 6.88 feet wide, fairly long and narrow, and slightly tapered at the ends. They have a seating capacity of 50, are built with two side doors opening inward and two auxiliary doors at the ends. The total weight of a car is 12 tons. Each car is freely suspended from two trucks spaced about 25 feet apart. The wheels, about 3 feet in diameter, are mounted tandem to run on a single rail, and are gear-driven by two electric motors of 36 horsepower each. The motor trucks receive power by means of a slipshoe and a contact rail which is carried on the bottom of the lateral girder, somewhat to the inside of the main supporting beam. The truck frames embrace the rail girders and the rails so closely that derailment is impossible. If a wheel or axle should break, the cars would be supported by the frames. The cars swing around the curve in a slightly inclined position and spontaneously reassume their vertical position when a tangent part of the rail is reached. To the passengers the change in equilibrium is imperceptible.

In the United States the modern concept of monorail for mass transportation of people takes three distinctly different forms: There is a modernized version of the Wuppertal Monorail, in which the car is free to swing to a position of equilibrium between vertical and horizontal forces, known as the Monorailway; there is the version known as the Suspended Railway, which allows

Fig. 1. Cars of the Barmen-Elberfeld-Vohwinkel monorail system pass over the Wupper River suspended by A-frame style supports. The system has been operating successfully since its construction in 1901.

the car to swing controlled in time and magnitude by well-known mechanical devices; and there is the version in which the car is rigidly held in any position predetermined by design, analogous to the usual railway car. Of this version there are two types, one known as the Skyway Monorail and the other as the U. S. Monorail. In all versions the car can be designed to meet transportation requirements as to its size; seating arrangement; area for standees; door arrangement, size, and operation; lighting; ventilation; and similar factors. All systems feature a single row of supporting columns, to avoid cluttering streets and rights of way. The supporting columns carry outriggers to which some form of longitudinal support girder is attached from which the cars are suspended or on which they are supported. Physical form of the columns and brackets is a matter of choice of the engineer as to what is best to meet technical and aesthetic requirements. The size of these structural supporting members varies with the design, each having imposed on it different loadings for each use.

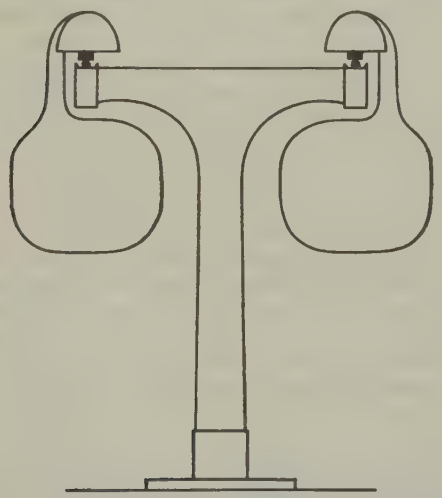


Fig. 2. Monorailway.

The car of the Monorailway is hung from two trucks (Fig. 2) each equipped with two wheels in line that run on a single rail mounted on top of a rail-supporting longitudinal girder. The car is suspended from the two trucks by means of two hanger arms so arranged that the car hangs in a normally vertical position below the trucks. Because the hanger arms occupy the space on one side around the outside of the longitudinal girder the car is essentially single ended and must be turned around to travel forward in the reverse direction on double track. The longitudinal girder, being one of the essential differences in the various versions, is described more fully. It is generally a rectangular box girder, completely enclosed, and is usually 16 inches wide by 36 inches deep for a span of 60 feet between supporting columns. The rectangular shape avoids giving the car hanger arm too great an eccentricity and allows the car normally to hang directly under the running rail. The hanger arm is unusual because it provides for rotation in the horizontal plane of the truck with relation to the car body, thus accommodating track curvature, and also permits rotation of the truck in the vertical plane to allow the car to pass through vertical curves in the track. In this system, the car hanger arm is carried over the longitudinal girder to the opposite side to avoid the possibility of the car falling, in case of a broken wheel or other cause of derailment. The truck is powered usually by electric traction motors to obtain the transportation characteristics required.

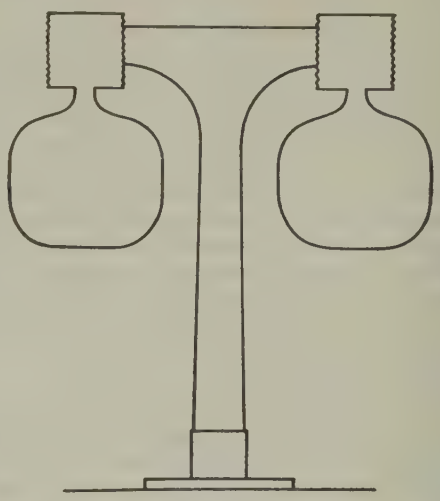


Fig. 3. Suspended Railway.

The car of the Suspended Railway is hung from two four-wheel trucks (Fig. 3) each consisting of two axles with wheels having a gauge of about 30 inches. Each truck is essentially a narrow-guage railway truck, except that the car is suspended directly below the center plate instead of being mounted above it. Side sway of the car is controlled by well-known mechanical linkages and snubbers to provide resistance to such movement until a predetermined horizontal force has been attained. Sway, controlled by physical vertical and horizontal forces, is allowed, but with the horizontal movement becoming increasingly restrained until it is limited to an angle of about 10 degrees with the vertical. The narrow-guage track is supported in position by two structural trusses forming the longitudinal girder so tied together that the rails will not separate beyond the predetermined gauge and designed to limit vertical deflection to acceptable railway practice. This longitudinal girder, called the splitrail type, provides space for operating trucks, electrical contact conductors, and the necessary power and signal cables. On the inside of each individual truss a plate is provided as a guide in case of a broken wheel or other disturbance tending to derail the truck, and with such close clearances that derailment is practically impossible and falling of the truck is completely so. The completed longitudinal girder is covered with an aesthetically pleasing metallic skin with noise-absorbing material inside to effectively deaden the noises of truck, track, and traction operation. The top cover plate is removable to allow inspection and maintenance. Because of the protected area inside the truss, it is possible to utilize two contact conductors in conjunction with the running rails, so making available the use of three-phase electrical power with this type of installation.

The car of the Skyway Monorail is suspended from an overhead track by two same-side hanger arms (Fig. 4) pivoting on two truck assemblies mounted on top of the track. Each truck assembly is equipped with two pairs of closely coupled parallel pneumatic-tired wheels running on a flat surface on top of a cylindrical longi-

tudinal girder. The flat surface is divided into two parts by a vertical member on which bear horizontal wheels that guide the running wheels and also form the top part of a vertical couple which holds the car in any predetermined position. On the lower arc of the longitudinal girder is another similar vertical member projecting downward. Horizontal guide wheels mounted on top of the car bear on this vertical member, completing the vertical couple for holding the car in position. Thirty-foot-high inverted J towers supporting the cylindrical longitudinal girder form a single track system, or T towers supporting two such girders form a dual track system for continuous two-way travel using loop turnbacks for change of direction of cars. Propulsion can be effected by electric motors, diesel or gas engine, or gas turbine mounted on the truck assembly. Power is delivered to a forward-reverse transmission, then to the driving axles. The two trucks for each car are articulated or hinged together. The control position for the operator is an aviation type cockpit situated on the leading portion of the front truck of the car. This system, developed by Murel Goodell, is the

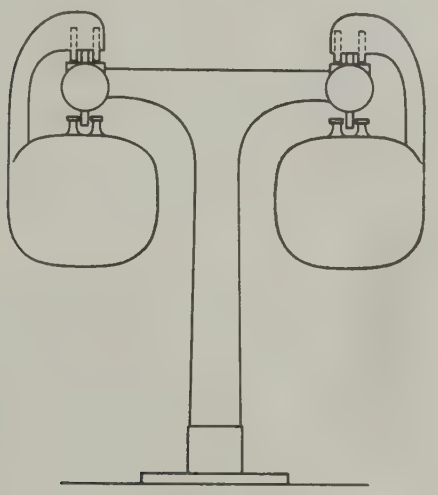
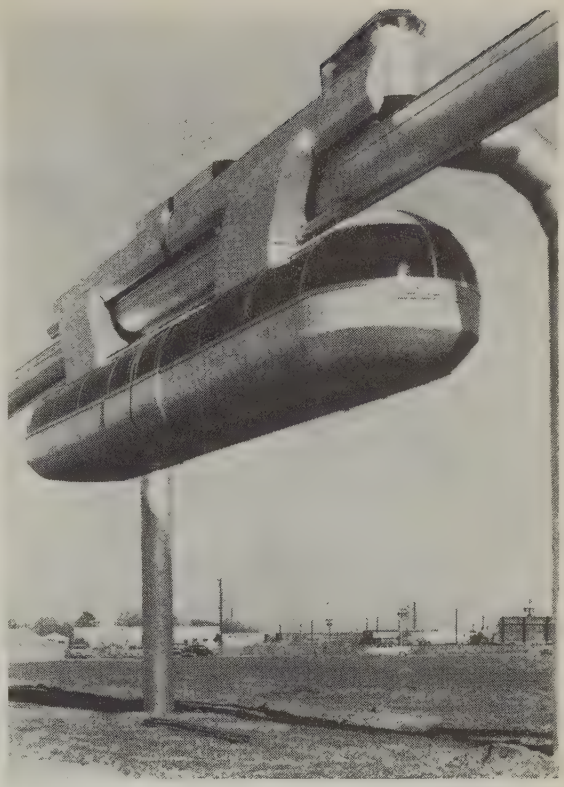


Fig. 4. Skyway Monorail.

only modern system of monorail in the United States that has been demonstrated by a test installation. In 1955 in Houston, Texas, a 970 foot section of Skyway Monorail was built and operated (Fig. 5). Later this installation was transferred to the Texas State Fair Grounds in Dallas, Texas, and was extended in length. The longitudinal girder was revised in shape from a cylindrical section to a triangular section with one flat forming the top riding surface.

The car of the U. S. Monorail is supported on a series of single wheels in line that run on a single rail underneath the car (Fig. 6) the car being held upright in any predetermined position by a support above the car which includes a vertical member on which bear horizontal wheels attached to the top of the car. Such wheels, running on both sides of this vertical structural member, provide the stability required. Propulsion is by means of the vertical wheels supporting the car and is usually by electric power. This type of system requires two sets of outriggers from the main central line of columns, each set of outriggers in a horizontal plane, supporting two sets of longitudinal girders. The lower longitudinal girder carries the car, supported on a single rail,



Monorail, Inc.

Fig. 5. A modern monorail system has been tested in Houston, Texas, on a pilot line. The coach is carried along the "pipe" rail on rubber tires which reduce noise and vibration.

and the upper longitudinal girder carries the vertical member on which the horizontal wheels above the car run for stability.

In these two types of predetermined-position cars, which include the Skyway Monorail and the U. S. Monorail, the normal position of the car negotiating curves is a predetermined compromise of the weight of the loaded vehicle and the centrifugal force due to the speed on the curve. In this respect, these two types differ from the first two types, the Monorailway and the Suspended Railway, in which the car swings either freely or restrained to a position more nearly in line with the resultant of the horizontal and vertical forces imposed on the car by its move-

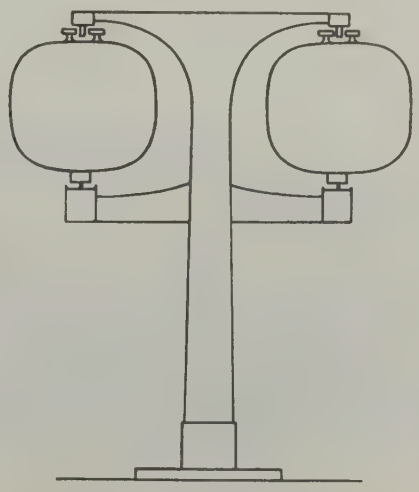


Fig. 6. U.S. Monorail.

ment and speed around any given curve.

There have been many other attempts to create monorail systems of different designs. Among them are the following:

The first car run on a single rail, the invention of Charles Lartigue (1834–1907), was in practical operation for many years in Djibouti, French Somaliland, East Africa. The car was kept vertical by its attachment to a laterally placed horse, which balanced the car as a hansom is balanced by attaching the horse in front. This early type of monorail was one where all the different resistances to a moving car or train, except the atmospheric resistance, were concentrated in the vertical plane of the center of gravity of the car or train because the car was suspended below the track. The downward vertical force consisted of the weight of car, trucks, and load. This weight was delivered to and directly sustained by two centrally disposed bearing rails laid with precision as to alignment and surface, and closely gauged to each other so as to constitute practically a single support.

The design of William B. Mack appears to have been given much consideration among engineers. As far back as 1872 a charter was granted in the State of New York for the building of a hanging railroad which had the general mechanical principles of hanging loads later exploited in Germany, France, and Russia, but the Mack system was the only serious effort made at hanging cars on the side of the structure instead of underneath.

In 1888 the Enos Electric Railway of St. Paul, Minn., planned to build a suspended monorail, as shown in Fig. 7, much like the Wuppertal system previously described, except that the track girders were supported on single columns and cantilever arms. It was to enter the city on South Robert Street, proceed to State, Greenwood, East Delos, and Starkey streets, and cross the Mississippi River at Cedar. It was actually constructed from the top of the hill at South Park, now South St. Paul, to Bryant Avenue. An ordinance, recommended by the Committee on Streets, specified that "the track must always be 20 feet above the ground, supported by steel and wooden posts set 42 feet apart."

Eben Moody Boynton (1840–1927) patented plans for a monorail which were approved by such experienced men as Austin Corbin. Several short test roads were built and operated. A modification of his plan was put into use in Tunis, North Africa. Here the single rail was laid on the ground like the rails of steam roads and trolley lines. Over the single rail at fixed intervals were trusses, or bents, joined by cross pieces at the top and supporting the guides which prevented the car from toppling over. The car was balanced on the single rail, the wheels being of the grooved pattern. So accurately were the weights adjusted that a slight lurch of the body swayed the car from side to side. At first some apprehension was expressed that in going around curves the centrifugal motion of the car would impose too great a strain on the bents, but this fear proved groundless. Allowing for the centrifugal force by inclination of the car toward the inner side of the circle, which is accomplished on ordinary railroads by superelevating the outer rail, removed most of the loading from the bents.

The English monorail known as the Behr System after its inventor, Fritz Bernhard Behr (1842–1927), was in operation for a number of years at Ballybunion, Ireland, and was successfully tested by the Belgian government, securing a speed of 83 miles per hour with a car weighing 70 tons. In 1901 and 1902 the English Parliament granted the Behr company the right to construct a road between Manchester and Liverpool, after the plans had been examined and approved by many eminent engineers. The monorail track was raised above the ground on an A-shaped trestle. Built in two parts, the trucks and car straddled the rail for balance.

In May 1907, with a gyroscope monorail car, Louis Brennan (1892–1932), the inventor of the Brennan torpedo used by the British government, demonstrated before the Royal Society of Great Britain a practical application of the gyroscope to rail transportation. The invention was, briefly, a system by which a car or a train of cars supported by a single row of wheels could travel on a single rail and maintain perfect equilibrium in motion regardless of the distribution of the load, wind pressure, or other factors, because of auto-

Fig. 7. The Enos Electric Railway of St. Paul, Minnesota was a suspended monorail begun in 1888 but never completed. Its track girders were supported on single columns and cantilever arms.

matic stability mechanism carried by the vehicle itself. The mechanism consisted essentially of two flywheels rotated directly by electric motors in opposite directions at a very high velocity and mounted so that their action could be utilized. The model car, while running on a curved monorail, leaned, and so automatically balanced the effect of centrifugal force.

In 1909, Froelich developed another type of gyroscopic car which did not pass beyond the experimental stage; and about two years later the system of P. P. Shchilovski was brought out, in which the gyroscopic principle was also employed.

In 1930 George Bennie developed what was known as a Rail Plane, which was essentially a suspended monorail but used two motor-driven air propellers for the motive power for each car. A short section of the skeleton steel track was built near the city of Milngovie, Scotland, and cars were operated for demonstration purposes. The cars were prevented from swaying by a guide rail mounted on a part of the structure erected below the suspended car.

Late in 1952, Axel Wenner-Gren's technical staff built a 2/5th full scale model of a system called "Alweg" for demonstration on a mile-long track near Cologne, Germany. The model consisted of a streamlined, electric-powered three-car train with an inverted U-shape undercarriage. The inside of the inverted U rides on a flat steel plate having two side flanges, and the two arms of the inverted U grip the side flanges from underneath. The steel plate is supported in the air by a series of concrete columns.

EDWARD H. ANSON,
Senior Vice President, Gibbs & Hill, Inc.

MONOSACCHARIDE, mŏn-ô-săk'à-rīd, mōn-ô-săk'à-rīd, a carbohydrate that does not hydrolyze to a simpler compound. Its general formula is $(CH_2O)_n$. It includes the dioses (2 oxygen atoms), trioses (3 oxygen atoms), tetroses (4 oxygen atoms), pentoses (5 oxygen atoms), hexoses (6 oxygen atoms), heptoses (7 oxygen atoms), octoses (8 oxygen atoms), nonoses (9 oxygen atoms), glucosides, fructosides, and some others. See also CARBOHYDRATE.

MONOTHEISM, mŏn'ô-thê-ĭz'm (mono-, one; Gr. *theos,* god), in religion, the belief that God is one, or that there is only one God. The historical sources of monotheism are very ancient and involved; in the history of religious thought, however, three philosophical types of monotheism have developed:

The first type is exemplified in the later monotheism of the Israelitish tribes. The unity of God is derived from an ethical concept of the universe. God is one, holy, and the righteous ruler of the world. He is the dispenser of justice, the giver of the law. He derives his power from the fact that he is the creator and, therefore, he enjoins upon his creatures ethical responsibility and heightened moral consciousness. Apart from the world, he sits in supreme jurisdiction over it.

In Greek philosophy we find the second type of monotheism, in which God as a unity or unifying principle is the source, the explanation of the order and rational coherence of the universe. According to Aristotle, he is at once the commanding general of the universe and the rational order of it.

The Hindu philosophy represents the third type. In its teaching, a distinction is maintained between the reality of the world and the reality of God. The earth and its phenomena are ephemeral, transitory, unreal. God, who is imminent in all things, is at the same time transcendental, superior—the ultimate reality. Knowledge of God cannot be obtained by intellectual reasoning alone. It must come as a direct revelation by insight to those souls who are best prepared to receive it. Therefore, the contemplative life is to be desired and commended in preference to the practical. Logically, this mysticism argues that, since knowledge obtained through sensuous experience is at best defective and limited, some comprehensive perfect reality partaking of the nature of all things must exist somewhere—and this is the one God.

These various types of monotheism did not exist as pure concepts practically, however. The continued study of the problem of the relation of the world to God brought about interesting syntheses of these several philosophies. The intellectualism of Greek monotheism which conceived the Logos or divine essence of things to be the ruler and the order of things at the same time, soon found its position besieged by ethical questionings. How establish the proper relationship between a remote, righteous God who orders all things and a lawless unjust world? How, in other words, reconcile the Greek rational and the Jewish ethical monotheism? The Neo-Platonic school turned to mysticism for the solution. Early Christianity found itself beset with similar problems, and in its answer also found recourse to transcendental philosophy necessary.

In Christian monotheism, a curious synthesis of all three monotheistic concepts is found, together with the doctrine of the personality of God. The ethical and mystical concepts predominate. The existence of a rational world is acknowledged to the point of fixing the ethical responsibility of human relationships. But beyond that, the things of the earth are untrue, imperfect, unreal. The whole truth is in God, of whom knowledge is obtained through insight and revelation. The concept of immortality solves the problem of injustice and evil, for in the after life all ethical readjustments are made. The Hellenistic concept of the universe as a well-ordered system capable of being fathomed by the intellect also survives in Christianity in the attempt to rationalize its doctrines and to build up a definite convincing system to establish the unity between the finite world and its infinite ruler.

Constant revivals of the third type of monotheism arise also out of the problem of synthetizing all three forms. The escape from the difficulties attendant upon the acceptance of any one of the three is generally in transcendentalism of some form or in scepticism. True monotheism must take into just consideration the ethical, rational and intuitional elements of religious philosophy.

MONOTHELETES, mô-nŏth'ĕ-lēts (Gr. *monos,* alone, and *thelein,* to will), members of a 7th century Christian sect, also less correctly called Monothelites, who maintained that though Christ had two natures coexisting distinctly in the unity of the person, yet these natures possessed or acted by but a single will, the divine, which so predominated over or absorbed the human as to deprive it of all action or efficiency. The sect was commonly regarded

as an offshoot of the Monophysites, though they themselves denied all connection with them. The doctrine originated with the Emperor Heraclius, who in 630, by adopting a middle course, attempted to reconcile the Monophysites to the orthodox church. The attempt was for a time successful. Heraclius consulted Sergius I, patriarch of Constantinople, on the new dogma, and he not only approved of it, but became its most active propagandist. At his instance, and mainly in consequence of his representations, Pope Honorius I addressed two letters to Sergius, which according to some interpreters would seem to favor Monothelism. The successors of Honorius condemned the Monothelites, and Martin I, in 649, issued a bull anathematizing them. For this he was sent prisoner to the Chersonesus by the Emperor Constans, who protected the Monothelites. The sixth ecumenical council, that of Constantinople (680), condemned this heresy, and with this the early controversies on the incarnation became gradually fainter, till they were forgotten amid the disputes between the Iconoclasts and their opponents.

MONOTREMATA, an order of mammals belonging to the subclass *Prototheria* (q.v.) and represented by the duckbill (q.v.) of Australia and Tasmania, and the spiny anteaters (see ECHIDNA), the range of which extends into New Guinea. In many respects they recall the *Sauropsida* and especially the birds, a fact reflected in the name *Ornithodelphia* sometimes applied to them. The most marked of these peculiarities are the obliteration of the sutures of the skull, the possession of a terminal canal (cloaca) into which both the digestive tract and the urogenital organs empty; the possession of a well developed coracoid bone; and the fact that they do not, like other mammals, bring forth living young, but lay eggs. After the eggs are laid they are transferred to a temporary pouch beneath the abdomen, where they hatch and the young are nourished by the mammary glands.

MONOTYPE. See COMPOSING MACHINES.

MONOXIDE, *in chemistry,* a compound consisting of one atom of oxygen united to one atom of another divalent substance, or of one atom of oxygen united to two atoms of some other monovalent substance. The word is used when it is necessary to distinguish two or more states of oxidation of the same substance. Thus CO is called "carbon monoxid," in distinction CO_2, which is called "carbon dioxid." Similarly Na_2O is "sodium monoxid," while Na_2O_2 is "sodium dioxid." See OXIDE.

MONREALE, mŏn'rā-ä'lā, Italy, town in the Sicilian province Palermo, five miles southwest of Palermo city and connected with it by surface car tracks. It is the seat of an archbishopric, has a well-preserved cathedral (built 1174–89) with old bronze doors and beautiful mosaics, monumental graves of Normanic kings; also there is a Benedictine abbey dating from the 12th century with a magnificent cloister of 216 mosaic pillars and large library. Among its other public edifices are a gymnasium and a lyceum. It has about 24,000 inhabitants.

MONRO, mŭn-rō', **Alexander,** Scottish anatomist: b. London, 8 Sept. 1697; d. Edinburgh, 10 July 1767. He studied at Edinburgh, afterward in London under Cheselden, and still further both in Paris and Leyden, at the former under Bouquet, and at the latter under Boerhaave. On his return to Edinburgh in 1719 he was made professor of anatomy and surgery to the surgeon's company; in 1720, the first university professor of anatomy, though not inducted till 1725. He attended the wounded on the field at Prestonpans (21 Sept. 1745), and was an accurate observer, having studied the effect of the presence of solid bodies in the vermiform appendix, and otherwise anticipated later views. He resigned his professorship in 1764. His principal work is 'Osteology, a Treatise on the Anatomy of the Human Bones' (1726), once a popular textbook.

MONRO, Alexander, known as Secundus; Scottish anatomist: b. Edinburgh, 20 May 1733; d. there, 2 Oct. 1817. He was son of Alexander Monro, called Primus (1697–1767) (q.v.). Educated at Edinburgh University (M.D. 1755), he also studied on the Continent, and in 1759–1808 lectured at Edinburgh. In 1783 he described the communication between the lateral ventricles of the brain, known as the foramen of Monro. He published 'Three Treatises on the Brain, the Eye, and the Ear' (1797) and other medical works.

MONRO, Alexander, known as Tertius, Scottish anatomist: b. Edinburgh, 5 Nov. 1773; d. Craiglockhart, near Edinburgh, 10 March 1859. He was the son of Alexander Monro (1733–1817) (q.v.). He obtained his M.D. at Edinburgh in 1797, was appointed conjoint professor with Monro Secundus of medicine, surgery and anatomy, and in 1817–46 was sole professor. His works include 'Observations on Crural Hernia' (1803), and other publications.

MONRO, Charles Carmichael, British general: b. 15 June 1860, entered the army in 1879 and served in India and South Africa with distinction. In 1914 he commanded the 2nd Division at Aldershot. The next year he was made lieutenant-general and in September succeeded Sir Ian Hamilton as Commander-in-Chief of the Dardanelles campaign.

Under his direction the Allied troops were withdrawn from their untenable position on the Gallipoli Peninsula without appreciable loss. Sir Charles was made commander of the 1st Army in France in 1916, and Commander-in-Chief in India the same year, serving until 1920. He received the rank of General in 1917. From Sept. 1923, until he retired in 1928, he was Governor and Commander-in-Chief at Gibraltar. He was created a Grand Commander of the Order of Bath in 1919, and 1st Baronet Monro in 1921. He died 7 Dec. 1929.

MONROE, Harriet, American author: b. Chicago, Ill., 23 Dec. 1860. She was graduated from the Visitation Academy, Georgetown, D. C., in 1879 and has since devoted herself to literature. In 1889 she wrote the text of the cantata given at the opening of the Chicago Auditorium and in 1891 wrote by request of the committee the 'Columbian Ode' which was sung at the dedicatory ceremonies at the World's Columbian Exposition in 1892. She has published 'Valeria and Other Poems' (1892); 'John Wilborn Root — a Memoir' (1896); 'The Passing Show — Five Modern

Plays in Verse (1903); *You and I* (poems) (1914); *The Difference and Other Poems* (1924); *Poets and Their Art* (1926); *Chosen Poems, a Selection from My Book of Verse* (1935). In 1912 she established and became editor of *Poetry.*

MONROE, James, 5th president of the United States: b. Westmoreland County, Va., April 28, 1758; d. New York, N.Y., July 4, 1831. He served as a youth of eighteen in the Revolutionary forces, but he withdrew from army service in 1780, and as a student of law formed a connection with Thomas Jefferson, then governor of Virginia. The bond between the two men became a close one, and it was as Jefferson's protégé that Monroe entered politics.

After a year in the Virginia legislature, Monroe was elected in 1783 to the Congress of the Confederation where he served for more than three years. There he made himself particularly conspicuous by his strong support of the interests of the West and by his vigorous opposition to John Jay's proposal to waive American claims to the navigation of the Mississippi in exchange for a commercial treaty with Spain. He did not participate in the great constitutional convention of 1787, and, when elected a delegate to the Virginia ratifying convention of 1788, he was one of the leaders of the opposition to affirmative action. When once the Constitution was adopted, however, Monroe accepted the result, and almost immediately entered national politics. In 1790 he was elected a senator of the United States; in the Senate he represented the anti-Federalist point of view.

Partisanship, and partisanship of a rather injudicious and violent kind, is characteristic of Monroe's career at this stage. This is clearly demonstrated in his mission to France in 1795 and 1796. In 1794 the George Washington administration nominated John Jay as minister to London, with a view to a settlement of the many outstanding difficulties with Great Britain. Monroe opposed the mission, and the president, with a view to holding the balance even between the great European rival nations, named him as envoy to France. At the very least, he behaved on this mission with singular imprudence. He made speeches which went beyond the bounds of diplomatic discretion; he gave assurances to the French government that he had no right to give; he criticized in private letters the administration which he served; and he even went so far as to assure the Directory that matters might go better after the next presidential election. He was finally recalled.

Monroe's errors nonetheless never lost him the confidence of his Virginia constituency. In 1799 he became governor of his state, and he held this post until 1802. Then came the famous diplomatic mission to France that resulted in the purchase of Louisiana. Monroe's role, however, in this purchase was really a subordinate one. He went to France to negotiate, along with Robert R. Livingston, the regular American representative, a treaty which would assure to the United States the navigation of the Mississippi and the island of New Orleans. Before Monroe arrived in Paris, the astonished Livingston had been offered, not the island of New Orleans, but all the vast territory which had just been ceded to France by Spain, and had signified his willingness to negotiate on this basis. Monroe, however, not only participated in the details of negotiation but was ready to transcend his instructions and to associate himself with this bold and wholly unauthorized purchase. He deserves credit for this fact.

There were diplomatic frustrations ahead of him. He was sent to Madrid, Spain, after the completion of the French negotiations, to negotiate with the Spanish government with regard to West Florida, the title to which was ill-defined in the Louisiana treaty. There he was made to cool his heels for months, and accomplished nothing. His next mission was to London. In association with William Pinkney, he negotiated a treaty which made numerous concessions to Great Britain on the pending issues of neutral trade and hence was repudiated by the administration of Jefferson. He returned to the United States at a low point in his career and his attempt to rehabilitate himself politically as a presidential candidate in the campaign of 1808, ended in stark failure.

It argues greater strength in Monroe than appears on the surface that he was soon active again. He was elected governor of Virginia in 1811 and was shortly thereafter called by President James Madison to the office of secretary of state, an office which he held for six years. He was one of those who shared the rising feeling of resentment against British arrogance at sea and he appears to have written the report to the House of Representatives, on which the declaration of war of June 1812 was based. But early in the struggle he was ready to accept Russian mediation and he deserves some credit for the very able peace delegation that was sent abroad in 1813. He cannot be said, however, to have played more than a subordinate role in the negotiations that ended the war.

In the congressional caucus of 1816 Monroe was nominated by the narrow margin of eleven votes over his rival, William H. Crawford, and in the fall of that year was elected to the presidency. He was to be re-elected to that office virtually unanimously in 1820 in a period of depression and to leave office at the very height of his prestige. Those who depreciate him (and there have been not a few) will have to take account of the extraordinary culmination of his long public career.

Monroe began his administration by drawing about him one of the strongest cabinets in the history of the country. He rose above sectional prejudice in choosing John Quincy Adams, the atrabilious New Englander, as his secretary of state; and Adams is considered by most students of diplomacy the greatest of the American secretaries. He named his rival, Crawford, as secretary of the treasury. The brilliant John C. Calhoun took the war department, and William Wirt, one of the most eminent lawyers of his day, the attorney generalship. This remarkable team served throughout the two administrations without a break.

Monroe's theory of the presidency, the prevailing theory at the time, circumscribed his role. He did not conceive of himself as a legislative leader. He left legislation very largely to the Congress. Yet, when legislative issues came up to him, he met them, and he showed both firmness and flexibility. In the great debate on the Missouri Compromise he facilitated the final agreement by making it clear that he would refuse to sign any bill which did not admit Missouri as a slave state. At the same time, despite

doubts as to the constitutionality of the measure, which excluded slavery from the territory north of 36°30′, he permitted it to become law.

On the much discussed question of internal improvements, he began by arguing that the Constitution did not empower Congress to carry out such improvements. But he recommended an amendment to cover the point, and in 1822 he so far modified his stand as to declare that Congress could appropriate money for any purpose if such appropriations were for the purposes of common defense and of general, not local, national, nor state, benefit. He signed the first harbor act in 1823 and the far more important Survey Act of 1824 which laid out an elaborate program for the future.

The great achievements of his administration were in the field of foreign affairs. The acquisition of Florida from Spain in 1819 was, it is true, largely the work of Adams. But Monroe supported his secretary in the negotiations and, in particular, he stood with the New Englander against the rest of the cabinet when in 1818 the impetuous General Andrew Jackson invaded Florida, jeopardizing the discussions then in progress. Monroe refused to rebuke Jackson and gave his approval to the strong stand taken by the secretary in the note to Spain of November 1818. It may well be that this stand actually facilitated the final outcome by convincing the slow-moving Spanish government that it had better make the best of a bad business and cede Florida before that province was wrested from it.

In the question of the Spanish colonies Monroe played an important role. He was, from the first, very sympathetic with the movement for independence in these colonies. He wished to recognize the new states at an early date but held his hand in order not to jeopardize the negotiations with Spain over Florida. When these negotiations were concluded, he acted. And he went further. When word came in the summer of 1823 that there was some danger of intervention by the continental European powers in the interests of Spain, he prepared the great document which bears his name, the Monroe Doctrine. It was he, not Adams, who took the initiative in warning Europe that any interference on the part of Old World states would be dangerous to our peace and safety. While the form of the annual message of December 2, 1823, in which this principle was laid down, was influenced in part by the secretary—in particular in the clear line which it drew between Europe and America—the initiative in this matter was the president's.

It is true that the brave words then penned were in part modified in 1824 when, in an exchange of notes with the Colombian government, Adams qualified the stand of the United States and made it clear that positive action might depend on an understanding with Great Britain. But the message itself became one of the most fundamental documents in the field of American foreign policy and the source of many renewed assertions of the principle which it laid down. Given the circumstances, and having regard in particular to the limited physical power of the United States in 1823, it was a very bold pronouncement indeed.

At the expiration of his second presidential term, Monroe returned to Virginia. He presided over the constitutional convention of 1828 where he opposed the widening of the suffrage, and showed very little interest in the question of slavery. Shortly after he went to live with his daughter in New York, and there he died on July 4, 1831.

Monroe was by no means regarded as commonplace by his contemporaries. The longer his term of service, the greater became the number of his admirers. Jefferson and Madison, Calhoun, Thomas Hart Benton and Adams, all spoke in praise of him, and perhaps it should be said of the last of these men that praise from Adams was praise indeed. Monroe was never a brilliant man. But he grew with responsibility, and his years in the presidency exhibited sound judgment and genuine statesmanship. No mere mediocrity could have left behind so many favorable judgments from so many persons of diverse views and temperament. Not, perhaps, a great president of the United States, he must be regarded as one of the most useful and successful. See also MONROE DOCTRINE, THE.

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MONROE, Paul, American educator: b. North Madison, Ind., June 7, 1869; d. Garrison, N. Y., Dec. 6, 1947. He graduated from Franklin College in Franklin, Indiana, in 1890 and received a Ph.D. degree from the University of Chicago in 1897, in which year he became a history instructor at Teachers College, Columbia University. He was professor of education there from 1902 to 1935, director of the School of Education (1915–1923), a founder and president of the China Institute in America, and president of Robert College and the American College for Girls in Istanbul, Turkey (1932–1935). A world renowned authority on the history of education, he edited the *Cyclopedia of Education* (5 vols., 1910–1913).

MONROE, mûn-rō, rural town, Connecticut, in Fairfield County, ten miles north of Bridgeport, on the Housatonic River. Settled about 1775, it was incorporated in 1823. Its government is by town meeting. Pop. (1950) 2,892.

MONROE, city, Georgia, in Walton County, 46 miles east of Atlanta; altitude 950 feet. It is served by the Georgia Railroad. The products of the surrounding agricultural area are cotton, corn, poultry, dairy and beef cattle. Manufactures include cotton cloth, work garments, fertilizer, cottonseed oil, and brooms. First settled in 1818, the city was incorporated in 1821. The government is by mayor and council. Pop. (1950) 4,560.

MONROE, city, Louisiana, and Ouachita Parish seat, altitude 82 feet, on the Ouachita River, 75 miles west of Vicksburg, Miss. It is served by the Missouri Pacific, Illinois Central, Arkansas and Louisiana Missouri railroads, and the Delta Air Lines. It is 97 miles east of Shreveport by rail. There is also water transportation via the Ouachita River.

With agricultural surroundings, the city stands also in one of the largest natural gas fields in the United States (discovered in 1916). Forests are nearby and lumber milling is an important industry. Manufactures include carbon black, chemicals, paper, paper bags, oak flooring, cooperage products, awnings, cottonseed oil, brick and tile.

The first settlement in 1785 was called Fort Miro. The name was changed to Monroe in 1818. Incorporated as a city in 1900, it is governed by a commission. Pop. (1950) 38,572.

MONROE, city, Michigan, and Monroe County seat, on Lake Erie at the mouth of the Raisin River, 41 miles southwest of Detroit, 18 miles north of Toledo, Ohio. It is served by the Detroit and Toledo Shore Line, the Michigan Central, New York Central, Pennsylvania, Chesapeake and Ohio, and Pere Marquette railroads. The harbor is one of the most modern on the Great Lakes.

Monroe is in a fertile farming region and is an important distributing point for a large section of the southeastern part of the state. Its manufactures are varied. They include paper products, fiberboard, auto parts, filing equipment, and beverages. There are limestone quarries, fisheries, and nurseries nearby.

When first settled (about 1784) by migrants from Canada, the place was known as Frenchtown, and here on Jan. 22-23, 1813, the Battle of Raisin River took place (see FRENCHTOWN, MICH., BATTLE OF). In 1815 the name was changed, in honor of President Monroe. It has been the county seat since 1817. The city was chartered in 1837 and the government is administered by a mayor and six commissioners, all elected officials. Pop. (1950) 21,467.

MONROE, city, North Carolina, and Union County seat; altitude 595 feet; 25 miles southeast of Charlotte; on the Seaboard Air Line Railroad. It is in a diversified farming area. Products include small grains, dairy and beef cattle, poultry, and cotton. Manufactures include small garments, cotton yarn, fertilizer, brick and tile, cottonseed oil, and hosiery.

Marshal Ferdinand Foch of France visited the city on Dec. 9, 1921, to decorate the colors of the 5th and 17th Field Artillery regiments from Fort Bragg with the fourragère of the Croix de Guerre. Settled in 1751, the city was incorporated in 1844. It has city-manager government. Pop. (1950) 10,140.

MONROE, city, Wisconsin, and Green County seat, altitude 1,040 feet, on the Chicago, Milwaukee, St. Paul and Pacific, and the Illinois Central railroads, 35 miles south-southwest of Madison. Located in the midst of a rich dairy-farming region, the city distributes for the farmers millions of pounds of butter and cheese annually, and ships quantities of condensed milk. Swiss immigrants, a colony sent out by the Canton of Glarus, brought to the Green County dairy-farm region the art of making Swiss cheese, and later comers introduced other varieties.

Monroe's notable buildings are the Masonic Temple, the courthouse, and the public library. Monroe was incorporated as a village in 1840, as a town in 1855, and as a city in 1882. It has mayor and council. The water supply system is municipally owned. Pop. (1950) 7,037.

MONROE DOCTRINE, The. The Monroe Doctrine was first enunciated by President James Monroe in his message of Dec. 2, 1823; but it owes its origin to ideas which go back considerably further in time, and in particular to the idea that the interests and ideals of the New World are different from those of the Old. This conception is to be found in some of the writings of the Revolutionary period; it is implicit and explicit in George Washington's famous Farewell Address which warns against close political association with European states, and again in the language of Thomas Jefferson's first inaugural; it possessed indeed a striking validity at a time when most of Europe was monarchical and reactionary, when American institutions represented, as they did, new tendencies toward republicanism and democratic liberalism, and when the breadth of a great ocean made for the separateness of the United States from Europe. What may be described as American isolationism was already well developed when Monroe sent to Congress his famous message.

The Monroe Message.—The message consisted of two different pronouncements. The first of these grew out of a controversy with Russia with regard to the northwest coast of America. The Russian government had in 1821 promulgated a ukase closing that coast to the commerce of other nations and forbidding the ships of such nations to approach within one hundred Italian miles of the shore. This decree was contested by the United States. In the course of the negotiations Secretary of State John Quincy Adams, who had long been a vigorous opponent of colonialism, declared that "the American continents, by the free and independent condition which they have assumed and maintained, are henceforth not to be considered as subjects for future colonization by any European powers." This phrase was taken over by the president and incorporated in his annual message of Dec. 2, 1823.

The second part of the message related to the former Spanish colonies in America. These colonies had revolted in the second decade of the century, and their independence had been recognized by the United States. In the summer of 1823 word arrived in Washington that the European powers might hold a congress on the colonial question, a congress which, if it followed previous European precedents, might result in armed intervention. At the same time the language of Czar Alexander I occasioned some concern. The British government had made overtures to Richard Rush, the American minister, suggesting a joint declaration on the whole problem. The matter was debated at length in the cabinet meetings of November 1823. Monroe, acting on his own initiative, drafted a statement in his message which declared, with regard to the former Spanish colonies, that "we [the United States] could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny, by any European power, in any other light than as the manifestation of an unfriendly disposition towards the United States." The warning, we now know, was unnecessary, since no aggressive designs existed. But it needed considerable courage to pronounce it, and to do so without waiting for any understanding with Great Britain.

The message of December 1823 was received with much acclaim in the United States, and with natural resentment and perhaps contempt (con-

sidering the meager basis of military and naval force on which it rested) by European powers. In the years immediately following 1823, the Monroe administration resolutely refused to transform it into an alliance with any South American state, though on four occasions appeals came to do so. Moreover, when in 1826 the question of sending delegates to the so-called Panama Congress arose, a congress projected by Simón Bolívar with regard to closer cooperation between the American republics, opinion in the United States was seen to be emphatically hostile to any political understanding. For a time, indeed, Monroe's message —after all, relating to a specific and immediate problem—seemed hardly likely to become a great American diplomatic principle. It was largely ignored for almost two decades. In the 1840's the situation changed.

Its Application in the 1840's.—The intrigues of Great Britain and France to prevent the annexation of Texas to the United States, the quarrel with Great Britain over Oregon, and the fear of British purposes in California led in the 1840's to the revival of the pronouncement of 1823. President James K. Polk gave the most striking, though by no means the first, expression of this revival in the message of Dec. 2, 1845, in which he warned not only against armed intervention but also against diplomatic intervention based on the principle of the balance of power, and at the same time stressed the special applicability of the Monroe Doctrine to North America.

The Polk message was well received, but like that of 22 years before, it was not accorded congressional sanction and produced little effect abroad. In 1848 the president reiterated his statement, suggesting that the Monroe principle forbade the assumption by England or Spain of a protectorate over Yucatan, and might lead to American control of that province. Here for the first time the dogmas of 1823 became the excuse for a proposed measure of expansion. No action was taken, however.

The president's proposal with regard to Yucatan led to a great debate in which John C. Calhoun, a member of the Monroe cabinet in 1823, took strong grounds against erecting into an absolute principle what he declared was a specific declaration aimed at an immediate and present danger a quarter of a century before. This tendency to avoid commitment to a doctrine was further exemplified in the attitude of the Whig administrations of Zachary Taylor and Millard Fillmore towards the British claims of sovereignty in Central America. In the negotiations which culminated in the Clayton-Bulwer Treaty of April 19, 1850, the name of Monroe was never mentioned, though the treaty bound the British government to abstain from further colonization in the area of Central America.

The Doctrine as National Dogma.—But such a position could not be long maintained. When new controversies arose under the pact, the Democrats proceeded to invoke the Monroe Doctrine, and in the negotiations of the 1850's, which terminated in new agreements at the end of the decade, the message of Monroe was gradually elevated, not into a partisan, but into a national dogma. It is in this period that the word "doctrine" first appears; and both parties now paid tribute to it. Moreover, it began to become known abroad; and though Lord Clarendon, the British foreign secretary, refused to admit its validity when it was brought to his attention, it was dealt with more respectfully by so eminent an Englishman as Benjamin Disraeli.

The period of the Civil War saw the Monroe Doctrine sharply challenged. In the spring of 1861, Spain reasserted its sovereignty over the Dominican Republic in the Caribbean. Secretary William H. Seward at once invoked the Monroe principle in a blustering note, and received a sharp rebuff. With the victory of Northern arms, however, and with the disastrous failure of Spanish arms in the new Spanish colony, the tone of the government in Madrid changed, and evacuation took place in 1865.

Still more dramatic and fundamental was the course of events in Mexico. Taking advantage of the divided Union, the Emperor Louis Napoleon managed to set up in Mexico an imperial government under the Austrian Archduke Maximilian. In this case Seward again left no doubt of the displeasure felt by the United States. But, taught by his earlier experience, he did not invoke the Monroe Doctrine by name, and indeed maintained a rather suave opposition until the victory of the North freed his hands.

With the close of the Civil War, the sentiment for the invocation of Monroe's dogma grew by leaps and bounds. The situation might have been a ticklish one, but Secretary Seward handled it with superb address. He was aware of the opposition in France to the Mexican enterprise, and of the strain which it imposed on French finances. He was aware, too, of the heroic resistance of the Mexicans themselves. In a series of skilful diplomatic notes, he raised his tone bit by bit, and at one and the same time succeeded in preventing any rash action at home while he increased the pressure on the government in Paris. By the end of 1865 it was apparent that the French would withdraw from Mexico. There can be no question that the attitude of the United States caused the French much anxiety, and contributed in some degree to the eventual decision. To the American people the outcome of the Mexican imbroglio was the vindication of the principles of 1823.

Once rooted as national dogma the doctrine was more and more liberally interpreted, often in ways which would have seemed strange to Adams and Monroe. Before 1870 attempts had been made to link the idea of non-intervention by Europe in American affairs with the principle that territories in the New World could not be transferred from one European power to another, but this principle was most definitely asserted and most closely connected with the Monroe Doctrine in the pronouncement of President Ulysses S. Grant in 1870 when urging upon the Senate the annexation of Santo Domingo. Thereafter it was repeatedly brought forward when cessions of territory were imminent, though it appears to have passed unnoticed at the time of the cession of the little island of St. Bartholomew by Sweden to France.

In the late 1870's and early 1880's the Monroe Doctrine was frequently cited as forbidding the construction by European powers of a trans-Isthmian canal across Panama, and still more as implying that any such a canal must be under the exclusive guaranty of the United States. Presidents Rutherford B. Hayes and James A. Garfield both insisted upon this point; and in the course of time American opinion compelled the repeal of the Clayton-Bulwer Treaty of 1850 (which looked towards joint British and American control of any canal constructed) by the signing of the

second Hay-Pauncefote Treaty (1901), by which Great Britain conceded the American point of view.

A still more extraordinary extension of the original doctrine was made by Grover Cleveland in his second administration when, in the name of Monroe, he demanded (1895) that the British government arbitrate a dispute with Venezuela over the boundary between that country and British Guiana, and threatened to appoint a commission to determine the line if the British did not accept his demand. This extreme position naturally provoked severe criticism across the seas, and for a time the situation was a touchy one. But on both sides of the Atlantic a more pacific sentiment prevailed, and the matter was finally settled by an arbitration agreement, the terms of which virtually conceded to Great Britain in advance much of what she claimed. It is to be noticed that in the course of this dispute Lord Salisbury, the British foreign secretary, flatly denied, in a note to the American government, that the Monroe Doctrine was, in any sense, international law.

The Venezuela Blockade of 1902.—The turn of the century saw a new and interesting development of the principles of 1823. Down to this time, these principles had never been invoked to prevent an Old World state from taking punitive action against a New World state considered guilty of wrongdoing. But in the Venezuela blockade of 1902 by Great Britain, Germany, and Italy—a blockade which, despite assertions to the contrary, may be said to have been undertaken without any thought of territorial aggrandizement—American public opinion asserted itself strongly. In the face of this public opinion British statesmen, both of the ministry and of the opposition, for the first time recognized the validity of the Monroe Doctrine. The German government was less adroit; it had to deal with its own nationalists, who were in general venomously antagonistic to the principles of 1823. It made no such obeisance as did the British, and this fact may well have had an influence over the future course of events and have helped to fix in the American mind a prejudice against the Reich which was to be a powerful factor when war broke out in 1914.

The Venezuela blockade had important effects in the United States. President Theodore Roosevelt had originally consented to the blockade by the allied powers for the purpose of collecting debts which Venezuela owed their nationals; but he became very nervous before an arrangement was made, and as a result he was soon to give a new twist to the Monroe Doctrine itself. Before commenting upon this it is worth while noting that the legend that Roosevelt compelled arbitration by threats of direct action directed against the German government has now been pretty well exploded. The dispute had hardly begun before it was put in the way of settlement.

The Roosevelt Corollary.—The area of major sensitiveness with regard to the principles of 1823 had always been the Caribbean and the Gulf of Mexico. Indeed, it is a striking fact that in every case where these principles were seriously invoked, a country in this particular area was involved. It is not strange therefore that what became known as the Roosevelt Corollary to the Monroe Doctrine was first enunciated in regard to the Dominican Republic.

This little state had been a prey to almost constant internecine strife. It also had floated various loans abroad, but had become bankrupt. There was thus a possibility that its distraught condition might provoke intervention by some European state. Anticipating such action, as early as 1904 in his annual message President Roosevelt stated that "chronic wrong-doing, or an impotence which results in a general loosening of the ties of civilized society" might, in the Western Hemisphere as elsewhere, lead to action by a strong power, and that, under the Monroe Doctrine, that power would have to be the United States.

Following out this theory, and perhaps bringing some pressure to bear upon the Dominican government, the president had negotiated an agreement for the control of the customs in the winter of 1905. The Senate balked, but Roosevelt went ahead on the basis of an executive agreement, and two years later the treaty was ratified. It set a precedent for others that were to follow.

The Roosevelt Corollary, in its first application, had resulted only in customs control. But it was soon to be carried further. The William Howard Taft administration negotiated a similar agreement and induced American bankers to make a loan to the Nicaraguan government. When its policy seemed jeopardized, marines were landed, and remained in occupation for more than a decade. In Haiti, where again American banking interests had been encouraged to take a part in the affairs of the republic, disorders and the fear of German or French action led towards intervention in 1915. In the Dominican Republic, the breakdown of government brought about American control in 1916. Thus the Roosevelt Corollary led on to direct military occupation of the territory of assumedly independent states.

The question of the Monroe Doctrine came up in connection with the drafting of the Covenant of the League of Nations at Paris in 1919. In order to placate domestic opposition President T. Woodrow Wilson found it necessary to incorporate in the Covenant itself an article declaring that nothing therein contained should affect the validity of "regional understandings" such as the Monroe Doctrine. The phrase used was a cloudy one, and it did not satisfy the president's American foes, who insisted upon further reservations to the peace treaty on the matter. That it was approved by the other signatories is, however, some indication of the increasing acceptance of the position of the United States.

The Doctrine had by this time become an object of suspicion and dislike rather than cause for gratitude in Latin America. As early as 1913, Hiram Bingham (the explorer) had suggested that it was an obsolete shibboleth. The statement was an extreme one, but it contained a germ of truth. The states of the New World were more afraid of interference on the part of the United States than they were of any action by Europe. American statesmen found themselves on the defensive in discussing the famous dogma. Secretary of State Charles Evans Hughes attempted to re-define it in terms that would remove apprehension and to justify American intervention, or interposition, as he preferred to call it, on other grounds. But the tide of opposition to American hegemony continued to swell throughout the decade of the 1920's, and it was particularly evident at the Pan American Conference of 1928. The course of events suggested a change in American policy.

The Clark Memorandum.—The withdrawal of the United States from the Dominican Republic in 1924 was a first step. But withdrawal from Nicaragua in 1925 was followed by a new intervention, and it was not until the Washington Conference on Conciliation and Arbitration in December 1928 that a really decisive move was taken in the famous Memorandum on the Monroe Doctrine (drafted by J. Reuben Clark) which definitely repudiated the Roosevelt Corollary. In January 1929 the Senate Committee on Foreign Relations, in transmitting the Kellogg-Briand pact for the outlawry of war, added a gloss, or separate report, in which the Monroe Doctrine was conservatively interpreted and based upon the principle of self-defense. In 1930 the Clark memorandum was transmitted to other governments, thus emphasizing the fact that it represented official policy.

But this was only the beginning, in a sense, for in 1933 at the conference of Montevideo, Secretary Cordell Hull put his name to a protocol which bound the United States not to intervene in the internal or external affairs of any American state. There was, indeed, a reservation to this pledge reserving the rights of the United States under international law. But in 1936 at Buenos Aires a new protocol was signed, this time without any qualification whatsoever. The connection of the principles of 1823 with a right of intervention was thus brought to an end.

The Doctrine and Collective Defense.—One hears relatively little of the Monroe Doctrine in the early 1930's. There existed in these years little danger to the status of the New World, and the prevailing tone of American policy, preoccupied as we were with internal concerns, reflected a certain indifference to questions of foreign affairs. But the rise of Adolf Hitler to power in Germany was to alter the situation materially. As a result there took place a process which has sometimes been called the internationalization of the Monroe Doctrine. The phrase is in a sense an inaccurate one, since there is no reason to believe that the American government would hesitate to assert alone and independently the principles of 1823 if it felt the necessity of so doing.

It is true, on the other hand, that measures were taken which looked to collective defense, and that these measures alter the context in which the doctrine would be invoked. Thus, for example, at the conference of Buenos Aires in 1936, an agreement was signed by the states of Latin America calling for consultation if they were threatened by any European power. In 1938, this agreement was supplemented by another, which provided for a meeting of the foreign ministers of the American states on the call of any one of them. Much more important measures were taken in 1940.

The fall of France naturally produced a strong reaction in the United States and led to the adoption of resolutions by both houses of Congress expressing opposition to the transfer of the European colonies of any power (France and Holland were of course meant) to any other power. The action of Congress was supplemented by the Conference of Havana, which drew up an elaborate scheme to meet the possible danger of any such transfer, and at the same time, going far beyond the no-transfer principle, declared that an attack on any one American power would be regarded as an attack on all. From these declarations were deduced others. At Chapultepec in 1945, the principle of collective action in case of external attack was re-stated, and various measures enumerated which would be taken in case of aggression. At Rio de Janeiro in 1947, the Inter-American Treaty of Reciprocal Assistance stated unequivocally that aggression against an American state would, on the two-thirds vote of the representatives of the states, be met with sanctions of various degrees of severity. In the meantime, between the Chapultepec and the Rio meetings, the Charter of the United Nations had established a world organization based upon the idea of common action against a law-breaking state. The original purposes of the Monroe Doctrine had thus received a far wider than national sanction.

In the World War II period the Monroe Doctrine served a useful purpose in a way hardly thought of before. The establishment of a base for American troops in Greenland, a Danish colony, in the spring of 1941, for example, was related to the principles of 1823. Monroe would certainly have been surprised at any such application of his message.

Significant Generalizations.—What significant generalizations stand out with regard to the Monroe Doctrine? Fundamentally, in 1823 the president placed his warning to Europe on grounds of national security. Yet it is not easy to see that the safety of the United States would have been jeopardized by what took place, let us say, in Patagonia or in Chile. In extending his principle so far, the president perhaps might be said to have fallen a victim to that tendency to over-generalization which not infrequently has asserted itself in American foreign policy. In a sense, future statesmen were to recognize this fact. The practical application of the doctrine, as already mentioned, was almost invariably in the region of the Caribbean, where there were security interests of the most patent kind.

Were the dangers which the doctrine was designed to prevent real dangers? As already pointed out, there seems to have been no real peril in 1823. But British acquisitive instincts in the Caribbean in the 1850's did run counter to the interests of the United States. So, too, did Napoleon III's activities in Mexico. After the American Civil War there was never a moment when there was serious danger of European aggression with an eye to conquest against an American state. European colonial ambitions were satisfied elsewhere, especially in Asia or in Africa. There were Germans, no doubt, especially German naval men, who dreamed of bases in the New World and of the extension of German influence. But the German Foreign Office was extremely cautious in the first years of the 20th century, and the danger from Germany was temporarily extinguished by the events of World War I. In the 1930's and the 1940's Adolf Hitler had objects of ambition other than Latin America.

Was the Monroe Doctrine gratefully accepted by the states to the south? To some extent, and in some specific instances, yes. It was certainly invoked by some of them when it served their interests. But, after the end of the 19th century, it was as often associated with American hegemony as with American benevolence. In this context it was an object of concern rather than a matter for admiration. Yet the principle at its base was sound, and it has been more and fully recognized in the association of the states of the New World together in the war against Hitler,

and in the compacts which have followed that war. Were a real danger again to arise, in terms of actual physical aggression, it would undoubtedly once more figure prominently.

Finally, the Monroe Doctrine illustrates a general tendency that seems to inhere in American diplomacy. This tendency is towards large and sweeping generalization which captures the imagination of the mass of the people and has the advantage of being easily assimilated and of easily becoming a focus for popular support. The task of statesmanship is to relate such generalization to the actual interests of the United States. As this sketch demonstrates, the task has been well performed. In its various manifestations, the Monroe Doctrine has usually been wisely and profitably applied. It has given a broad popular and, in a sense, a broad moral basis to the specific objectives of American diplomacy. See also UNITED STATES—*38. United States Diplomacy* (Relations with Spain and the Monroe Doctrine).

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MONROVIA, mŭn-rō'vĭ-à, city, California, situated in Los Angeles County, at an altitude of 560 feet, 9 miles east of Pasadena, on the Atchison, Topeka and Santa Fe and the Pacific Electric railways. The surrounding area raises citrus fruit, poultry, and avocados, and the city has packing plants, as well as plants producing water heaters, lumber, paint, gloves, textiles, soap, and dairy products. Monrovia was named for W. N. Monroe, who laid out the city in 1886. It was incorporated in the following year. Government is of the city manager type, and the water supply system is municipally owned and operated. Pop. (1950) 20,186.

MONROVIA, seaport, Liberia, capital of the republic and seat of Montserrado County, situated on Cape Montserrado, just south of the mouth of the St. Paul River. The chief port of the country, it exports rubber, iron, palm kernels and oil, forest products, gold, and cassava. Industry is undeveloped. The town is the seat of Liberia College, founded in 1863, and of the College of West Liberia, and has Roman Catholic and Protestant missions and a general hospital.

Founded in 1822 by the American Colonization Society, Monrovia was named for James Monroe, fifth president of the United States. During World War II a harbor and submarine base were built on Bushrod Island; the harbor became a free port in 1948. Roberts Field, 30 miles east-southeast of the town, was also built during the war; it is used by United States, French, and Spanish airlines. Government is administered by a municipal board appointed by the president of Liberia. Pop. (est. 1952) 15,000.

MONS, môns (Flemish BERGEN), town, Belgium, capital of the province of Hainaut, situated on the Trouille River, 32 miles southwest of Brussels, at the junction of the Condé-Mons Canal and the Canal du Centre. To the southwest are the extensive coalfields of the Borinage, and the town is a shipping center for coal. It also processes sugar and produces leather goods, chemicals, and cotton and rayon textiles. The Collegiate Church of Ste.-Waudru was built in the Gothic style from 1450 to 1600. The town hall dates from 1443–1667, and a belfry with a large carillon from 1662.

Mons was made the capital of Hainaut by Charlemagne in 804. In the 16th, 17th, and 18th centuries it was often the scene of heavy fighting, and the battlefields of Malplaquet (1709) and Jemappes (1792) are nearby. In World War I, the British Expeditionary Force fought its first engagement here, on Aug. 23, 1914. Pop. (official est. 1948) 25,684.

MONSELICE, môn-sâ'lê-châ, commune, Italy, situated in Veneto, 13 miles south-southwest of Padua. It has plants producing shoes, jute, and agricultural implements and processing food. Overlooking Monselice are the ruins of a castle built by Emperor Frederick II in the 13th century, and there is a 13th century cathedral (restored in 1931). Pop. (est. 1951) 16,500.

MONSIGNOR, mŏn-sē'nyôr (Ital. *monsignore,* my lord), a title of honor given by the pope to domestic prelates of the Roman Catholic Church. It is abbreviated Msgr.

MONSIGNY, môn-sē-nyē' **Pierre Alexandre,** French composer: b. Fauquembergues, Pas-de-Calais, Oct. 17, 1729; d. Paris, Jan. 14, 1817. He went to Paris in 1749 and soon entered the service of Louis, duc d'Orléans, first as major-domo, and then as administrator of the duke's estates and inspector general of canals. After studying composition for a few months with Pietro Gianotti, he composed a series of 13 comic operas, the first of which, *Les Aveux Indiscrets,* was produced in Paris in 1759. During the French Revolution he lost his position and was impoverished, but in 1798 he was pensioned by the Opéra-Comique, and from 1800 to 1802 he served as inspector of instruction at the Conservatoire de Musique. In 1813 he became a member of the Académie des Beaux-Arts.

Monsigny was an excellent melodist, but his lack of training prevented him from being a great composer. Among his other works, all of which were highly popular, are *Le Cadi Dupé* (1761); *On ne s'Avise Jamais de Tout* (1761); *Le Roi et Le Fermier* (1762); *Le Déserteur* (1769), his best opera; *Le Faucon* (1772); and *Félix, ou l'Enfant Trouvé* (1777), his last work.

MONSON, mŭn's'n, SIR **Edmund John,** British diplomat: b. Seal, Kent, Oct. 6, 1834; d. London, Oct. 28, 1909. He was educated at Eton and at Balliol College, Oxford University, receiving his B.A. degree in 1855. In 1858 he was elected a fellow of All Souls College and received his M.A. degree. Entering the diplomatic service in 1856, he held various posts as attaché, undersecretary, and consul until 1876, when he was sent on a special mission to Dalmatia and Montenegro. He served as minister to Uruguay from 1879 to 1884, to Argentina and Paraguay in 1884, and to Denmark from 1884 to 1888. Monson was appointed arbitrator of the Butterfield claims be-

tween Denmark and the United States in 1888, Minister to Belgium 1892, Ambassador to Austria 1893, and to the French Republic 1896–1904. He was made a Privy Councillor in 1893. His decision in 1900, in favor of the action of the Danish authorities in 1854–55 at the island of Saint Thomas, disposed of the claims of the two American vessels belonging to Butterfield and Company. In 1903 he received the order of the G.C.V., and was knighted in 1905.

MONSOONS, mŏn-soonz', *in meteorology,* are certain winds, operative from the tropic of Cancer to lat. 7° S., and from the coast of Africa through the Indian Ocean and the Bay of Bengal to Japan and the western Pacific. There are two monsoons, the southwestern and the northeastern. The latter prevails from October to April, and the former from April to October. Monsoons are caused by the unequal heating of the land and water and of the several land masses themselves in the regions which they affect. Independently of their great use in bringing rain to countries which otherwise would degenerate into deserts, they are useful for navigation. As in the case of the trade winds, navigators of sailing vessels plan their voyages to take advantage of the monsoons. Consult Ferrel, W., 'A Treatise on the Winds' (New York 1889).

MONSTERS. See TERATOLOGY.

MONSTRANCE (Lat., *monstrare,* to show), called also *ostensorium* or *expositorium,* the sacred vessel in which, in the Roman Catholic Church, the host is shown to the people, through a glass-covered opening, at benedictions, processions and other solemnities. Its use dates from the institution of Corpus Christi Day (1264) by Pope Urban IV. It was not until after the Council of Cologne 1452 that the consecrated wafer was exhibited to the people, having been previously deposited in the ciborium which enclosed and concealed it.

MONSTROSITY. In anatomy and physiology any deviation in form or function so great as to be noticeable may be termed a monstrosity by the extension of the term. But it is customary to consider as true monstrosities only such deviations from the normal as are excessive. Supernumerary fingers, toes, legs, arms, etc., or the absence of any or all of them from birth are not called true monstrosities. Deviations from the normal in form or function are almost limitless, the study of them being otherwise known as teratology. The subject of human teratology has been systematized by Saint Hilaire and slightly modified by Hirst and Piersol and is as follows: (1) Hemiterata are all abnormal developments which are not true monstrosities, lacking the element of excess, with the exception of excess in numbers referred to. They include, however, anomalies in size such as dwarfs and giants, anomalies in form of head, pelvis, etc., of color such as albinism or melanism, of position, including curvature of the spine, hernia, clubfoot, etc., of continuity, including imperforate esophagus, rectum or vagina. (2) Heterotaxes, which include the anomalous position of heart, liver, etc. (3) Hermaphrodites, which according to the definition of Ahlfeld are those individuals which possess sexual glands both masculine and feminine, but show all possible variations of one sex organ upon the other. (4) True monsters, where there are either more or less than the normal number of legs, arms or there are no heads or rudimentary heads or two or more. This group also contains what are called omphalositic monsters which are embryos attached to an original fœtus and depending on it for what nourishment and development they can get. The best-known type of monsters, those which have been frequently exhibited, are the composite monsters of which the Siamese Twins and the Tocci Brothers are examples. Other illustrations are of children with two bodies joined together at the pelvis but having no legs, and the bodies pointing in opposite directions. There are also terata with two heads and two faces or with one head and two faces like the ancient conception of the god Janus.

It is almost impossible to imagine any deviation in form, function or size which has not been recorded, since the curiosity of mankind has been such as to be attracted from time immemorial to anything in the nature of the marvelous. The composite monsters on record have shown almost all varieties of union of lower extremities and of reduplication of both lower and upper; and of the partial or total reduplication of the entire body, the climax being reached in the twins which are united by only a comparatively small cartilage. Double monsters are either parasitic or independently nurtured as was the case of the Siamese Twins, who lived to the age of 63 years. There are also known triple monsters, one case being recorded by Saint Hilaire of a three-headed child who was born in Italy in 1832.

The very unpleasant side of anatomic teratology has its more cheerful compensation in the records of extraordinary developments in vitality and fecundity and in the recovery of many persons who have suffered accidents or other misfortunes ordinarily found fatal, or who have shown remarkable abilities of adaptation to apparently impossible conditions. For not only do we see the monstrosities of fatness and leanness, the people with elastic skin, the bearded women, etc., but there have been recorded a large number of cases of extraordinary ability to function in spite of adverse circumstances. Examples of teratology of function are seen in suspended animation, a case being recorded of a man who could, apparently at will, cause his heart to stop beating. He succeeded once in prolonging this inactivity of the heart for about 30 minutes. The function appeared to be restored automatically. A post mortem examination of his heart showed nothing extraordinary. Other illustrations of purely physiological wonders without, however, showing any other abnormality are seen in very high temperature. One case is on record of a man whose temperature ran up to 148° and was between 120° and 125° for five days in succession.

Among anomalies of excess in function are to be included also mental prodigies such as extraordinary memory and other mental functions of which one of the most remarkable was Jacques Inaudi born in 1869 in Piedmont. He had an extraordinary mathematical ability which enabled him to perform mentally operations with numbers in the billions and trillions

MONT, môn, a French word meaning "mountain," found in many place names.

MONT-DE-MARSAN, mônd-mâr-săn′, town, France, capital of the Department of Landes, situated 66 miles south of Bordeaux, at the confluence of two small rivers, the Midou and the Douze, which here form the Midouze. The trade and shipping center of a lumbering area, the town produces furniture, pit props, turpentine, and wax, and has metalworks and meat-preserving plants. There are the ruins of a 14th century donjon. Once the seat of the viscounts of Marsan, the town became part of Béarn in 1256. It was united with the French crown in 1589, on the accession of Henry IV. Pop. (1946) 11,929.

MONT-DE-PIETE, môn-dĕ-pyâ-tā′ (from Ital. *monte di pietà*, bank of pity or piety), a public pawnbroking establishment which lends money on pledges at a low rate of interest, and whose primary aim is philanthropic. *Monts-de-piété* are found in France, Italy, and other Continental countries, but not in Great Britain or the United States, where pawnbroking is a private enterprise.

The development of *monts-de-piété* arose from the need of providing some means whereby poor persons could obtain loans at moderate charges on pledges for which private lenders exacted usurious rates of interest. The first such establishment was founded by the Franciscans in Perugia, Italy, in 1462. By the end of the 16th century the movement had spread to many other Italian cities, notably Turin (1519) and Rome (1539), as well as to Avignon (1577) in France, Nürnberg (1498) in Germany, and Bruges (1572) in Belgium. The sanction of the Roman Catholic Church was given to the new institutions by the 5th Lateran Council in 1515. The principal French *mont-de-piété*, that of Paris, was not founded until 1777. It was closed for a time during the French Revolution, but its monopoly was restored by Napoleon I in 1806. See also GOVERNMENT PAWNSHOPS IN FRANCE; PAWNBROKERS.

MONT-DORE, môn-dôr′ (also known as MONT-DORE-LES-BAINS and LE MONT-DORE), town, France, situated in the Department of Puy-de-Dôme, at an altitude of 3,445 feet, on the Dordogne River, 19 miles southwest of Clermont-Ferrand. The town lies at the foot of the Puy de Sancy in the Monts Dore of the Auvergne Mountains, and is a center of winter sports. Its thermal springs, known since Roman times, attract many summer visitors. Pop. (1946) 2,165.

MONT JOLI, môn zhô-lē′, town, Quebec, Canada, situated in Rimouski County, near the south bank of the St. Lawrence River, 18 miles east-northeast of Rimouski. It is served by the Canada & Gulf Terminal and the Canadian National railways, and has an airport. It is also the starting point and terminus of the scenic highway which runs around the Gaspé Peninsula. The distributing center for a mixed farming and lumbering district, the town has railroad shops and establishments producing aerated waters and metal, wood, and dairy products. Mont Joli has a high school, a college, a convent, and a sanatorium. Pop. (1951) 4,938.

MONT LAURIER, môn lô′rĭ-ā, town, Quebec, Canada, seat of Labelle County, situated at an altitude of 733 feet, on the Lièvre River, 164 miles by rail northwest of Montreal. It is the terminus of a branch of the Canadian Pacific Railway extending from Montreal. The town lies at the foot of Mount Sir Wilfrid in the Laurentian Highlands and is a center of winter sports. There are deposits of mica in the vicinity, as well as good agricultural land devoted largely to the raising of oats, hay, potatoes, and dairy cattle. Near the town is a provincial experimental farm. A large plywood and veneer factory and several sawmills are the leading local industrial establishments.

Founded in 1915, Mont Laurier is the seat of a Roman Catholic bishopric and has a seminary affiliated with Laval University, a classical academy, two convents, the Hôpital Ste. Anne, and a weekly newspaper. Pop. (1951) 4,701.

MONT-SAINT-MICHEL, môn-săn-mē-shĕl′, rocky islet, France, situated in the Department of Manche, on the English Channel, 8 miles southwest of Avranches. A famous seat of learning and pilgrimage resort of Normandy as early as the 12th century, it is now an equally celebrated tourist resort. It consists of a collection of medieval houses, inns, ecclesiastical buildings, and fortifications, grouped on a conical rock 164 feet high and 3 acres in area, in the Bay of St.-Michel or Mont-St.-Michel, at the mouth of the Couesnon River, which here forms the boundary between Normandy and Brittany.

Once a lofty hill in the Forest of Scissy, which was submerged in the 7th century A.D. by a tidal cataclysm, the rock in prehistoric times was crowned by a Celtic temple. It was the Roman Mons Tumba and the *mons in periculo maris* (mount in danger of the sea) of the monastic chroniclers. The Bay of St.-Michel, 15 miles wide at its mouth and 8 miles long from north to south, is nearly dry at low water, but fills with treacherous rapidity at flood tide. In 1875 a dike nearly a mile long was built to connect the rock with the mainland.

Ramparts, towers, and bastions encircle the base of the rock, which has a circuit of about 2 miles, and entrance is made through a gate which opens on a single, narrow, winding street of a small village (pop. 1946, 149) built around the southern slope. The street leads by several flights of stone steps to a fortified abbey on the summit. Crowning the abbey is a church with a 12th century Romanesque nave, a Flamboyant Gothic choir built in 1450–1521, and a façade added in the 18th century. Capping its spire is a statue of St. Michael, which towers conspicuously 256 feet above the wide expanse of sandy bay and low-lying country around.

The abbey was founded in 709 by St. Aubert, bishop of Avranches, and his first chapel, which has been restored, stands on a rocky projection on the north side of the rock. In 1203 the abbey was destroyed by King Philip II (Philip Augustus), and the present buildings were erected between that year and 1264. Mont-St.-Michel was a strategic fortified post during the Hundred Years' War and during the religious wars of the 16th century. It was successfully defended against all assaults by the Order of St. Michael, which was founded in the Hall of Knights of the abbey in 1469. In the 18th and first half of the 19th centuries the fortress served as a prison for political offenders.

Mont-St.-Michel is now one of the protected

historical monuments of France. An elaborate process of restoration after 1863 renewed its ancient strength and beauty. Among the chief features of the Mont are the abbey church, elaborately decorated cloisters, La Merveille, "the marvel," or massive north wall of the abbey, the Salle des Chevaliers, the Châtelet or guardhouse, the crypts with their remarkable columns, the cellars, the dungeons, and the medieval elevator with its enormous hoisting wheel formerly operated by a donkey; and in the village, the ancient parish church, and museum.

MONTAGNA, Bartolommeo, môn-tä'nyä, Italian painter: b. Orzinovi, near Brescia, about 1450; d. Vicenza, Oct. 11, 1523. He settled at Vicenza in 1480, and worked in Padua and Verona; and from 1496 until his death he was again in Vicenza, being the first great master resident there. His work in general resembles the earlier Venetian school, was serious, marked by distinctness, power and severity of drawing, and had harmonious coloring in which a brown gleaming tint was noticeable. The human form was almost always shown as over-muscular. His principal works were the *Madonna and Child* at the Venice Academy, *Ecce Homo* at the Louvre, frescoes in the church of San Nazaro at Verona and an altar piece in the Brera, Milan. In the Johnson collection at Philadelphia he is represented by a *Madonna with Saints* and in the New York Metropolitan Museum by *A Lady of Rank as Santa Bibiana* and a *Madonna and Child.*

MONTAGNAIS (môn-tän-yā) **INDIANS,** a general name applied to several American Indian tribes. One of these, of the Athapascan family in British North America, were Christianized by Roman Catholic missionaries. Another and best-known tribe of this name was of the Algonquian family, and resided along the shores of the Saint Lawrence River. They have practically disappeared in recent years.

MONTAGNARDS, môn-tän-yär (Fr. mountaineers), a popular name in French history, applied in 1793 to the radical democratic party, the leaders in the French Revolution and its excesses. Soon after the fall of Maximilien F. M. I. Robespierre (q.v.) the denominations of "Montagnard" and "Montagne" gradually disappeared from party nomenclature. After the Revolution of 1848 an abortive attempt was made by the extreme party in the National Assembly, under Jean Joseph Louis Blanc (q.v.), to revive the title.

MONTAGU, Charles, Earl of Halifax, English statesman and poet: b. Horton, Northamptonshire, April 16, 1661; d. May 19, 1715. He first attracted notice by his verses on the death of Charles II; and in 1687, in conjunction with Matthew Prior (q.v.), wrote *The Town and Country Mouse,* a parody on *The Hind and Panther,* by John Dryden (q.v.). He was a member of the Convention Parliament of 1689 and supported the claim of William III to the crown. He became a lord of the treasury in March 1692; in 1694 was made chancellor of the exchequer; in 1695 carried out the much-needed recoinage, appointing Newton warden of the mint; and in 1696 he devised the system of exchequer bills. His administration was distinguished by the adoption of the funding system, and by the establishment of the Bank of England. In 1700 he was raised to the peerage, under the title of Baron Halifax. In the reign of Anne he remained out of office, but he actively exerted himself to promote the union with Scotland, and the Hanoverian succession. He was first lord of the treasury on the accession of George I, who created him an earl, and bestowed on him the Order of the Garter. The *Life and Miscellaneous Works of Lord Halifax* were published in 1715, and his poems were included in the edition of *English Poets* by Samuel Johnson (q.v.).

MONTAGU, Edwin Samuel, British statesman: b. Feb. 6, 1879; d. London, Nov. 15, 1924. He was under secretary for India under Lord Morley, 1910, and his first budget speech a few months later in the House of Commons created a highly favorable impression. Early in 1915 he entered the Cabinet as chancellor of the Duchy of Lancaster. He was minister of munitions in the first Coalition government, but retired with Prime Minister Herbert Henry Asquith (q.v.) when a new government was formed by David Lloyd George (q.v.). When Austen Chamberlain (q.v.) resigned the Indian secretaryship in the summer of 1917, Montagu was chosen for the post. He proceeded to India to investigate the political situation of the country in assocation with the viceroy, Lord Chelmsford, with a view to the gradual development of self-government for India. In July 1918 the "Montagu-Chelmsford Report" on Indian constitutional reforms was issued. In the new Lloyd George Cabinet of January 1919 Mr. Montagu was re-installed secretary for India; he retained this portfolio until his resignation in 1922, forced by indiscreet publication of the views of the Indian government respecting Turkey.

MONTAGU, Elizabeth Robinson, English author and society leader: b. York, Oct. 2, 1720; d. London, Aug. 25, 1800. In 1742 she married Edward Montagu, grandson of the first earl of Sandwich, who died leaving her a fortune. To wealth she added literary accomplishments, and these, joined to other personal qualities, enabled her to secure her social leadership. Among her visitors and associates were Lloyd Lyttelton, Samuel Johnson, Horace Walpole, Edmund Burke, Sir Joshua Reynolds, David Garrick, Hannah More (qq.v.), and other celebrated persons. To the gatherings at her house the term blue-stocking (q.v.) is said to have been first applied. Three of the dialogues in Lord Lyttelton's *Dialogues of the Dead* were written by her in 1760. She also wrote an *Essay on the Writings and Genius of Shakespeare, compared with the Greek and French Dramatic Poets* (1769). Much of her correspondence was published (1809–13).

MONTAGU, John, 4th Earl of Sandwich. See Sandwich, John Montagu, 4th Earl of.

MONTAGU, Lady Mary Wortley, English author: b. London, May 1689, d. London, Aug. 21, 1762. She was the eldest daughter of Evelyn Pierrepont, afterward Duke of Kingston. She learned Latin very early, and also became versed in English literature, especially its romance and drama. The Kit-Cat Club (q.v.) by acclamation admitted her to membership. In 1712, without the consent of her father, she married Edward Wortley Montagu, a wealthy Whig scholar, with whom the former had quarreled. On the accession of George I in 1714 Montagu ob-

tained the position of commissioner of the treasury, and the Montagus went to live in London, where Lady Mary's beauty, wit, and vivacity won her a wide circle of friends, among them Alexander Pope. Her *Town Eclogues* (1747) appeared in a pirated edition under the title of *Court Poems* in 1716. In the same year her husband was appointed ambassador to the Porte. Lady Mary accompanied him to Constantinople, where they remained from May 1717 to June 1718. It was during this period that her celebrated *Letters from the East* were written. In Adrianople she learned of the Turkish practice of inoculation against smallpox, and she had her son inoculated. On her return to England she introduced the practice in the face of violent opposition. Resuming her friendship with Pope, she and her husband settled in Twickenham. In 1722, however, she quarreled with the poet, who frequently satirized her thereafter, and she was also attacked by Jonathan Swift in a lampoon published in 1727. In 1739, for reasons never satisfactorily explained, Lady Mary left England to live on the Continent, chiefly in Italy, where she remained until after her husband's death in 1761. Her relations with her husband apparently remained friendly, and she corresponded frequently with her daughter, the countess of Bute. Returning to England early in 1762, she died shortly thereafter.

Lady Mary's letters are marked by wit, graphic power, keen observation, and independence of judgment. They were published in a three-volume edition in 1763. Her great-grandson, the 1st Baron Wharncliffe, edited a three-volume edition of her *Works* in 1837.

Consult Benjamin, L. S., *Lady Mary Wortley Montague: Her Life and Letters* (Boston 1925); Barry, Iris, *Portrait of Lady Mary Montague* (Indianapolis 1928); Cove, J. W., *Admirable Lady Mary; the Life and Times of Lady Mary Wortley Montague, 1689–1762* (New York 1949).

Her son, Edward Wortley Montagu (1713–1776), was a writer and traveler. He published *Reflections on the Rise and Fall of the Antient Republics. Adapted to the Present State of Great Britain* (1759).

MONTAGU, Ralph, 1st Duke of Montagu: b. about 1638; d. March 9, 1709. The son of the 2d Baron Montagu of Boughton, he obtained preferment at the court of Charles II, and in 1669 was appointed ambassador extraordinary to Louis XIV. He became a member of the Privy Council in 1672, and in 1676 was again named ambassador to Louis XIV. In this capacity he helped to arrange English neutrality in the war between the Netherlands and France. Because of political intrigues, he lost his positions in 1678, but as an early supporter of William of Orange was reappointed to the Privy Council in 1689, and in 1705 was created marquis of Monthermer and duke of Montagu.

MONTAGUE, Charles Edward, British journalist and writer: b. London, Jan. 1, 1867; d. Manchester, May 28, 1928. Of Irish parentage, he was educated at Balliol College, Oxford University (1885–1889), and in 1890 joined the staff of the Manchester *Guardian,* with which, except for his service (1914–1919) in World War I, he was affiliated until 1925. He published several novels, including *A Hind Let Loose* (1910), *Rough Justice* (1926), and *Right Off the Map* (1928); *Dramatic Values* (1911) and *Disenchantment* (1922), essays; and *Fiery Particles* (1923) and *Action* (1928), volumes of short stories.

His brother, Francis Charles Montague (b. London, Aug. 31, 1858; d. Oxford, April 8, 1935), was a historian. He served as curator of the Indian Institute, Oxford, from 1900 to 1913. His published works include *The Limits of Individual Liberty* (1885); *Life of Sir Robert Peel* (1888); *Elements of English Constitutional History* (1894); and contributions to the *Cambridge Modern History* and Longman's *Political History of England* (1907).

MONTAIGNE, môn-tĕn'y', **Michel Eyquem de,** French essayist: b. Château de Montaigne, near Bordeaux, Feb. 28, 1533; d. there, Sept. 13, 1592. As a small child he was placed under the care of a German tutor who spoke only Latin to him, and at the age of six he was sent to the Collège de Guyenne in Bordeaux. He remained in Bordeaux for seven years, and probably studied philosophy there under George Buchanan (q.v.) and Marc Antoine Muret. Thereafter he probably studied law at Bordeaux and Toulouse, and when he came of age was made a counselor of the Cour des Aides of Périgueux. This court was abolished three years later, and in 1557 Montaigne with the other members was appointed counselor of the Bordeaux Parliament, a body in which, about 1559, he made the acquaintance of Étienne de La Boétie, whose intimate friend he became. From 1561 to 1563, Montaigne was at the court of Charles IX, and he was present at the siege of Rouen in 1562. In 1565 he married Françoise de La Chassaigne, daughter of one of his fellow counselors. The deaths of his father and La Boétie in 1568 greatly lessened Montaigne's interest in public affairs. After preparing his friend's posthumous works for publication and publishing (1569) his own translation of Raymond of Sabunde's *Theologia naturalis sive Liber creaturarum,* for which he received the Order of St. Michael, he sold his post as counselor and retired to Montaigne in 1570. There in the following year he began, and in nine years completed, the first two books of his *Essais.* It is not known whether or not he intended them for publication, although their style seems to point to the fact that in their earliest form they must have been merely jottings in a commonplace book. Except for an occasional trip to Paris, Montaigne did not leave the château until 1580, when, his health having greatly deteriorated, he set out on travels through Switzerland, Germany, and Italy, meeting Torquato Tasso at Ferrara. (His *Journal* of this trip was discovered and published in 1774.) During his absence from France, and apparently against his will, he was elected mayor of Bordeaux. He served in this office from 1581 to 1583, and then was re-elected for another two-year term. His administration, which was highly successful, came to a close in 1585, and he spent the next three years in revising the first two books of the *Essais* and adding a third. In 1588 he accompanied Henry III to Rouen. His last years were spent in revising his work.

Montaigne had five daughters; only one of them, Léonor, of whom he was very fond, survived him. He was also much attached to Mlle. Marie Le Jars de Gournay, whom he called his adopted daughter, and who was fortunate enough to receive from Montaigne's widow a copy of his *Essais,* with

manuscript additions and corrections, the basis of a new edition, published in 1595. Montaigne's literary reputation is safe, though in the hands of the few, not the many. His spirit is skeptical, essentially typical of his time, and it was not for nothing that his study at Château Montaigne was decorated with texts from Ecclesiastes, Ecclesiasticus, Lucretius and Horace, for he was akin to these ancient writers who proclaim the vanity of all things. His theme is varied, his treatment discursive and his charm largely due to this very variety, together with a quaintness and raciness of style that did much for French prose and was mostly original even if patterned on Amyot. His manner of approaching the questions of life and criticism is apparently purely subjective; indeed, his delightful egoism that makes his own life, experiences and thoughts the theme of the essays seems at first to be quite independent of so serious a purpose. But this subjective manner brings him nearly as close to the analysis of universal problems as does the dramatic objectivity of a Shakespeare. His entire attitude is skeptical, but he is not to be ranked as the enemy of religion. He is the curious, interested skeptic, not the doubting cynic. Professor Saintsbury well says that the nearest spiritual parallel to Montaigne in literature is Charles Lamb.

Montaigne affected English literature scarcely less than he did French. His essays, translated by Florio (1603), seem to have been known to Shakespeare in their English form, and this same version, revised by Hazlitt (1893), is still the standard in English. The best editions of the original are those by Amaury-Duval (1820) and Le Clerc (1865). (See MONTAIGNE'S ESSAYS, FLORIO'S TRANSLATION OF) Consult the appreciations by Emerson, 'Representative Men' (1850); Church, 'Miscellaneous Essays' (1888); Pattison, 'Essays' (1889), and Pater, 'Gaston de Latour' (1896); also Bonnefon, 'Montaigne et ses Amis' (1892); Stapfer, 'Montaigne' (1894); Lowndes, 'Michel de Montaigne' (1898); Guizot, 'Montaigne' (1899); Champion, 'Introduction aux Essais de Montaigne' (1900); Dowden, E., 'Michel de Montaigne' (Philadelphia 1905); Woodberry, G. E., 'Great Writers' (Garden City 1907); 'Montaigne's Essays,' trs. by G. B. Ives (Harvard Univ. Press 1925).

MONTAIGNE'S ESSAYS, Florio's Translation of. The interest of Florio's translation of the essays of Montaigne is manifestly due in the first place to Montaigne and only very secondarily to Florio. The world has never failed to find the good-natured and wise father of the modern essay both amusing and interesting, and Montaigne, in whatever dress he might wear, would be sure of a welcome in any reflecting but not too serious society of men and women. Yet it is no small credit to Florio that he has not only kept Montaigne alive and to the fore in his translation, but has also managed to slip in by the way some considerable flavor of himself. His translation of his French original is not always accurate in detail, though it is perhaps not less accurate than translations customarily were in the days when it was made. It has something better, however, than simple verbal accuracy, it has color and life. Like most Elizabethan translators, Florio was seldom content to let a single English word stand as the equivalent of a significant word of his original. In order to be sure to get the full content of his French source, he amplified by the addition of intensifying modifiers and synonyms. The result is that the translation is often more wordy and more highly colored stylistically than the original, is often quaint and colloquially picturesque when Montaigne is simple and direct. Florio was above all a lover of the ingenious style, and his ingenuity not infrequently betrayed him into the grotesque. He was fond not only of strange words, but also of puns, alliteration and the other frippery of the courtly writing of his day. When it suited his convenience he did not hesitate to Anglicize a French word, with the result that though he put Montaigne "in English clothes" it was done "many times with a jerke of the French jargon." Yet when one compares the 'Epistle Dedicatorie' of the translation, addressed to his "best-best Benefactors and most-most honored Ladies, Lucie Countesse of Bedford; and her best-most loved-loving Mother, Ladie Anne Harrington," where he was writing in his own person, with the body of the translation, one notes with gratitude that Florio has not done his worst in the way of verbal ingenuity. His original exerted a salutary restraining influence when he came to the actual task of translating, and few readers will cavil at him for being occasionally Florio, since he really gives us Montaigne.

GEORGE PHILIP KRAPP.

MONTALEMBERT, Charles Forbes de Tryon, shärl fôrb dė trē-ôṅ môṅ-tä-lŏṅ-bār, COMTE DE, French publicist and historian: b. London, England, 29 May 1810; d. Paris, 13 March 1870. He received a university education at Paris; identified himself with the Liberal Catholic movement of Lamennais (q.v.) and Lacordaire (q.v.), whom he assisted in establishing (18 Oct. 1830) and editing *L'Avenir,* and in efforts to obtain the freedom of education at that time impossible under the state system, and in 1831 went with these two leaders to Rome to present their cause. On his return he opened with Lacordaire and De Coux at Paris a free Catholic school, which was promptly closed by the police, while the directors were arraigned for infringement of the laws respecting instruction. Montalembert made a notable defense before the Chamber of Peers, but the directors were sentenced to pay the costs and 100 francs apiece in fines. When the doctrines of *L'Avenir* were condemned by Gregory XVI in an encyclical of 15 Aug. 1832, Montalembert duly submitted and did not proceed with Lamennais to final revolt. He entered the Chamber of Peers in 1835, spoke much and eloquently on ecclesiastical matters, and in 1836 published his 'Histoire de Sainte Elizabeth de Hongrie,' which appeared in an English rendering by Hackett and Sadlier (1854). His Catholic zeal was combined with liberal ideas and after the Revolution of 1848 he was elected as a Moderate Republican to the Constituent Assembly; but here, as in the Legislative Assembly, where he sat from 1849 to 1857, he became more and more conservative. In June 1851 he debated against Victor Hugo in opposition to the proposed constitutional re-

vision. He found himself unable to support the measures of the Empire and was known as one of the most determined opponents of Napoleon III. His chief work, *Les Moines d'Occident depuis Saint Benoît jusqu'à Saint Bernard* (1860–1877) was translated into English as *The Monks of the West from St. Benedict to St. Bernard* in 1895. He wrote many pamphlets, the last of which, *La Victoire du Nord aux États-Unis* (1865), translated into English in 1866, was an appreciation of the triumph of the Union cause in the Civil War.

Consult Oliphant, M. O., *Memoirs of Count de Montalembert* (London 1872); De Meaux, *Montalembert* (Paris 1897); and Lecanuet, L. R. P., *Montalembert, d'après ses papiers et sa correspondence,* 3 vols. (Paris 1895–1902).

MONTALEMBERT, môn-tà-läN-bâr', Marquis de (Marc René), French military engineer: b. Angoulême, July 16, 1714; d. Paris, March 29, 1800. After serving with the French Army in many parts of Europe, he directed the construction of several forts in France. Seeing the defects of bastionary defense and opposing the Marquis de Vauban's trace system, in his principle work, *La Fortification Perpendiculaire* (1776–1786), he set forth his ideas favoring a massed fire power achieved by a system of detached forts built around a central military stronghold. His ideas were not well received in France, but abroad, especially in Germany, they were widely adopted. He was elected to the Academy of Sciences in 1747. At the time of the Revolution he emigrated but later returned and was made a general of division by Carnot in 1792.

MONTALVAN, môn-täl-vän', **Juan Pérez de,** Spanish dramatist and novelist: b. Madrid, 1602; d. there, June 25, 1638. He was already a success as a dramatist at 17 years of age and was soon working with Lope de Vega. In 1625 he was ordained by the church and became apostolic notary of the Inquisition. A collection of some of his works entitled *Comedias* appeared in two volumes in 1635 and was distinguished by a fervent national attitude. Several of his novels appeared in *Sucesos y Prodigios de Amor* (1624) and others in *Para Todos* (1632). His *Orfeo* (1624) is a poem in octaves. On the death of Lope de Vega he wrote *Fama Póstuma de Lope de Vega* (1636).

MONTALVO, García Ordóñez de. See Ordóñez de Montalvo, García.

MONTANA, mŏn-tă'nă, most northerly of the Rocky Mountain states. It is bounded on the east by North Dakota and South Dakota, on the south by Wyoming, on the southwest and west by Idaho, and on the north by the Canadian provinces of British Columbia, Alberta, and Saskatchewan. The word *montana* is a Latin noun meaning "mountainous region."

State flag.

Land area	145,878 square miles
Water area	1,260 square miles
Total area	147,138 square miles
Latitude	44° 26′—49° N.
Longitude	104° 02′—116° 02′ W.
Altitude (average)	3,400 feet
Population (1950)	591,024
Capital city—Helena; Pop. (1950)	17,581
Admitted as a state	Nov. 8, 1889
Bird	Meadowlark
Flower	Bitterroot (*Lewisia rediviva*)
Motto	*Oro y Plata* (Gold and Silver)
Nicknames	Bonanza State; Treasure State
Song	*Montana*
Tree	Yellow Pine

State seal.

Physical Characteristics. — *Topography.* — About half the state has an altitude under 5,000 feet, of which 40,700 square miles are less than 3,000 feet above sea level. Approximately 7 per cent of the area, or 10,000 square miles, shows an elevation of more than 8,000 feet.

About two fifths of the state, lying in the west and southwest, is mountainous. The main ridge of the Rockies extends from Glacier National Park in northern Montana to Yellowstone National Park on the southern border. About two thirds of the distance from the Canadian boundary, the Continental Divide turns abruptly west to the Idaho line, where it again takes a sharp angle to the southeast. From this angle juts the Bitterroot Range which, farther north, becomes the Cabinet Range. Between these ranges and the Rockies are small ranges, the most beautiful of which are the Mission and the Swan. East of the Rockies are many small ranges, some isolated and others jutting out from the main ridge. Parallel to the main ridge are the Big Belt and Little Belt Mountains, near the center of the state, and south of them the Crazy Mountains. Farther south are the Tobacco Root Mountains, Bridger Mountains, Ruby Mountains, and the Gallatin and Madison ranges. Extending east along the southern boundary are the lofty Absarokas and the Beartooth Mountains, highest in the state. Still further east are the Pryor and Rosebud ranges. Isolated ranges near the center of the state are the Bear Paw Mountains, Highwood Mountains, the Big Snowy, the Little Snowy, Moccasin Range, Blue Mountains, Elk Range, and other groups. Granite Peak, in the Beartooth Range, rises to a height of 12,850 feet, the highest point in the state.

Mountain passes are not high. Of those crossed by railways, the Pipestone and Homestake east of Butte are about 6,500 feet. Mullan Pass west of Helena is 5,547, and Marias Pass, crossed by the Great Northern Railway, is 5,125 feet. Main highways traverse the same passes or others of about equal height.

East of the mountains lie the Great Plains broken by much rolling country and isolated mountains.

Rivers.—In the mountains of Montana rise streams that feed many of the great rivers of the western half of the continent. From the Glacier Park region, they flow north to the Saskatchewan, east to the Missouri and west to the Columbia. The Missouri finds its source in the Jefferson, Madison, and Gallatin ranges, fed by melting snows that also supply the sources of the Clark Fork, which flows west. The Yellowstone, whose sources interlock with those of the upper Missouri, also joins the waters that empty into the Mississippi. Clark Fork, which flows into the Columbia, finds its source in the springs and melting snow that form Silver Bow Creek. The Blackfoot rises high on the Continental Divide near Lewis and Clark Pass, 6,350 feet above sea level and flows into Clark Fork a few miles east of the Bitterroot Mountains. The Bitterroot River drains a large area between the Bitterroot Range and the Continental Divide into Clark Fork. An important affluent is Flathead River, which flows into Flathead Lake from the north and out of it at the lake's south end to join Clark Fork near Paradise.

Lakes.—In Glacier Park are some 250 lakes. In hollow places in the mountains outside, nestle many others, some hardly more than ponds, fed by mountain snow and reflecting varied hues spun by sunlight and clouds on the many colored rocks of the region. Flathead Lake, with an area of some 200 square miles, is the largest natural body of water in the state.

Climate.—The climate is varied. Greatest extremes are in the northeast where a low of —65° and a high of 117° have been recorded. The Yellowstone Valley has a more equitable and mild climate. West of the mountains, which break the high winds of the plains, temperatures vary less. Mean temperatures recorded vary from approximately 46° in the Yellowstone to 35° in some high altitudes. Rainfall east of the mountains is generally below 15 inches annually. West of the divide, it amounts to something more. The mean for the state is about 18 inches. Rains generally occur in the autumn and spring, and the late summer months are usually dry. Growing seasons are relatively short, but the long days of northern latitudes compensate to some extent. There is much sunshine east of the mountains. West of the divide the days are often cloudy. The climate is regarded as salubrious and generally agreeable.

Irrigation.—The semiarid climate calls for irrigation, and the abundance of water accumulated by mountain snows during the winter makes feasible the irrigation of large parts of the state. The first undertakings of this sort were made by individuals. For larger areas, cooperative organizations and corporations were formed and some continue to the present. The Carey Act of 1894 provided capital through grants of federal lands. Large projects, such as those irrigating 19,000 acres on the Billings Bench, 16,000 acres near Brady, 60,000 acres near Valier, and 5,000 acres near Bigtimber were planned, but much of the work was never completed.

The National Reclamation Act of 1902 provided for a more rapid expansion of irrigation. Extensive projects were undertaken by the Bureau of Reclamation which, by 1949, had made water available to more than 235,000 acres. Some of these projects are very large. In northern Montana, Sun River irrigates more than 75,000 acres and Milk River more than 66,000 acres. On the Yellowstone, the Huntley project irrigates 24,000 acres and the Lower Yellowstone 48,445, part of which is in North Dakota. Buffalo Rapids, near Glendive, provides water for more than 20,000 acres. In southwestern Montana are a number of small projects.

The Bureau of Indian Affairs has promoted irrigation on Indian lands. The reservations have been breaking up and whites as well as Indians profit from these projects. On the old Flathead Indian Reservation, peopled largely by whites, nearly 75,000 acres were irrigated in 1949 and 30,000 additional acres were to be brought under the ditch. On the Blackfeet Reservation, 12,363 acres were irrigated, on the Crow Reservation, 21,579 acres were supplied with water, on Ft. Belknap, 12,679 acres, and on the Rocky Boy 628 acres (see also *The People—Indians*).

In the 1940's, private enterprise, supplied with federal funds returned to extensive irrigation projects. Artesian wells and water storage in reservoirs were developed for spot irrigation. In 1940, lands under irrigation were reported as 2,340,390 acres and further expansion was planned, particularly from Fort Peck. In 1949, bids were advertised for construction of the Canyon Ferry Dam on the Missouri, near Helena, to irrigate 245,000 acres.

Political Divisions.—*Cities and Towns.*—Most of the cities and larger towns of Montana showed increases in population between the 1940 and 1950 censuses. An exception was Butte, formerly the state's largest city, which declined in population from 37,081 in 1940 to 33,251 in 1950. Great Falls, which by 1950 became Montana's most populous city, grew from 29,928 in 1940 to 39,214 in 1950; Billings from 23,261 to 31,834; Missoula from 18,449 to 22,485; Helena from 15,056 to 17,581; Anaconda from 11,004 to 11,254, and Bozeman from 8,665 to 11,325. Four other cities, Havre, Kalispell, Livingston, and Miles City, have populations above 7,500. For populations of other communities in Montana, see reverse side of state map.

Butte, high on the west slope of the Rockies, was built upon the copper industry and was once reputed the "richest hill on earth." Copper mines are sunk to great depths and so extensive became the diggings that, during periods of low-priced copper many proved unprofitable. With higher prices, mines were reopened in 1947 but did not immediately return to full production because of the scarcity of labor. The Anaconda Copper Mining Company, one of America's great corporations, had its first mines in Butte and now owns most of them. It is reworking the talings discarded in years gone by and reports profitable returns. Butte has the best railroad facilities of any city in Montana. Two transcontinental lines traverse the city and it has direct lines to Anaconda; Ogden, Utah; and to Helena, and Great Falls. Bus and truck lines spread in all directions. Advantages of transportation facilities give Butte a pre-eminent position for general wholesale and retail trade, as well as for shipments of metals and ore. The city is the home of the Montana State School of Mines and numerous attractive Catholic churches. Great Falls, the power city, takes its name from the Great Falls of the Missouri, near which it is located. The advantages of this site were first proclaimed by the pioneer, Paris Gibson (1830–1920) largely

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MONTANA

Fantastic limestone architecture in Montana's famous Lewis and Clark Cavern, one of the largest in the United States.

Courtesy Northern Pacific Railway

Autumn in the Montana Rockies.

MONTANA

1950 Total Population 591,024

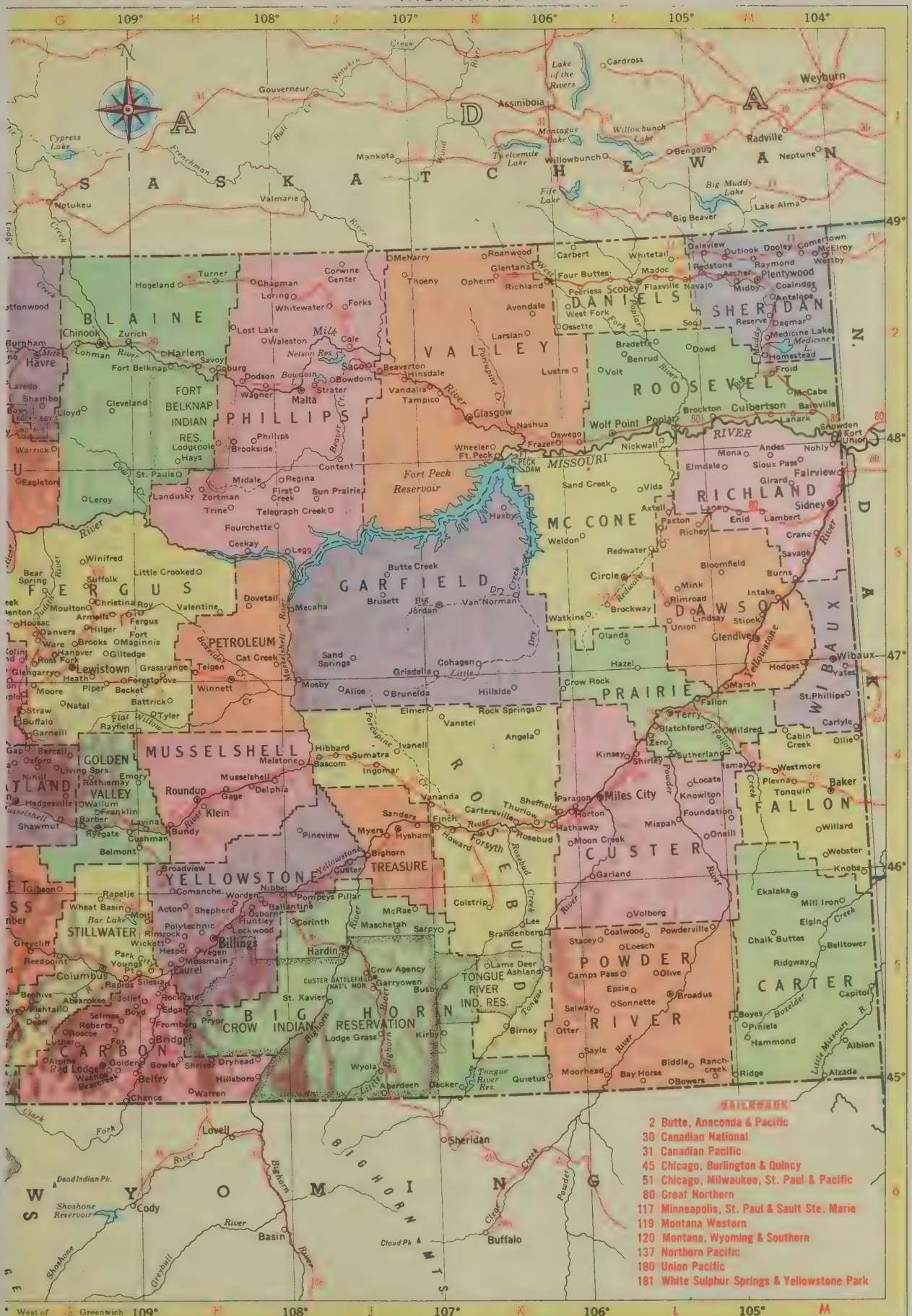
Abe (E5)
Aberdeen (J5) 8
Absaroka (mt. range) (F5)
Absarokee (G5) 423
Accola (E5)
Acton (H5) 14
Agawam (D2) 17
Alberton (B3) 326
Albion (M5) 6
Alder (D5) 100
Alhambra (E4) 43
Alice (J4)
Allen (mt.) (C2)
Aloe (D2)
Alpine (G5)
Alta (B5) 4
Alzada (M5) 75
Amazon (E4) 1
Amsterdam (E5) 65
Anaconda ◉(C4) 11,254
Anceney (E5) 10
Andes (M3) 32
Angela (K4) 7
Antelope (M2) 125
Apex (D5)
Apgar (B2) 76
Archer (M2) 5
Arlee (B3) 300
Armells (G3) 3
Armington (F3) 120
Armstead (D6) 200
Arrow (riv.) (F3)
Arrow Creek (F3) 25
Ashland (K5) 150
Ashley (lake) (B2)
Ashuelot (E3)
Augusta (D3) 475
Austin (D4) 50
Avon (D4) 200
Avondale (K2) 5
Axtell (L3) 50
Babb (C2) 25
Bainville (M2) 356
Baker ◉(M4) 1,772
Ballantine (J5) 298
Bannack (C5)
Barber (G4) 60
Bascom (J4)
Basin (D4) 300
Battrick (H4) 3
Bay Horse (L5) 39
Bear Spring (G3) 50
Bearcreek (G5) 162
Bearhat (mt.) (C2)
Bearmouth (C4) 15
Beaver (creek) (J2)
Beaverhead (riv.) (D5)
Beaverton (J2) 20
Becket (G4) 3
Beehive (G5) 12
Belfry (H5) 200
Belgrade (E5) 663
Belknap (A3) 72
Belltower (M5)
Belmont (G4) 25
Belt (E3) 702
Benchland (F3) 57
Benrud (L2)
Bercail (G4) 2
Bernice (D4) 2
Biddle (L5) 5
Big Arm (B3) 100
Big Belt (mts.) (E4)
Big Dry (creek) (K3)
Big Hole Battlefield Nat'l Mon. (C5)
Big Muddy (riv.) (M2)
Big Sag (F3) 6
Big Sandy (G2) 743
Big Timber ◉(G5) 1,679
Bigfork (C2) 450
Bighorn (J4) 21
Bighorn (riv.) (J5)
Billings ◉(H5) 31,834
Birney (K5) 35
Bitterroot (mt. range) (B4)
Bitterroot (riv.) (B4)
Black Eagle (E3) 1,449
Blackfeet Ind. Res. (D2)
Blackfoot (D2) 200
Blackfoot (riv.) (C4)
Blackleaf (D2)
Blatchford (L4) 8
Bloomfield (M3) 40
Blossburg (D4) 35
Bole (D3)
Bonita (C4) 150
Bonner (C4) 250
Boulder ◉(E4) 1,017
Bowdoin (J2)
Bowers (L5) 26
Bowler (H5) 8
Box Elder (F2) 284
Boxelder (creek) (M5)
Boxelder (creek) (H3)
Boyd (G5) 32
Boyes (M5) 25
Bozeman ◉(F5) 11,325
Brady (E2) 435
Brandenberg (K5) 49
Bredette (L2)
Brenner (C6)
Bridger (H5) 854
Brinkman (F2) 15
Broadus ◉(L5) 517
Broadview (H4) 164
Brockton (M2) 350
Brockway (L3) 103
Brooks (G3) 11
Brookside (H2) 25
Browning (C2) 1,691
Brunelda (J4) 13
Brusett (J3) 20
Buelow (E2)
Buffalo (G4) 150
Bundy (H4)
Burnham (G2) 26
Burns (M3) 8
Busby (J5) 20
Butte ◉(D5) 33,251
Butte Creek (J3)
Bynum (D3) 52
Bynum (res.) (D2)
Cabin Creek (M4) 6
Cabinet (mts.) (A2)
Calkins (F4)
Calvert (E3)
Camas (B3) 125
Camas Prairie (B3) 5
Cameron (E5) 138
Camps Pass (L5)
Campsite (E3) 3
Canyon Creek (D4) 76
Canyon Ferry (E4) 150
Capitol (M5) 4
Carbella (F5) 5
Carbert (L2)
Cardwell (E5) 98
Carlyle (M4)
Carter (E3) 100
Cartersville (K4)
Cascade (E3) 447
Cat Creek (H3) 65
Ceekay (H3)
Centerville (D4) 1,800
Central Park (E5)
Chadbourn (F5) 7
Chalk Buttes (M5) 41
Chance (H5) 7
Chapman (J2) 35
Charlo (B3) 260
Chester ◉(E2) 733
Chestnut (F5) 12
Chico (F5) 20
Chinook ◉(G2) 2,307
Choteau ◉(D3) 1,618
Christina (G3) 20
Circle ◉(L3) 856
Clancey (E4) 161
Clark Fork (riv.) (A3)
Clark Fork, Yellowstone (riv.) (G6)
Clarkston (E4) 20
Clasoil (E4) 8
Cleiv (E3)
Cleveland (G2) 17
Cliff Lake (E6) 21
Clinton (C4) 150
Clyde Park (F5) 280
Coalridge (M2) 49
Coalwood (L5) 2
Coburg (H2)
Coffee Creek (F3) 50
Cohagen (K3) 36
Cole (J2)
Collins (E3) 26
Colony Bay (F2)
Colstrip (K5) 300
Columbia Falls (B2) 1,232
Columbus ◉(G5) 1,097
Comanche (H4) 12
Comertown (M2) 50
Conner (B5) 150
Conrad ◉(D2) 1,865
Content (J3)
Continental Divide (D3)
Cooke (G5) 45
Coolidge (C5) 2
Coram (C2) 500
Corbin (D4) 50
Cordova (E3) 175
Corinth (J5) 16
Corvallis (C4) 350
Corwin Springs (F5) 2
Corwine Center (J2)
Cottonwood (C3)
Cottonwood (G2) 40
Cottonwood (creek) (E2)
Craig (D3) 80
Crane (M3) 50
Crazy (peak) (F4)
Creston (C2) 200
Crow Agency (J5) 500
Crow Ind. Res. (H5)
Crow Rock (L4)
Culbertson (M2) 779
Cushman (H4) 17
Custer (J4) 300
Custer Battlefield Nat'l Mon. (J5)
Cut Bank ◉(D2) 3,721
Dagmar (M2) 46
Dailey (F5)
Daleview (M2)
Danvers (G3) 32
Darby (B4) 415
Dayton (B3) 95
De Smet (C4) 10
Dean (G5) 92
Deborgia (A3) 75
Decker (K5) 21
Deer Lodge ◉(D4) 3,779
Dell (D6) 150
Delphia (H4) 14
Delpine (F4)
Dempsey (D4) 10
Denton (G3) 435
Devon (E2) 50
Dillon ◉(D5) 3,268
Divide (D5) 116
Dixon (B3) 250
Dodson (H2) 330
Dooley (M2) 17
Douglas (mt.) (F5)
Dover (F3) 20
Dovetail (H3) 35
Dowd (M2)
Drexel (A3) 9
Drummond (D4) 531
Dryhead (H5) 4
Duderanch (F5) 3
Dunkirk (E2) 13
Dupuyer (D2) 125
Dutton (E3) 431
Eagle Butte (F3) 72
Eagleton (G3)
East Glacier Park (C2) 300
East Helena (E4) 1,216
Eddy (A3) 25
Eden (E3) 5
Edgar (H5) 160
Ekalaka ◉(M5) 904
Electric (F5) 20
Electric (peak) (F6)
Elgin (M5) 15
Elk Park (D4) 80
Elliston (D4)
Elmdale (M3) 25
Elmer (J4) 10
Elmo (B3) 104
Emigrant (F5) 25
Emigrant (peak) (F5)
Emory (G4)
Enid (M3) 8
Ennis (E5) 600
Epsie (L5) 65
Essex (C2) 75
Ethridge (D2) 45
Eureka (B2) 929
Evans (E3)
Evaro (C3) 92
Fairchild (F2) 20
Fairfield (D3) 693
Fairview (M3) 942
Fallon (L4) 251
Family (D2) 150
Farmington (D3) 30
Ferdig (E2) 15
Fergus (H3) 4
Finch (K4)
Findon (F4)
Finn (D4) 50
First Creek (J3)
Fishtail (G5) 50
Fishtrap (C5) 10
Flat Willow (creek) (H4)
Flathead (lake) (C3)
Flathead (riv.) (B3)
Flathead Ind. Res. (B3)
Flaxville (L2) 220
Florence (B4) 350
Floweree (E3) 60
Forestgrove (H3) 25
Forks (J2) 3
Forsyth ◉(K4) 1,906
Fort Belknap (H2)
Fort Belknap Ind. Res. (H2)
Fort Benton ◉(F3) 1,522
Fort Browning (D2) 1,674
Fort Logan (E4)
Fort Maginnis (H3) 4
Fort Peck (K2) 1,214
Fort Peck (dam) (K3)
Fort Peck (res.) (K3)
Fort Shaw (E3) 180
Fort Union (M2)
Fortine (A2) 100
Foundation (L4)
Four Buttes (L2) 50
Fourchette (H3)
Fowler (E2)
Fox (G5) 15
Francis (F4) 10
Franklin (G4) 7
Frazer (K2) 575
Frenchman (riv.) (H1)
Frenchtown (B3) 100
Fresno (G2) 10
Fresno (res.) (F2)
Froid (M2) 555
Fromberg (H5) 442
Fulgurite (peak) (C4)
Gage (H4) 8
Galata (E2) 53
Galen (D4) 220
Gallatin (peak) (E5)
Gallatin (riv.) (E5)
Gallatin Gateway (E5) 200
Gardiner (F5)
Garland (L4) 3
Garneill (G4) 33
Garnet (C4) 20
Garrison (D4) 150
Garryowen (J5) 28
Gateway (A2) 50
Genou (E2) 25
Georgetown (lake) (C4)
Geraldine (F3) 374
Geyser (F3) 150
Gibson (G4)
Gibson (res.) (D3)
Giffen (E3) 12
Gildford (F2) 340
Gilman (D3) 15
Giltedge (G3) 8
Girard (M3) 7
Glacier Nat'l Park (C2)
Glasgow ◉(K2) 3,821
Glen (D5) 100
Glendive ◉(M3) 5,254
Glengarry (G3) 7
Glentana (K2) 65
Gold Stone (F2) 9
Goldbutte (E2)
Goldcreek (D4) 190
Golden (G5)
Granite (peak) (F5)
Grant (C5) 25
Grantsdale (B4) 50
Grass Valley (B4)
Grassrange (H3) 234
Grayling (E6) 20
Great Falls ◉(E3) 39,214
Greenfield (lake) (D3)
Greenough (C4) 50
Gregson (D4) 35
Greycliff (G5) 125
Grisdella (J3) 2
Gunsight (D2)
Hall (C4) 100
Hamilton ◉(B4) 2,678
Hammond (M5) 10
Hanover (G3) 100
Hardin ◉(J5) 2,306
Hardy (E3)
Harlem (H2) 1,107
Harlowton ◉(F4) 1,733
Harrison (E5) 305
Hathaway (K4) 25
Haugan (A3) 70
Havre ◉(G2) 8,086
Haxby (K3) 25
Hay Coulee (F2) 12
Hays (H2) 150
Haystack (peak) (A3)
Hazel (L3)
Heart Butte (C2) 50
Heath (G3) 16
Hebgen (res.) (E6)
Hedgesville (G4) 25
HELENA (E4) 17,581
Helmville (C4) 150
Henderson (A3)
Heron (A2) 200
Hesper (H5) 27
Hibbard (J4)
Highwood (F3) 272
Hilger (G3) 42
Hill (E2)
Hillsboro (H5) 4
Hillside (K4)
Hingham (F2) 214
Hinsdale (K2) 350
Hobson (G4) 205
Hodges (M4) 40
Hogeland (H2) 75
Holland (E5)
Homestake (D5) 15
Homestead (M2) 87
Hoosac (G3) 4
Horton (L4)
Hot Springs (B3) 733
Houser (lake) (E4)
Howard (K4)
Hughesville (F3) 18
Hungry Horse (C2)
Hungry Horse (res.) (C2)
Hunters Hotsprings (F5) 7
Huntley (H5) 268
Hurricane (mt.) (D2)
Huson (B3) 75
Hyalite (peak) (E5)
Hysham ◉(J4) 410
Inga (F2)
Ingomar (J4) 100
Intake (M3) 8
Inverness (F2) 360
Iron Mountain (A3) 3
Ismay (M4) 182
Ivanell (J4)
Jackson (C5) 82
Jackson (mt.) (C2)
Jardine (F5) 40
Jeffers (E5) 60
Jefferson (riv.) (D5)
Jefferson City (E4) 100
Jefferson Island (E5) 50
Jennings (A2) 10
Jens (D4) 25
Joliet (G5) 410
Joplin (F2) 368
Jordan ◉(J3) 800
Judith (riv.) (G3)
Judith Gap (G4) 175
Kalispell ◉(B2) 9,737
Kenilworth (F2)
Kevin (D2) 351
Kila (B2) 100
Kinsey (L4) 8
Kintla (B2)
Kirby (J5) 14
Klein (H4) 400
Knobs (M5) 33
Knowlton (L4)

◉County Seat

MONTANA

116° A 115° B 114° C 113° D 112° E 111° F 110°
49°
48°
47°
46°
45°
Medicine Hat
Kimberley
Cranbrook
Fernie
Blairmore
Macleod
Lethbridge
Taber
Bow Island
Pincher Creek
Stirling
Conrad
Glenwoodville
Cardston
Manyberries
Pakowki Lake
BRITISH COLUMBIA
ALBERTA
Oldman River
Crowsnest River
Elk River
Flathead River
Waterton River
Belly River
Etzikom Coulee
Milk River
St. Mary River
Whisky Gap
Waterton
Gateway
Yaak
Rexford
Eureka
Trailcreek
Kintla
Babb
Coutts
Sweetgrass
Sunburst
Goldbutte
Whitlash
Fairchild
Simpson
Gold Stone
Stonehill
Fortine
Trego
Stryker
Polebridge
Ural
Troy
Libby
Jennings
Warland
Lupfer
Olney
Mock
Radnor
Lake McDonald
Apgar
Whitefish
Columbia Falls
Coram
Hungry Horse
Paola
Sheep Mt.
Kalispell
Creston
Ashley L.
Little Bitterroot L.
Heron
Manicke
Noxon
Yakt
Marion
Somers
Bigfork
Hungry Horse Reservoir
McGregor L.
L. Mary Ronan
Rollins
Swan Lake
Tuscor
Trout Creek
Proctor
Dayton
Elmo
Big Arm
Niarada
Whitepine
Belknap
Raystock Pk.
Lonepine
Radio
Thompson Falls
Eddy
Hot Springs
Camas
Pablo
Polson
Wallace
Taft
Saltese
Plains
Haugan
Deborgia
Henderson
Drexel
Perma
Dixon
Ravalli
Arlee
Iron Mountain
Superior
Lozeau
Stark
Alberton
Huson
Evaro
Frenchtown
Nimemie
De Smet
Cothrop
Grass Valley
Rivulet
Quartz
Tarkio
Woodworth
Cottonwood
Ovando
Fulgurite
Blackfoot
Milltown
Greenough
Potomac
Helmville
Bonner
Missoula
Lolo
Clinton
Bonita
Hot Springs
Nimrod
Garnet
Finn
Wilborn
Canyon Creek
Nelson
Lincoln
Mike Horse
Wolf Creek
Craig
Marysville
Drummond
Bearmouth
New Chicago
Helena
East Helena
Canyon Ferry
Fort Logan
White Sulphur Springs
Findon
Delphine
Martinsdale
Florence
Stevensville
Victor
Woodside
Corvallis
Hamilton
Grantsdale
Maxville
Stone
Pioneer
Garrison
Deer Lodge
Dempsey
Race Track
Philipsburg
Southern Cross
Georgetown Lake
Galen
Warmsprings
Anaconda
Basin
Amazon
Boulder
Radersburg
Townsend
Loweth
Ringling
Sixteen
Darby
Conner
Walkerville
Centerville
Meaderville
Elk Park
Toston
Lombard
Francis
Maudlow
Clarkston
Sedan
Wilsall
Fishtrap
Silverbow
Homestake
Pipestone Springs
Whitehall
Cardwell
Piedmont
Renova
Jefferson Island
Three Forks
Menard
Acola
Manhattan
Springhill
Central Park
Clyde Park
Chadbourn
Hunters Hotsprings
Sula
Wise River
Divide
Melrose
Waterloo
Willow Cr.
Logan
Sappington
Ameterdam
Belgrade
Bozeman
Missio
Springdale
Alta
Big Hole Battlefield Nat'l Mon.
Wisdom
Silver Star
Pony
Harrison
Norris
Holland
Ancony
Gallatin
Chestnut
Livingston
Coolidge
Glen
Twin Bridges
Sheridan
McAllister
Laurin
Ennis
Alder
Virginia City
Varney
Cameron
Gallatin Gateway
Swingley
Jackson
Polaris
Apex
Madison Res.
Gallatin Ph.
Jeffers Ph.
Mt. Blackmore
Pray
Emigrant
Chico
Mt. Douglas
Dailey
Emigrant Pk.
Garbella
Duderanch
Corwin Springs
Gardiner
Electric
Electric Pk.
Bannack
Dillon
Grant
Brenner
Armstead
Abe
Cliff Lake
Hebgen Res.
Grayling
Dell
Red Rock
Lima Res.
Lima
Monida
Lakeview
West Yellowstone
Henry's Lake
Gilmore
Dubois
Ashton
Salmon
Salmon River
South Fork
Salmon R.
Lemhi R.
Continental Divide
Bitterroot Range
Beaverhead Mts.
Lewis and Clark Range
Rocky Mts.
Big Belt Mts.
Big Snowy Mts.
Little Belt Mts.
Judith Mts.
Highwood Mts.
Sweetgrass Hills
Bull Mts.
Crazy Mts.
Gallatin Range
Absaroka Range
Yellowstone River
Missouri River
Milk River
Marias River
Teton River
Sun River
Dearborn River
Smith River
Judith River
Musselshell River
Big Hole River
Bitter Root River
Lochsa River
Clearwater R.
North Fork
Middle Fork Selway R.
Middle Fork
Flathead Lake
Swan Lake
Hungry Horse Reservoir
Pishkun Res.
Greenfield L.
Willow Creek Res.
Gibson Res.
Tiber Res.
Fresno Reservoir
Nilan Reservoir
Nelson Reservoir
Fort Peck Reservoir
Lake Pakowki
Shoshone Lake
Lewis Lake
Heart Lake
Yellowstone Lake
Henry's Lake
Railroad Mt.
Secley Lake
Ninepipe Res.
Post Creek
Round Butte
Rumble Creek
Ronan
Moiese
Charlo
Paradise
Sloan
Prairie
Camas Prairie
Camas Fork
Flathead Indian Reservation
Mineral
Missoula
Powell
Granite
Ravalli
Deer Lodge
Lewis and Clark
Flathead
Lincoln
Sanders
Glacier
Toole
Pondera
Teton
Chouteau
Liberty
Hill
Blaine
Phillips
Valley
Roosevelt
Sheridan
Daniels
Richland
Dawson
Wibaux
Fallon
Carter
Prairie
Custer
Rosebud
Treasure
Big Horn
Yellowstone
Carbon
Stillwater
Sweet Grass
Park
Gallatin
Madison
Beaverhead
Jefferson
Broadwater
Meagher
Wheatland
Golden Valley
Musselshell
Petroleum
Fergus
Judith Basin
Cascade
Great Falls

MONTANA


RAILROADS
2 Butte, Anaconda & Pacific
30 Canadian National
31 Canadian Pacific
45 Chicago, Burlington & Quincy
51 Chicago, Milwaukee, St. Paul & Pacific
80 Great Northern
117 Minneapolis, St. Paul & Sault Ste. Marie
119 Montana Western
120 Montana, Wyoming & Southern
137 Northern Pacific
180 Union Pacific
181 White Sulphur Springs & Yellowstone Park
SASKATCHEWAN
ALBERTA
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
MC CONE
RICHLAND
DAWSON
WIBAUX
FERGUS
GARFIELD
PETROLEUM
MUSSELSHELL
GOLDEN VALLEY
YELLOWSTONE
TREASURE
ROSEBUD
CUSTER
PRAIRIE
FALLON
POWDER RIVER
CARTER
STILLWATER
CARBON
BIG HORN
CROW INDIAN RESERVATION
TONGUE RIVER IND. RES.
FORT BELKNAP INDIAN RES.
WYOMING
MONTANA
Fort Peck Reservoir
MISSOURI RIVER
Yellowstone River
Big Horn River
Powder River
Tongue River
Musselshell River
Milk River
Missouri River
Fort Peck Dam
Havre
Chinook
Harlem
Fort Belknap
Malta
Glasgow
Wolf Point
Poplar
Scobey
Culbertson
Sidney
Fairview
Wibaux
Glendive
Terry
Miles City
Baker
Ekalaka
Broadus
Billings
Hardin
Crow Agency
Lame Deer
Ashland
Colstrip
Forsyth
Roundup
Lewistown
Winnett
Jordan
Circle
Brockway
Watkins
Culbertson
Plentywood
Westby
Whitetail
Medicine Lake
Froid
Nashua
Oswego
Nickwall
Fort Peck
Haxby
Weldon
Redwater
Savage
Crane
Lambert
Enid
Richey
Paxton
Axtell
Bloomfield
Burns
Intake
Rimroad
Mink
Lindsay
Stipek
Union
Olanda
Hazel
Crow Rock
Hodges
Vates
Marsh
Fallon
St. Phillips
Carlyle
Ollie
Cabin Creek
Mildred
Blatchford
Zero
Sutherland
Kinsey
Shirley
Westmore
Plevna
Tonquin
Locate
Knowlton
Foundation
Mizpah
Oneill
Willard
Webster
Knobs
Ekalaka
Mill Iron
Elgin
Chalk Buttes
Belltower
Ridgway
Capitol
Boyes
Piniele
Hammond
Albion
Alzada
Ridge
Bowers
Ranch-creek
Biddle
Bay Horse
Moorhead
Sayle
Otter
Birney
Quietus
Tongue River Res.
Decker
Aberdeen
Wyota
Kirby
Lodge Grass
Pryor
Bridger
Fromberg
Roberts
Roscoe
Edgar
Boyd
Selmas
Joliet
Absarokee
Rockvale
Silesia
Rapids
Laurel
Mossmain
Park City
Young's Pt.
Wicket
Hesper
Ryegan
Rimrock
Polytechnic
Lockwood
Huntley
Ballantine
Corinth
Maschetah
Sarpy
McRae
Shepherd
Acton
Wheat Basin
Molt
Bar Lake
Greycliff
Reedpoint
Columbus
Beehive
Dean
Fishtail
Luther
Alpine
Red Lodge
Golden
Bowler
Shriver
Dryhead
Hillsboro
Belfry
Bearcreek
Washoe
Chance
Warren
Lovell
Sheridan
Cody
Shoshone Reservoir
Dead Indian Pk.
Basin
Buffalo
Cloud Pk
Greybull
Shoshone
Clark Fork
Bighorn
Powder
Tongue
Little Missouri
Little Bighorn
Rosebud Creek
Yellowstone
Musselshell
Porcupine Cr.
Redwater
Poplar
Milk
Frenchman
Bull
Notukeu Creek
Cypress Lake
Lake of the Rivers
Montague Lake
Willowbunch Lake
Twelvemile Lake
Fife Lake
Big Muddy Lake
Big Beaver
Lake Alma
Cardross
Assiniboia
Gouverneur
Mankota
Willowbunch
Bengough
Radville
Neptune
Weyburn
Valmarie
Notukeu
Creek
Turner
Hogeland
Chapman
Loring
Whitewater
Forks
Corwine Center
McHarry
Thoeny
Opheim
Roanwood
Glentana
Richland
Carbert
Four Buttes
Madoc
Peerless
Scobey
Flaxville
Navajo
Daleview
Outlook
Dooley
Comertown
McElroy
Redstone
Raymond
Archer
Midby
Coalridge
Antelope
Dagmar
Reserve
Medicine Lake
Homestead
Avondale
West Fork
Ossette
Larsian
Bradette
Benrud
Dowd
Volt
Lustre
Lost Lake
Waleston
Cole
Nelson Res.
Saco
Beaverton
Hinsdale
Vandalia
Tampico
Glasgow
Wagner
Malta
Strater
Bowdoin
Dodson
Phillips
Brookside
Lodgepole
Hays
Coburg
Savoy
Fort Belknap
Harlem
Chinook
Zurich
Lohman
Havre
Burnham
Shambo
Laredo
Cleveland
Lloyd
Warrick
Eagleton
St. Pauls
Content
Midale
Regina
First Creek
Sun Prairie
Landusky
Zortman
Trine
Telegraph Creek
Leroy
Fourchette
Ceekay
Legg
Winifred
Little Crooked
Suffolk
Bear Spring
Moultono
Christina
Roy
Valentine
Armells
Fergus
Danvers
Hilger
Hoosac
Ware
Brooks
Maginnis
Hanover
Gilteadge
Ross Fork
Lewistown
Grassrange
Heath
Forestgrove
Moore
Piper
Becket
Natal
Battrick
Straw
Buffalo
Garneill
Tyler
Flat Willow
Rayfield
Dovetail
Mecaha
Brusett
Butte Creek
Big Dry Cr.
Van Norman
Sand Springs
Cat Creek
Telgen
Grisdella
Cohagen
Little Dry
Mosby
Alice
Bruneida
Hillside
Winnett
Teigen Cr.
Elmer
Rock Springs
Vanstel
Angela
Porcupine Cr.
Ivanell
Hibbard
Sumatra
Bascom
Ingomar
Melstone
Musselshell
Roundup
Delphia
Gage
Klein
Barber
Wallum
Franklin
Hedgesville
Shawmut
Ryegate
Lavina
Bundy
Cushman
Belmont
Pineview
Myers
Hysham
Howard
Sanders
Finch
Cartersville
Thurlow
Sheffield
Paragon
Horton
Hathaway
Moon Creek
Rosebud
Vananda
Garland
Broadview
Custer
Bighorn
Yellowstone
Nibbe
Worden
Pompeys Pillar
Comanche
Rapelje
Gibson
Colstrip
Volborg
Lee
Brandenberg
Coalwood
Powderville
Stacey
Loesch
Olive
Epsie
Sonnette
Broadus
Camps Pass
Selway
Lame Deer
Ashland
Crow Agency
Garryowen
Busby
Custer Battlefield Nat'l Mon.
St. Xavier
Hardin
Billings
Lockwood
Huntley

Kolin (G3) 12
Kootenai (riv.) (A2)
Korner (D2) 50
Koyl (D3) .....
Kremlin (F2) 160
Lake Mc Donald (B2) 1
Lakeview (E6) 18
Lambert (M3) 359
Lame Deer (K5) 400
Lanark (M2) 3
Landusky (H3) 65
Lane (M3) 25
Laredo (G2) 38
Larslan (K2) 159
Laurel (H5) 3,663
Laurin (D5) 110
Lavina (H4) 195
Lebo (F4) .....
Ledger (E2) 20
Lee (K5) .....
Legg (J3) .....
Lehigh (F3) 5
Lennep (F4) 25
Leroy (G3) 10
Lewis (mt. range) (C2) .....
Lewistown ◉(G3) 6,573
Libby ◉(A2) 2,401
Lima (D6) 483
Limestone (F5) 43
Lincoln (D4) 250
Lindsay (L3) 57
Lingshire (E4) .....
Little Bitterroot (lake) (B2) .....
Little Crooked (H3) 3
Little Dry (creek) (K3) .....
Little Horn (riv.) (J5)
Little Missouri (riv.) (M5) .....
Living Springs (G4) 7
Livingston ◉(F5) 7,683
Lloyd (G2) 5
Locate (L4) 4
Lockhart (mt.) (D3)
Lockwood (H5) 200
Lodge Grass (J5) 536
Lodgepole (H2) 50
Loesch (L5) 10
Logan (E5) 172
Lohman (G2) .....
Lolo (B4) 210
Lolo Hot Springs (B4) 25
Loma (F3) 200
Lombard (E4) 26
Lone (mt.) (E5) .....
Lonepine (B3) 9
Loring (J2) 50
Lost Lake (H2) 25
Lothair (E2) 72
Lothrop (B4) .....
Lower Saint Mary (lake) (C2) .....
Loweth (F4) 20
Lowry (D3) .....
Lozeau (B3) 12
Lupfer (B2) 8
Lustre (K2) 4
Luther (G5) 22
Madison (riv.) (E5)
Madoc (L2) 33
Malta ◉(J2) 2,095
Manhattan (E5) 716
Manicke (A2) 30
Manson (E2) .....
Marias (E2) 10
Marias (riv.) (E2) ...
Marion (B2) 47
Marsh (M4) 100
Martinsdale (F4) 130
Marysville (D4) .....
Maschetah (J5) 25
Maudlow (E4) 50
Maxville (C4) 40
Mc Allister (E5) 21
Mc Cabe (M2) 55
Mc Donald (lake) (B2) .....
Mc Elroy (M2) 2
Mc Gloughlin (peak) (C4) .....
Mc Gregor (lake) (B3) .....
Mc Leod (G5) 10
◉ County Seat

Mc Rae (J5) 5
Meaderville (D4) 250
Mecaha (J3) .....
Medicine Lake (M2) 454
Meharry (J2) 4
Melrose (D5) 130
Melstone (H4) 195
Melville (F4) 29
Menard (E5) .....
Merino (F3) 5
Midale (H3) .....
Midby (M2) 7
Mildred (M4) 75
Miles City ◉(L4) 9,243
Milk (riv.) (J2) .....
Mill Iron (M5) 75
Millegan (E3) .....
Milltown (C4) 750
Miner (E5) 53
Mink (L3) 30
Mission (F5) .....
Mission (mt. range) (C3) .....
Missoula ◉(C4) 22,485
Missouri (riv.) (L3)
Mizpah (L4) .....
Moccasin (F3) 300
Mock (B2) 8
Moiese (B3) 8
Molt (H5) 25
Mona (M3) 25
Monarch (F3) 53
Monida (D6) 50
Montague (F3) 20
Moon Creek (L4) ....
Moore (G4) 224
Moorhead (K5) 15
Mosby (J4) 3
Mossmain (H5) 12
Moulton (G3) 50
Musselshell (H4) 250
Musselshell (riv.) (J3) .....
Myers (J4) 37
Nashua (K2) 691
Natal (G4) 3
Navajo (M2) 7
Neihart (F4) 289
Nelson (E4) .....
Nelson (res.) (J2) ...
New Chicago (C4) .. 20
Niarada (B3) 4
Nibbe (H4) 20
Nickwall (L2) .....
Nihill (G4) 2
Nimrod (C4) 45
Ninemile (B4) .....
Ninepipe (res.) (C3)
Nohly (M3) 57
Norris (E5) 100
Noxon (A3) 113
Nyack (C2) 40
Nye (G5) 3
Oilmont (E2) 250
Oka (G4) .....
Olanda (L3) .....
Olive (L5) 6
Ollie (M4) .....
Olney (B2) 147
Oneill (L4) .....
Opheim (K2) 383
Osborn (H5) .....
Ossette (L2) .....
Oswego (L2) 100
Otter (K5) 57
Outlook (M2) 235
Ovando (D3) 100
Oxford (G4) 10
Pablo (B3) 150
Paola (C2) .....
Paradise (B3) 300
Paragon (K4) .....
Park City (H5) 450
Paxton (L3) 20
Peerless (L2) 125
Pendroy (D2) 80
Perma (B3) 60
Philipsburg ◉(C4) 1,048
Phillips (H2) .....
Piedmont (D5) 21
Pineview (J4) .....
Piniele (M5) 10
Pioneer (D4) .....
Piper (G4) 6
Pipestone Springs (D5) 12

Placer (E4) .....
Plains (B3) 714
Plentywood ◉(M2) 1,862
Plevna (M4) 247
Polaris (C5) 25
Polebridge (B2) 56
Polson ◉(B3) 2,280
Polytechnic (H5) 250
Pompeys Pillar (J5) .. 200
Pony (E5) 185
Poplar (L2) 1,169
Poplar (riv.) (L2) ...
Portage (E3) 22
Post Creek (C3) .....
Potomac (C4) 65
Powder (riv.) (L4) ..
Powderville (L5) 4
Power (E3) 75
Pray (F5) 14
Proctor (B3) 125
Pryor (H5) 70
Purcell (mts.) (A2) .
Quartz (B3) 4
Quietus (K5) 3
Race Track (D4) 20
Radersburg (E4) .....
Radio (B3) .....
Radnor (B2) 8
Railley (mt.) (C3) ...
Ramsay (D5) 131
Ranchcreek (L5) .....
Rapelje (G5) 150
Rapids (G5) .....
Ravalli (B3) 190
Rayfield (G4) 11
Raymond (M2) 50
Raynesford (F3) 45
Red Lodge ◉(G5) 2,730
Red Rock (creek) (D6) .....
Red Rock (lakes) (E6) .....
Redstone (M2) 105
Redwater (L3) .....
Redwater (creek) (L3) .....
Reedpoint (G5) 150
Regina (J3) .....
Renova (D5) 6
Reserve (M2) 215
Rexford (A2) 200
Richey (L3) 595
Richland (K2) .....
Ridge (M5) 50
Ridgway (M5) 3
Riebeling (D3) .....
Rimini (D4) .....
Rimroad (L3) 20
Rimrock (H5) .....
Ringling (F4) 135
Riverdale (E3) 50
Rivulet (B4) 47
Roanwood (K2) 3
Roberts (G5) 200
Rock Springs (K4) .. 1
Rockvale (H5) 10
Rocky (mts.) (D4) ..
Rocky Boy (G2) 50
Rocky Boy's Ind. Res. (G2) .....
Rollins (B3) 200
Ronan (C3) 1,251
Roscoe (G5) 75
Rosebud (K4) 125
Ross Fork (G3) .....
Rothiemay (G4) 55
Round Butte (B3) ....
Roundup ◉(H4) 2,856
Roy (H3) 175
Rudyard (F2) 521
Rumble Creek (C3) 30
Ryegate ◉(G4) 339
Saco (J2) 539
Sage (creek) (F2) ....
Saint Ignatius (C3) .. 781
Saint Mary (lake) (C2) .....
Saint Mary (riv.) (C1)
Saint Pauls (H3) 70
Saint Peter (E3) .....
Saint Phillips (M4) .. 6
Saint Regis (A3) 500
Saint Xavier (J5) 150
Salem (E3) .....
Saltese (A3) 95
Sand Creek (L3) .....

Sand Springs (J3) 12
Sandcoulee (E3) 500
Sanders (J4) 40
Sandy (creek) (F2) .
Santa Rita (D2) 145
Sappington (E5) 34
Sarpy (J5) 5
Savage (M3) 300
Savoy (H2) 15
Sayle (L5) 10
Scobey ◉(L2) 1,628
Sedan (F4) 6
Seeley Lake (C3) 250
Selma (E2) 7
Selmes (G5) 6
Selway (K5) 4
Shambo (G2) .....
Shawmut (G4) 122
Sheep (mt.) (C2) .....
Sheffield (K4) .....
Shelby ◉(E2) 3,058
Shepherd (H5) 100
Sheridan (D5) 572
Shields (riv.) (F4) ...
Shirley (L4) .....
Shonkin (F3) 6
Shriver (H5) 10
Sidney ◉(M3) 3,987
Silesia (H5) 50
Silver Star (D5) 55
Silverbow (D5) 50
Simms (E3) 250
Simpson (F2) .....
Sioux Pass (M3) 40
Sipple (G4) .....
Sixteen (F4) 10
Sloan (B3) .....
Smith (riv.) (E3) .....
Snowden (M2) 16
Somers (B2) 750
Sonnette (L5) 5
Soo (L2) .....
Southern Cross (C4) 50
Sphinx (mt.) (E5) ....
Spion Kop (F3) 10
Springdale (F5) 75
Springhill (F5) .....
Square Butte (F3) 75
Stacey (L5) 7
Stanford ◉(F3) 542
Stark (B3) 25
Stevensville (C4) 772
Stillwater (riv.) (G5)
Stimson (mt.) (C2) .
Stipek (M3) 50
Stockett (E3) 300
Stone (C4) .....
Stonehill (A2) 5
Strater (J2) .....
Straw (G4) 25
Stryker (B2) 60
Suffolk (G3) 14
Sula (B5) 112
Sumatra (J4) .....
Sun Prairie (J3) .....
Sun River (E3) 115
Sunburst (E2) 845
Superior ◉(B3) 626
Sutherland (L4) .....
Swan (riv.) (C3) .....
Swan Lake (C3) 100
Sweetgrass (E2) .....
Swingley (F5) .....
Taft (A3) 2
Tampico (K2) 80
Tarkio (B4) 75
Teigen (H3) .....
Telegraph Creek (J3) 5
Terry ◉(L4) 1,191
Teton (F3) .....
Teton (riv.) (E3) .....
Thoeny (K2) 10
Thompson Falls ◉(A3) 851
Three Forks (E5) 1,114
Thurlow (K4) .....
Tongue (riv.) (K5) ..
Tongue River Ind. Res. (K5) .....
Tonquin (M4) .....
Toston (E4) 100
Townsend ◉(E4) 1,316
Trailcreek (B2) 10
Trego (B2) 48
Trident (E5) 150
Trine (H3) .....

Trout Creek (A3) 52
Troy (A2) 770
Tunis (F3) 6
Turner (H2) 200
Tuscor (A3) 4
Twin Bridges (D5) 497
Twodot (F4) 150
Tyler (H4) 3
Ulm (E3) 150
Union (L3) 50
Ural (A2) 37
Utica (F4) 60
Valentine (H3) 3
Valier (D2) 710
Van Norman (K3) .. 4
Vananda (K4) 100
Vandalia (J2) 25
Vanstel (K4) .....
Varney (E5) 12
Vaughn (E3) 190
Verona (F2) .....
Victor (B4) 350
Vida (L3) 58
Virgelle (F2) 20
Virginia City ◉(E5) 323
Volborg (L5) 7
Volt (L2) .....
Wagner (H2) .....
Waleston (J2) .....
Walkerville (D4) 1,631
Wallum (G4) .....
Waltham (E3) 25
Ward (peak) (A3) ...
Ware (G3) 4
Warland (A2) 90
Warmsprings (D4) .. 2,000
Warren (H5) 40
Warrick (G2) 3
Washoe (G5) .....
Waterloo (D5) 95
Waterton-Glacier Internat'l Peace Park (C2) .....
Watkins (K3) 10
Webster (M4) 2
Weldon (K3) 2
West Fork (L2) .....
West Gallatin (E5) ..
West Glacier (C2) 440
West Yellowstone (E6) 500
Westby (M2) 396
Westmore (M4) 16
Wheat Basin (G5) 10
Wheeler (K2) .....
White Sulphur Springs ◉(E4) 1,025
Whitefish (B2) 3,268
Whitehall (D5) 929
Whitepine (A3) 175
Whitetail (L2) 240
Whitewater (J2) 85
Whitlash (E2) 18
Wibaux ◉(M3) 739
Wickes (D4) 70
Wickett (H5) .....
Wilborn (D4) .....
Willard (M4) 3
Williams (D2) 10
Willow Creek (E5) .. 300
Willow Creek (res.) (D3) .....
Wilsall (F5) 300
Windham (F3) 116
Winifred (G3) 217
Winnett ◉(H4) 407
Winston (E4) 53
Wisdom (C5) 125
Wise River (C5) 50
Wolf Creek (D3) 156
Wolf Point ◉(L2) 2,557
Woodside (B4) 100
Woodworth (C3) 45
Worden (H5) 375
Wyola (J5) 110
Yaak (A2) .....
Yakt (B2) 28
Yates (M4) .....
Yegen (H5) 10
Yellowstone (riv.) (M3) .....
Yellowstone Nat'l Park (F6) .....
Youngs Point (G5) ..
Zero (L4) 22
Zortman (H3) .....
Zurich (G2) 85

through whose efforts the Great Northern Railway was extended to the new metropolis. Here, great quantities of hydroelectric power are generated to be used by factories and a huge smelter, as well as by railways, and to light a vast farming region. Billings, on the Yellowstone, is the center of a vast wheat and beet growing and stock raising area. The city has a large beet sugar factory and many small industries. It has good transportation facilities for transcontinental shipments east and west, as well as trade with St. Louis. Here is located the Eastern Montana Normal College and Rocky Mountain College. Missoula, located in the extreme western part of the state, is the center of extensive agricultural, live stock and dairying industry and of a great forest area. Transportation is handled adequately by two transcontinental railways and feeder lines. Missoula is the home of Montana State University, and headquarters for District Number 1 of the United States Forest Service. Helena, the capital, is a distributing center for a large stock growing area. Carroll College, a Catholic institution, is located in the city. A large smelter is operated in nearby East Helena. Anaconda, the smelter city, is on Warm Springs Creek. The smoke stack of its smelter, 585 feet high, is a land mark for many miles. The smelter is primarily for copper ore but, connected with it are plants for the manufacture of arsenic, sulphuric acid, and superphosphate fertilizers. Bozeman, in the Gallatin Valley, is the center of a rich farming area and the location for milling and canning plants. Montana State College is located here. Kalispell, west of Glacier Park and near Hungry Horse Dam, is a shipping point for northwestern Montana.

Counties.—There are 56 counties in the state. Some of them have a population of less than 2,000 and are supported chiefly by taxes on railroads and other public utilities, oil fields, or coal mines, within their borders.

County	County Seat	County	County Seat
Beaverhead	Dillon	Meagher	White Sulphur Springs
Big Horn	Hardin	Mineral	Superior
Blaine	Chinook	Missoula	Missoula
Broadwater	Townsend	Musselshell	Roundup
Carbon	Red Lodge	Park	Livingston
Carter	Ekalaka	Petroleum	Winnett
Cascade	Great Falls	Phillips	Malta
Chouteau	Fort Benton	Pondera	Conrad
Custer	Miles City	Powder River	Broadus
Daniels	Scoby	Powell	Deer Lodge
Dawson	Glendive	Prairie	Terry
Deer Lodge	Anaconda	Ravalli	Hamilton
Fallon	Baker	Richland	Sidney
Fergus	Lewistown	Roosevelt	Wolf Point
Flathead	Kalispell	Rosebud	Forsyth
Gallatin	Bozeman	Sanders	Thompson Falls
Garfield	Jordan	Sheridan	Plentywood
Glacier	Cut Bank	Silver Bow	Butte
Golden Valley	Ryegate	Stillwater	Columbus
Granite	Philipsburg	Sweet Grass	Bigtimber
Hill	Havre	Teton	Choteau
Jefferson	Boulder	Toole	Shelby
Judith Basin	Stanford	Treasure	Hysham
Lake	Polson	Valley	Glasgow
Lewis and Clark	Helena	Wheatland	Harlowton
Liberty	Chester	Wibaux	Wibaux
Lincoln	Libby	Yellowstone	Billings
McCone	Circle		
Madison	Virginia City		

The People.—The census of 1940 reported 540,464 white people within the state, 16,841 Indians, 1,120 Negroes, and 1,031 Asiatics. The population increased from a total of 559,456 in 1940 to 591,024 in 1950, an increase of 31,568, or 5.6 per cent. The state ranks 42d in population among the states. In Butte, the majority of people are of Irish descent and Finns are second. Along the northern border are many of Norwegian blood and in the extreme west are many of French ancestry.

Due to the prosperity of farmers, farm population has apparently increased, but villages and small towns classed as rural decreased sufficiently to show a net decrease in rural population. Urban population, which was 211,535, or 38 per cent, in 1940, increased to 258,034 in 1950, when it comprised 43.7 per cent of the total population. In March 1952 the state Unemployment Compensation Commission reported 143,200 employed in nonagricultural work and 5,900 unemployed. Church membership in 1945 was reported as 160,-138, of which 75,292 were Roman Catholics.

Indians.—Indian population increased notably after 1940, but the vast majority remained under the jurisdiction of the Office of Indian Affairs. Under the Indian Reorganization Act of 1934 and subsequent acts, most of these Indians are grouped around agencies and have adopted new forms of tribal government. Constitutions were approved in 1935 for the Blackfeet, Flathead, Fort Belknap, Rocky Boy, and Tongue River agencies. Only the Blackfeet and Crow Indians preserved their tribal integrity. The Flathead Agency (3,630 Indians in 1945) deals with the confederated tribes of Salish, Kootenai, and Upper Pend d'Oreille; the Fort Peck Agency (3,116) includes Assiniboine and Sioux; the Rocky Boy Agency (878) consists mostly of Chippewa and Cree; and the Tongue River Agency (1,719) deals mostly with Cheyenne. There also were 5,164 Indians on the Blackfeet Reservation in 1945, 2,488 on the Crow Reservation, and 1,805 Assiniboine and Gros Ventre at Fort Belknap.

Natural Resources.—*Fauna.*—The Great Plains area, once part of the great bison (buffalo) range of the Northwest, has become a region of stock ranches. The bison were almost completely destroyed by the whites, in which they were encouraged by the army in order to make the Indians dependent upon the Indian agencies for subsistence and thus keep them on the reservations. A herd of bison is maintained on the Montana National Bison Range, where there were some 440 in 1940, and at Yellowstone National Park, where there were about 900 in 1947. These parks also shelter deer and antelope.

Mule deer and the black-tailed variety are fairly plentiful in Montana, but such animals as mountain sheep, antelope, moose and elk are becoming rare, being encountered only infrequently in the less settled areas, as are puma, lynx, wolves, and grizzly and black bears. Various birds, such as grouse, geese and ducks are more plentiful. Montana's main varieties of fish are salmon, trout, whitefish and grayling.

Flora.—The grama grass and bunch grass, once characteristic of the plains and foothills, persisted until well into the 20th century. Then, a period of unusual rainfall accompanied by rising prices for grain, particularly during World War I, induced ranchers and new settlers to plow the ground for wheat. A few years of plenty were followed by a return of drought, and the wind eroded the soil, destroying plant life. Under the soil conservation plan of the Franklin D. Roosevelt administration, much of this land was purchased and efforts undertaken to restore it to former production. During the period of high prices for farm products beginning in 1946, much grass land was again ploughed to be seeded with wheat.

Water Power.—Mountain streams and great rivers afford an abundance of power. At the Great Falls of the Missouri immense hydroelectric power is developed, and many dams above them, extending beyond the Three Forks, provide much more. West of the divide are large power developments near Missoula, at Thompson Falls, and the largest at the outlet of Flathead Lake. All these are privately operated. Federal projects at Fort Peck and at Hungry Horse, are planned to provide many times the two and one half billion kilowatt-hours generated annually. Fort Peck was nearly completed in 1948, and Hungry Horse was scheduled for completion in 1954 at a cost of $100,000,000. On the Missouri, near Helena, the Canyon Ferry Dam power facilities to be developed are estimated at 245,000,000 kilowatt-hours.

Parks, Reservations and Preserves.—Montana advertises extensively the features that attract tourists. The best known of these is the Glacier National Park, located along the Canadian border, straddling the crest of the Rockies. Its area of 1,534 square miles has been characterized as the wildest, shaggiest block of mountain fastness in the country. A small portion of Yellowstone National Park is in Montana, but the principal area lies in Wyoming. Other mountain areas present scenes of beauty and charm. Snow-capped peaks, rugged cliffs, waterfalls, and lakes afford visitors an ever-changing wonder. There are hundreds of hot springs within the state; at some 30 of the largest, hotels and bath houses are available.

The United States Forest Service has built roads and developed camp sites at attractive places within the 13 national forests lying wholly or partly within the state. In these forests, are five "primitive areas" embracing more than 1,000,000 acres of exceptional beauty. The state maintains seven forests containing 200,000 acres of which much is attractive natural scenery. Dude ranches are scattered throughout the isolated parts of the state and tourist camps are numerous along the principal highways.

Large areas in Montana were formerly designated as Indian reservations but these have been reduced or abolished until few remain. Whites have obtained large tracts, particularly on the old Flathead Reservation. The Blackfeet, Crow, Fort Belknap, and Rocky Boy Agencies have held the Indian lands most successfully as reservation units (see also *The People—Indians*).

Glacier National Park is both a bird sanctuary and game preserve. Large bird sanctuaries are located in Lewis and Clark County and on two islands in Flathead Lake. There are many small ones on private property. About 33,000,000 acres, or one third of the land in the state, is government-owned.

Production and Manufacture.—*Agriculture.*—Farming began in Montana before the discovery of gold, but growth was slow. The 1870 census reported 851 farms and 139,357 acres under cultivation, valued, with livestock and equipment, at $2,154,569. Wheat was the principal crop. Early farms were irrigated, but the Desert Land Act of 1877 brought in dry-land settlers who by 1880 had established 370 desert farms.

In the decade of the 1880's homestead entries spread over the Yellowstone Valley and in northwest Montana. By 1920, there were 48,000 farms and 11,000,000 acres, of which 15 per cent was irrigated. In 1930, the number of farms still remained at nearly 48,000 but acreage had grown to 44,659,152. In 1940, farm land had increased to 46,451,594 acres but the number of farms had fallen to 41,823. This trend continues.

The farm boom, beginning in 1910, collapsed with the droughts from 1917–1919, and the decade of the 1920's brought new problems which seemed almost solved when the depression of 1929 hit farmers a heavy blow. Farm income for 1930 was $95,000,000, but was much lower during most of the intervening years until 1940 when it rose to $96,472,000. It climbed to $140,153,000 in 1941, to $226,156,000 in 1944, and to $400,000,000 in 1948. Wheat production increased from 30,000,000 bushels in 1930 to an estimated 90,500,000 bushels in 1948. Wheat, barley, oats, and rye have long been cultivated. Alfalfa is grown extensively. Flax seed, sugar beets, mustard seed, and seed peas and vegetables for canning have increased in recent years. Fruits, particularly apples, cherries, strawberries, and raspberries, have become important since 1910.

Stock raising became a great industry during the decade of the 1880's and has shown many variations. Between 1870 and 1890 cattle increased from about 50,000 to 1,000,000 and sheep from 2,000 to 2,000,000. By 1900, the ranges were crowded. Cattle pasturage was damaged by sheep, which increased to 6,000,000. The ranges were broken up during the next 20 years by homesteaders. Many farmers turned to milk production. In 1930, there were 1,226,000 cattle "on farms" and about 4,000,000 sheep. By 1949, cattle had increased to 2,000,000 and sheep decreased to 2,000,000. In the same year there were 200,000 hogs and 170,000 horses and mules. Wool production declined from 34,000,000 pounds in 1930 to 24,000,000 pounds in 1947, but higher prices increased value from $7,000,000 to about $12,000,000.

Lumber.—Montana contains about 52 billion board feet of standing timber, of which about 10 billion feet is Douglas fir, with slightly less of Ponderosa pine and western larch. Lodgepole pine and Engelmann spruce together comprise nearly 11 billion feet. Timber production increased from 293,000,000 board feet in 1930 to 448,000,000 in 1944. Due to the unprecedented demand for lumber, production expanded in 1948 to more than 600,000,000 board feet. Other products of lumbering are 75,000 cords of fuel wood annually, 3,000,000 cubic feet of mine timbers, 3,000,000 cubic feet of fence posts, and 2,000,000 cubic feet of pulp wood. More than 3,000,000 Christmas trees are cut annually. Depletion of forests is partially offset by efforts of the United States Forest Service to protect immature timber when the mature trees are cut, to prevent forest fires, and by vigorous tree planting. A nursery at Haugan, near the west end of the state, produces 4,000,000 trees annually, about one third of which are planted in Montana on cut-over or burned-over areas. National forest areas furnish grazing for some 200,000 horses and cattle and for half a million sheep, all at a nominal charge.

Minerals.—Montana has long been known as a mining state. The first mines were metal but, since 1900, coal, petroleum, and natural gas have been produced in great quantities. Upward trends of metal prices in the 1940's increased the value of metal production. The total value of minerals produced since mining began in 1863 through 1947 amounted to about $4,000,000,000. Variations were great from year to year but, after 1926, production generally declined and mining was

second to agriculture. An outstanding feature of metal mining in the first half of the 20th century was concentration of operations in one organization, the Anaconda Copper Mining Company. In 1947, it mined 94 per cent of the copper, 73 per cent of the silver, 72 per cent of the zinc and 47 per cent of the lead. Production of metal mines in 1948 was valued at approximately $50,000,000 and of coal, petroleum, and gas at about $40,000,000.

Gold was the first mineral mined in Montana. Small quantities were found before the Stuart discoveries on Gold Creek in the early 1860's started a gold rush to the territory. More important mines were soon found along Grasshopper Creek, in Alder Gulch, Last Chance Gulch, and in other places. The first mines were placer, but quartz mining began with the discovery of the Decotah Lode near Bannack and was extended to Philipsburg, Butte, and many other locations. Small stamp mills were built near all these mines and crushed large quantities of ore to be washed for gold long after the placer mines were exhausted. Gold production continued in connection with silver mining and as a by-product of copper and lead ores. After World War I, the gravel of the great gold-producing gulches, where placer mines had once washed out fortunes, was worked again by steam shovels with profit to the operators. Devaluation of the dollar during the depression, which raised the price of gold to $35.00 an ounce, roused many retired placer miners to new efforts and stimulated mining companies to look more carefully for gold-bearing ore. Gold mined in 1930 amounted to 43,489 ounces valued at $899,001 and in 1940 to 272,602 ounces valued at $9,541,070. During the war, gold production declined to 44,597 ounces in 1945, but rose to 86,400 ounces in 1947, but fell to 73,880 ounces in 1948.

Silver production began in the 1860's as a by-product of gold-bearing quartz. In 1875, William A. Clark built the Dexter Stamp Mill at Butte and silver mining expanded. Production increased extensively during the next two decades and declined only after the defeat of William Jennings Bryan in 1896 apparently ended the use of silver as money and stabilized its price at less than 50 cents an ounce. Silver remained of minor importance for many years. In 1930, production was 7,052,889 ounces, valued at $2,715,362. Inflationary trends of the 1930's and legislation supported by the "silver bloc" increased the price of silver, and its production. In 1940, silver mined was 12,361,050 ounces, valued at $8,790,080. World War II reduced silver production, and in 1946 it amounted to only 3,273,140 ounces valued at $2,644,697. Further increase in the price of silver to $0.905 per ounce voted by Congress increased production in 1948 to 6,776,000 ounces valued at $6,437,200 and further expansion of silver production was anticipated.

Copper mining began about 1880 when Marcus Daly, a Butte silver miner, deepened his Anaconda mine to more than 100 feet. He found a vein of rich copper ore whose product he shipped to Swansea, Wales for smelting. Within the next few years were built the huge reduction works at Anaconda and copper became the most valuable product of Montana mines. From 1890 to 1948, it exceeded in value all other metals combined, and total production through 1947 amounted to approximately $2,000,000,000. Copper production came to 352,139,768 pounds in 1916, but in 1930 it was 196,187,523 pounds. It fell to 63,000,000 in 1934 and rose to 252,782,000 pounds in 1940. During World War II it rose to 282,388,000 pounds but declined to 115,250,000 pounds in 1947. In 1948 copper production was valued at $25,000,000.

Lead occurs in mixed ores. Greatest quantities have been obtained from Butte mines. Lead is mined also in Cascade, Lewis and Clark, Broadwater, Jefferson, and Madison counties. Lead production goes back to 1883 and, in 1918, rose to 19,000 tons. It continued thereafter at a high rate of production until 1930 when it sank to 10,653 tons. In 1940, 23,000 tons were mined and production remained high during World War II. In 1946, production was only 8,000 tons, but in 1947 it jumped to 15,500 tons and the value of the output amounted to $4,526,000.

Zinc became important in 1910 when 16,000 tons were produced. Smelting was difficult until scientists of the Anaconda Company devised improved processes. In 1915, output was 94,000 tons and in 1916, 115,000 tons. After World War I, there was a decline to an annual rate of about 70,000 tons. In 1930, production was 26,421 tons, but by 1940 it rose to 52,287 tons. In 1946, it fell to 16,770 tons with a value of $4,091,880, but in 1947, it rose to nearly 50,000 tons valued at $14,440,000. This increase in lead and zinc in 1947 came almost entirely from the Butte mines.

Smelting of these metals is done at great reduction works at Anaconda, Great Falls, and East Helena. The Anaconda Company's copper smelter at Anaconda has a yearly capacity of 1,300,000 tons and its zinc smelters at Anaconda and Great Falls have a combined capacity of 233,400 tons of slab zinc. In 1947, zinc plants containing 448,367,000 pounds of zinc concentrates were received from all western mining states and some foreign companies. The company operates a zinc fuming plant at East Helena and in 1947 the output of zinc-lead fumes was 40,000 tons. The American Smelting and Refining Company's refinery at East Helena treats chiefly lead-silver concentrates from Idaho and Washington, residues from Anaconda plants, and old tailings from various districts in Montana. In 1947 and 1948 a number of small mills were constructed in the state.

Manganese was produced in large quantities during World War I and, in 1918, amounted to 200,000 short tons. In 1930, production was reported at 53,138 tons, and fell to 25,715 in 1940. In 1946, the output was 142,000 tons but in 1947 fell to 133,360 short tons.

Sapphires and garnets are found in considerable quantities. Production is not concentrated and the value of the output is undetermined. Phosphate production in 1948 amounted to $6,000,000. Fifty of Montana's 56 counties produce coal. Lignite deposits in the eastern section have been estimated at 380 billion tons, with a further reserve of 25 billion tons of bituminous farther west. In the 1940's annual production averaged about 4,000,000 tons. The principal fields are at Sand Coulee, southeast of Great Falls; at Red Lodge and Roundup, near the south central section; and at Colstrip in the east. At Colstrip, the surface soil is first removed by huge strippers and the coal mined by large shovels.

Montana has fields of petroleum and natural gas located east of the mountains. Production began between 1913 and 1915, and in general showed a steady increase through 1947. In 1948, the output of oil was 9,376,634 barrels. Gas produced was 32 billion cubic feet with a value of

$8,640,000. Oil refineries at Great Falls, Lewistown, Butte, Laurel, Sunburst, Cut Bank and other places serve the great oil companies and a number of small concerns.

Montana produces phosphates, gypsum, vermiculite, graphite, asbestos, bentonite, calcite, mica, corundum, and other minerals.

The Montana State Bureau of Mines and Geology with headquarters at Butte, carries on projects for mapping all the mineral resources of the state. The United States Bureau of Mines makes studies of production and trends as well as other researches.

Manufactures.—Manufactures are devoted largely to processing minerals, timber, and agricultural products. Power is mostly hydroelectric. Lumber mills, beet sugar factories, plants for canning fruits and vegetables and for manufacturing dairy products are widely scattered. Meat packing is important. The lumber department of the Anaconda Copper Mining Company operates huge mills at Bonner, near Missoula. Plans are announced for pulp manufacture, for wool cleaning plants, and the production of pig iron.

Transportation and Communication.—The Great Northern, the Northern Pacific, and the Chicago, Milwaukee, St. Paul and Pacific railroads parallel each other across the state. The Burlington has a branch line between St. Louis and Billings, and the Union Pacific connects Ogden, Utah; and Butte. Branch lines of the Northern Pacific and Great Northern extend to many communities off the main lines. The state has 5,000 miles of railway. Federal and state highways extend 8,809 miles, of which about 7,000 are surfaced. Transcontinental airlines cross the state from east to west, and Great Falls and Butte are served by an airline extending to southern California. In 1948, there were 79 regular airports and 21 other landing fields. Telegraph lines parallel all the railroads, and in 1947 the state had 111,000 telephones in use.

Economic and Financial Factors.—On Dec. 31, 1948, there were 39 national banks with total deposits of $291,300,000, and total loans of $56,586,000, and 73 state commercial banks with total deposits of $286,182,000 and total loans of $79,754,000. Total assets of national banks were $304,970,000; of state commercial banks, $298,703,000.

The state auditor reported the net worth of the state on January 1, 1949 as $86,716,958. There was a net balance in state funds of $51,592,839, and bonded debt was $11,533,500. State income in 1948 amounted to $22,000,000, of which $19,000,000 was supplied from taxes. The assessed valuation of the property in the state was $1,340,000,000 and the tax value $400,000,000. Personal income amounted to $827,000,000; property taxes for state, county, municipal and school taxes took $40,000,000 in taxes, counties received $11,000,000, cities and towns $7,000,000, schools $19,000,000, and the state took the balance. Other sources of state income were from gasoline and oil, $10,500,000; liquor taxes and profits of the state monopoly on liquor, $5,100,000; income taxes, $3,158,000; and business and license taxes $5,000,000.

Government.—The executive department consists of a governor, lieutenant governor, secretary of state, attorney general, state treasurer, state auditor, and superintendent of public instruction. All are elected for terms of four years. Each is independent in performing the executive duties except that some are subject to boards. Such boards exercise extensive powers. The State Board of Examiners, consisting of the governor, secretary of state, and attorney general is the most powerful. It prepares the budget and controls all expenditures. A governor's commission in 1943 recommended consolidation of executive duties, but the plan was poorly prepared and failed to pass.

The governor is general party leader and his position is strengthened by large appointive power and by item veto of legislation. He represents the state in all important matters.

The legislature is bicameral and meets regularly in odd years. There are 56 senators, one elected from each county for a term of four years. The House of Representatives has 90 members, elected for two year terms. Each county has at least one representative. Under this system the rural counties which are more numerous than the urban counties, but whose population is much smaller, control both houses of the legislature.

Although the legislature is generally Republican, there were only three Republican governors in the history of the state (1889–1948).

GOVERNORS OF MONTANA

TERRITORIAL

Sidney Edgerton	Republican	1864–1866
Thomas F. Meagher, Acting	Democrat	1865–1866
Green Clay Smith	"	1866–1869
James M. Ashley	Republican	1869–1870
Benjamin F. Potts	"	1870–1883
John Schuyler Crosby	"	1883–1884
B. Platte Carpenter	"	1884–1885
Samuel T. Hauser	Democrat	1885–1887
Preston H. Leslie	"	1887–1889
Benjamin F. White	Republican	1889

STATE

Joseph K. Toole	Democrat	1889–1893
John E. Rickards	Republican	1893–1897
Robert E. Smith	Democrat and Populist	1897–1901
Joseph K. Toole	Democrat	1901–1908
Edwin L. Norris	"	1908–1913
Samuel V. Stewart	"	1913–1921
Joseph M. Dixon	Republican	1921–1925
John E. Erickson	Democrat	1925–1933
Frank H. Cooney	"	1933–1935
W. Elmer Holt	"	1935–1937
Roy E. Ayers	"	1937–1941
Samuel C. Ford	Republican	1941–1948
John W. Bonner	Democrat	1948–1952
J. Hugo Aronson	Republican	1952–

The Judicial Department consists of the Senate as a court of impeachment, a supreme court, 18 district courts, and justices of the peace. District courts exercise original jurisdiction in all civil cases when the value of the property in controversy exceeds $50.00, and in cases of felony and misdemeanor, and of torts, divorce and of special actions.

There is a state board of health and most counties have health officers. Larger cities also have health officers frequently by contract with the county for a joint health service.

The Department of Public Welfare, established in 1937 has charge of old age assistance, care of mothers with dependent children and help for the blind. In 1947, this department spent about $8,000,000. The state maintains homes for orphans, and schools for the blind, and deaf and dumb, an old soldiers' home, a tuberculosis sanitarium, an insane asylum, and a school for feebleminded. The penitentiary at Deer Lodge houses adult criminals, and there are special reformatories for juveniles.

The legislature has set up a workingmen's compensation law, and the state cooperates with

Courtesy Montana Highway Commission

The Montana State Capitol at Helena

Courtesy Great Northern Railway

Towering mountains surround the hotel on Swiftcurrent Lake in Glacier National Park.

MONTANA

By Robert Yarnall Richie for Anaconda Copper Mining Company

The giant smelter at Anaconda, Montana, where ore is smelted to obtain copper and its many byproducts.

Courtesy Montana Highway Commission

Weird geologic formations are characteristic of the Bad Lands in the eastern section of the state.

the federal government on other social security policies.

Initiative and referendum was established in 1906 and woman suffrage in 1914. The secret ballot is required and there is a severe "corrupt practices act" governing elections.

Local government is based on counties which are creatures of the state. Townships are rudimentary. The law provides for consolidation of city and county governments under a commission-manager plan, but this had not been put into operation as of 1948. County administration is decentralized. The main executive powers are vested in a board of county commissioners who generally exercise only mandatory powers. Most county officers are elected for 4 year terms. The state examiner checks county finances and the state highway commission controls important roads.

Educational System.—The state educational system is under control of the State Board of Education, of which the governor is chairman and the state superintendent is secretary. The University of Montana consists of a State University at Missoula, a State College at Bozeman, a State School of Mines at Butte, a Northern Montana College at Havre, a Western Montana College of Education at Dillon, and an Eastern Montana College of Education at Billings. The executive head is a chancellor whose office is at Helena. Each of the units has a president. Total registration in January 1949 was about 7,500 of whom a majority were former service men. Of these about 3,300 are at the State University which provides liberal arts and science courses and maintains schools of law, forestry, business administration, journalism, pharmacy, and music. It also has curricula in social work, wild life, and Premedical. The State College with about the same registration, is a land-grant college and specializes in agriculture and engineering, but offers courses in sciences and humanities, nursing art, and secretarial work. The Northern Montana College is largely a junior college. The work of the other institutions is designated by their names. Elementary schools and high schools in Montana are administered separately from county and city government. In 1948, there were about 1,500 school districts of which 200 operated no schools. Grade teachers numbered 3,406 and high school teachers 1,338. Elementary schools had 69,278 pupils enrolled and high schools 25,650. Cost of operation amounted to $19,000,000. The State Board of Education directs educational policies, and the superintendent of public instruction is administrative head of the school system within his county. There is a fairly adequate retirement system for teachers, strong tenure contracts for university teachers, but for other public school teachers the law requires only a notice for dismissal and a hearing.

Libraries.—Most of the public and college libraries in larger communities have special collections of books and documents on the history of Montana and the Northwest. One of the best of these is at the Montana State University Library in Missoula. Other libraries which are notable for their special collections are the Montana State Law Library at Helena and the law library at the State University in Missoula, for their legal collections; the Montana School of Mines Library at Butte, for geology and metallurgy; the Parmly Billings Memorial Library at Billings, for petroleum; and the Montana State College Library at Bozeman, for agricultural subjects. The library of the Historical Society of Montana is in Helena, and its exhibits are in the state capitol.

History.—The lands now included in Montana were the homes of savage Indians. In the east were the Plains Indians whose food, clothing, shelter, and fuel were derived from the bison. They moved with these animals, but the Blackfeet, an Algonquin tribe, claimed their homes along the upper Missouri, and the Crows made their habitations in the Yellowstone Valley. In northwest Montana were the Kootenays who feared to cross the mountains to hunt the prized bison because of Blackfoot enmity. The Pend d'Oreilles and Flatheads or Selish, however, often crossed the mountains to fight the Plains Indians for hunting privileges. Along the headwaters of the Jefferson lived the Bannacks, a Shoshonean tribe of low culture, afraid of the Plains Indians.

The arid and treeless Great Plains checked the efforts of early explorers and traders to cross them. The earliest known whites to visit Montana were led by the sons of the famous trader Pierre Gaultier de la Vérendrye (1685–1749). In 1642, they crossed the southeastern part of Montana.

The Louisiana Purchase of 1803 ceded the "upper Missouri" and Yellowstone country to the United States, and the Lewis and Clark expedition gave the republic claim to the Clark Fork country. American rights to this region were recognized by Great Britain in the Convention of 1818 and the Oregon Treaty of 1846, and by Spain in the Florida Treaty of 1819.

Until about the middle of the 19th century, the whole of later Montana was a land of Indians, and white trappers and fur traders. Manuel Lisa of the St. Louis Missouri Fur Company built a post at the mouth of the Big Horn and started Indian trade there in 1808. From this post, John Colter explored the Yellowstone Park area, but a new post at Three Forks was destroyed by Blackfeet in 1810.

In 1822, William H. Ashley and Andrew Henry of St. Louis began to trade on the upper Missouri and Yellowstone. Traders of this partnership rediscovered South Pass and a rich beaver country on Green River where they moved. Later the group was known as the Rocky Mountain Fur Company. About 1829, John Jacob Astor's American Fur Company began trading from Fort Union near the mouth of the Yellowstone. The rivals fought bitterly over all of what is now Montana, and on Ruby Creek the daring trapper William Henry Vanderburgh was killed by Blackfeet. The resources of the Rocky Mountain traders were soon exhausted and the western department of the American Fur Company dominated the upper Missouri until past the middle of the century.

David Thompson, in the employ of the Canadian Northwest Company, first explored northwest Montana and in 1809, built "Saleesh House" on Clark Fork near Thompson Falls. Many traders traversed the Clark Fork country with parties led by Alexander Ross, Peter Skene Ogden, John Work and others. From Astoria, the post Astor had founded on the Columbia River, came American traders but their efforts accomplished little. The Treaty of 1846 ended British occupation but the Hudson's Bay Company traded in Montana for many years.

Missionary efforts were contemporary with the fur trade. Urged by Flatheads, Father Pierre-Jean De Smet established St. Mary's Mission in

the Bitterroot in 1841. This mission was at first successful, but an influx of whites and other difficulties led to its closing, and in 1850 the mission property was transferred to an ex-army sutler, "Major" John Owens, who used it as a trading post for more than 30 years.

After the gold rush to California, projects for a transcontinental railroad resulted in the Stevens survey of 1855. The railroad was not built then, but Lieut. John Mullan constructed a wagon road from Ft. Benton, head of steam boat traffic on the upper Missouri, to Walla Walla, and over this went pack trains of mules and camels, as well as pony express riders, stage coaches, and freighters.

Discoveries of gold between 1857 and 1863 produced a gold rush to this region. Bannack on Grasshopper Creek, Virginia City on Alder Gulch, and Helena on Last Chance Gulch soon became populous communities. Missoula, Deer Lodge, Bozeman, and other settlements became supply depots for mining communities. Bandits known as road agents preyed upon unlucky miners who had found gold, and the miners struck back by organizing as vigilantes in December 1863, and soon executed or frightened from the country all known road agents.

The gold rush which brought miners to both sides of the Rocky Mountains and the resulting lawlessness made necessary an organized government. In 1863 Idaho Territory was organized and included practically all of later Montana. On May 26, 1864, Montana Territory, so christened by James Ashley, then a congressman from Ohio, was formed from eastern Idaho.

Indian uprisings against the settlers began in the late 1860's. The Sioux were most implacable and their enmity culminated on June 25, 1876, at the Battle of Little Big Horn when Gen. George A. Custer and his entire command were killed. The next year, the Nez Percés of Idaho under Chief Joseph, seeking to escape confinement on a reservation, made a dramatic march across Montana until they were forced to surrender, Oct. 5, 1877.

In the decade of the 80's, construction of the Northern Pacific Railway gave an impetus to agriculture and stock raising. The 90's were characterized by feuds between the "copper kings" William A. Clark, Marcus Daly, and F. Augustus Heinze. These feuds were not only for control of the copper industry but involved state politics. This period marked also a demand for free coinage of silver, supported by miners and debt-ridden farmers anxious for inflation.

After the turn of the century, farming prospered and farmers complained that the mines escaped their fair share of taxation, thus imposing an undue burden upon agriculture. Their complaints led to a license tax on mines in 1924.

The decade following World War I was characterized by growing unrest among farmers and laborers. The period began conservatively in 1920 when former Senator Joseph M. Dixon defeated the rising young radical leader, Burton K. Wheeler, for governor, but the people later turned towards the federal government for a solution of their problems. Senators Thomas J. Walsh, and Wheeler, who was elected two years after his defeat for the governorship, both worked for federal assistance in reclamation, lower freight rates, and farm relief.

The depression, beginning in 1929, hit heavily. Farmers received so little for their produce that they had nothing left after paying freight to markets. Mass unemployment followed the closing of mines and suspension of lumbering. Beginning in 1933, the federal government poured vast sums into the state for relief projects, farm assistance, road building, and reclamation, particularly the great Fort Peck project. Public opinion, radical for two decades, drifted towards conservatism. In 1946, Leif Erickson, a prominent liberal, was defeated for the senate by a pronounced conservative, Zales N. Ecton. Economic groups tended to urge their particular interests. Sheep and cattle men called for higher protection, and better access to the public domains. Farmers were interested in federal support prices. General interest focused on reclamation and power development. Representative Michael J. Mansfield, a university professor turned politician, was generally applauded for his efforts in western Montana to build the great Hungry Horse Dam, a project which had been agitated for more than 20 years. A hearing by army engineers on a proposal to dam Clark Fork River below Paradise to regulate the flow of water at Grand Coulee Dam aroused bitter opposition. The lake formed above the dam would inundate the valleys of the Flathead and Clark Fork rivers for many miles and deprive many whites and Indians of their homes. It would force the Northern Pacific Railway to seek a new route over the mountains between Missoula and Spokane. Representative Mansfield suggested, as an alternative, a dam near Glacier Park. Opinions on further development of power and irrigation in eastern Montana were sharply divided. Senator James E. Murray supported a Missouri Valley Authority and, early in 1949, introduced a bill to establish it. Governor Sam Ford opposed this and urged that irrigation be carried out by the Bureau of Reclamation and that power sites be constructed by army engineers. The question came before the courts through an order of the Federal Power Commission declaring the upper Missouri navigable and thus subject to federal regulation. The Montana Power Company, which controls most of the hydroelectric power developed in the state, objected and the dispute was carried to the Supreme Court.

In the campaign of 1948, the Democrats carried all state offices. The new governor, John W. Bonner, recommended extension of social security, increased aid to education and expansion of highway construction. The legislature followed cautiously, seeking to avoid increases in taxation. It endorsed the governor's program to attract population to the state by development of new industries, and advertising the appeal of beautiful scenery. Support of the expected settlers depends upon the wise utilization of water.

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MONTANA NATIONAL BISON RANGE AND HERD.—The range is in western Montana, along the Northern Pacific Railroad between Ravalli and Dixon. The tract set apart for the home of the herd contains approximately 18,000 acres, with both grazing land and timber. In the center is a mountain about 2,500 feet high, with grassy slopes and wooded ridges. On the north side of the range several miles of Post Creek are included. On the south side the range takes in about a mile of the Jocko River. In the interior are several large springs. The place is ideal for buffalo. It is estimated the food supply is sufficient for a herd of from 1,500 to 2,500 animals. The range was selected by Prof. M. J. Elrod, of the University of Montana, for the American Bison Society, with W. T. Hornaday, then president. In 1908 Senator Joseph Dixon of Montana introduced in Congress a bill to provide for the purchase of the range and for fencing. This became a law in May 1908.

The American Bison Society raised a fund of approximately $10,500 for the purchase of bison for the range. Thirty-seven animals made the nucleus of the present herd which numbered in 1940 about 437.

MONTANA SCHOOL OF MINES, a State institution founded in 1893. It is located at Butte, one of the leading mining centers of the world, and is open to both men and women. It offers courses in mining, metallurgical and geological engineering, confining its work exclusively to education in the field of the mineral industry. It was endowed with a land grant of 100,000 acres, the income from which approximates $30,000 annually. The departments of instruction include chemistry, English, economics, geology and mineralogy, mathematics, metallurgy, mineral dressing, mining engineering and physics. The undergraduate course of instruction covers four years. The degrees given are the B.S. and the M.S. Approximate annual enrollment is 375.

MONTANA STATE COLLEGE, a coeducational institution, founded in 1893 and located at Bozeman, Mont. In 1913 it was, by an act of the state legislature, made one of the component parts of the University of Montana. It was endowed with a land grant of 140,000 acres of which 41,543 acres were sold, some years after the institution was founded, for cash and deferred payments amounting to $562,423.99. Within recent years the number of students has increased. The enrolment in 1933–1934 was 1,034 students; in 1947–1948 it was 3,664. These figures are exclusive of those enrolled in short courses. The institution offers courses in engineering, agriculture, science, household and industrial arts. The state experiment stations, both for agriculture and engineering, are connected with the college. The college receives the benefit of the several federal acts providing support for the land-grant colleges, as well as state support. The income from all sources in 1938–1939 was $385,239. This does not include dormitory funds, building funds, etc., but is money spent for operation of the college proper. The state appropriation was $158,250. The plant value is $3,916,359. The degree of bachelor of science is given for the completion of the various courses, and graduate work in specified departments is offered with the master of science and professional engineering degrees. Short specialized courses in agriculture and agricultural education are offered. The buildings are modern and of permanent construction.

MONTANA STATE NORMAL COLLEGE, The. One of the six components of the University of Montana. The institution is located at Dillon and was created by act of the state legislature in 1893. In March 1913, the several higher institutions of the state were constituted the University of Montana. The first chancellor assumed his duties in 1916, at which time the Normal College became a part of the university through methods of administration.

MONTANA STATE UNIVERSITY, originally the University of Montana, made one of the six component parts of the latter by legislative act of 1913, is located at Missoula. Established by the state legislature in 1893, the doors of the institution were opened Sept. 10, 1895, with 50 students and five members of the faculty. In 1947–1948 the faculty numbered 158 and the total number of students was 3,694.

Courses are offered in the College of Arts and Sciences in bacteriology, botany, chemistry, classical languages, economics, and sociology, English, fine arts, geology, history, and political science, home economics, library economy, mathematics, medical technology, modern languages, nursing education, physical education, physics, psychology, zoology and wild life technology. The degrees conferred are bachelor of arts and bachelor of science and the corresponding master's degrees. Women are admitted on equal terms with men. The income is derived from a small federal land grant income, in greater part from legislative appropriation, and from student fees. The campus contains about 100 acres, with an adjoining portion of Mount Sentinel of 520 acres, and in addition 20,216 acres in the Montana Forest and Conservation Experiment Station in the Blackfoot Valley and 160 acres in the Biological Station at Flathead Lake.

MONTANELLI, mŏn'ta-nĕl'lē, **Giuseppe,** Italian author and patriot: b. Fucecchio, January 1813; d. there, June 17, 1862. He studied law. He became counsel, writing at the same time on philosophical subjects and (1836) issued a volume of lyric poetry. In 1840 he was made professor of Italian and commercial law at Pisa. He founded the Society of Fratelli Italiani (1844), started (1847) the periodical *L'Italia,* fought at Curtatone (1848) and was made (1849) a member of the triumvirate with Guerrazzi and Mazzini. He was given a mission in

Paris, from whence he issued a series of works of a striking character such as 'Memorie sull' Italia e specialmente sulla Toscana dal 1814–1850' (Turin 1853–55); 'La sensazione' (Paris 1856), a dramatic poem; 'Camma,' a gripping tragedy; also the political works, 'Il partito nazionale italiano' (Turin 1856); 'L'impero, il papato, la democrazia in Italia' (Florence 1859). In 1859 he was again called to arms and (1862) was elected to Parliament. Consult Provenzal, 'Alla cara memoria di Guiseppe Montanelli' (Leghorn 1862); Redi, Ricardo, 'Biografico di Giuseppe Montanelli' (Florence 1883); Orlando, 'Il Montanelli poeto,' in *Marzocco* (ib. 1910).

MONTANISM, mon'-, the religious system of Montanus (q.v.).

MONTANITE, a mineral consisting of the hydrated oxides of bismuth and tellurium, and having the formula $Bi_2O_3.TeO_3.2H_2O$. It occurs as an incrustation, frequently in connection with the mineral teradymite, from which it is often formed by alteration. It is soft and opaque with a waxy lustre, and is variable in color. Montanite is found at Highland, Mont., and also in Davidson County, N. C., and at Norongo, N. S. W.

MONTANUS, mŏn-tā'nŭs, Phrygian sectary of the middle of the 2d century A.D. Of him practically nothing is known save in connection with his sect, the Montanists. He was a heathen priest, a native of Ardahan; was converted to Christianity about 156; and about 171 A.D., proclaimed himself the Paraclete or Comforter promised by Jesus. He soon gathered around him a group of followers who believed with him that he was the mouthpiece of the Holy Spirit, as were his companions Prisca, or Priscilla, and Maximilla, each of whom had left her husband to join Montanus. Both these women uttered prophecies, but like Montanus claimed to be only the passive agents of the Holy Ghost. Montanus' principal tenets, apart from his belief that every believer may be the means of special revelation, were largely millenarian; in view of the approaching end of the world he enjoined asceticism, strict church discipline with the exclusion of all offending members, the terrible effect of mortal sin and the incompetency of the Church to forgive it. He and his followers counted it sin to attempt escape from persecution. He was excommunicated with his followers about 175, and died soon after; Maximilla, the last of the prophets, died in 179. His teaching spread after his death, his most notable disciple being Tertullian (q.v.). The sect soon died out in the West, but survived in the East until the time of Justinian, when it was suppressed. Consult Bonwetsch, 'Geschichte des Montanismus' (1881); Erlangen, De Loyres F., 'Montanism and the Primitive Church' (Cambridge 1878).

MONTARGIS, môn-tär-zhē, France, a town in the department of Loiret, 47 miles east by north of Orleans. It is a manufacturing town with an important trade in paper, cotton goods, leather, shoes, chemicals and agricultural produce. Mirabeau was a native; the castle anciently a favorite residence of the reigning family was called "The Royal Cradle," and here in 1371 occurred the famous judicial combat between the "dog of Montargis" and Macaire, its master's murderer. The dog not only showed the spot in the forest of Bondy where its dead master was buried, but singled out the murderer, and when Charles VI granted the ordeal of battle to test his guilt, the dog flew at his throat and so proved its charge upon his body. Pop. 13,000.

MONTAUBAN, môn-tō-bŏn, France, capital of the department of Tarn and Garonne, on the Tarn, 342 miles south by west of Paris. It is situated on a plateau surrounded by the Tarn, the Tescou and a deep ravine. The cathedral, episcopal palace, hôtel de ville and the bridge over the Tarn are its principal features. Montauban has manufactures of silk bolting cloths, of common cloths, colors, porcelain, starch, candles, etc.; silk and wool spinning-mills, dyeworks, potteries, etc. During the religious wars in France, Montauban was a stronghold of the Huguenots, and was besieged in 1580 by Montluc, and in 1621 by the troops of Louis XIII, without success; but it was taken in 1629 by Richelieu, and its walls razed to the ground. The Protestants maintain both an academy and a theological college. The artist Ingres was born at Montauban; many of his pictures are in the museum and his celebrated 'Vow of Louis XIII' hangs in the cathedral. Pop. about 20,000.

MONTAUK INDIANS, an American tribe of the Algonquin family formerly occupying the extreme eastern end of Long Island, N. Y. They were formerly a powerful people, but a pestilence in the 17th century reduced their number to less than 1,000. Since 1903 only about a dozen of the Montauk tribe survive on Long Island.

MONTAUK POINT, N. Y., the eastern peninsular promontory of Long Island, in Suffolk County, with lighthouse and life-saving stations, the lighthouse, in long. 41° 4′ N.; lat. 71° 51′ W., being built of stone, 170 feet high, and its light visible 19 miles. The peninsula has a height of from 50 to 100 feet above the sea, is rolling and wooded and noted for its bracing healthful climate. Here in 1898 Camp Wikoff was established for the sick, wounded and convalescent soldiers who had served in the Spanish-American War.

MONTAUSIER, mŏn'tō'zyā, **Charles de Sainte-Maure,** MARQUIS DE, French diplomat: b. 6 Oct. 1610; d. 17 May 1690. He entered the army young, distinguished himself in Italy and Lorraine and in his 28th year became major-general. After seceding from the Reformed Church and subscribing to the Catholic faith (1645) he was created lieutenant-general and governor of Saintonge and Angoumois. He remained true to the court during the Fronde war and, in 1665, he was raised to marquis and peer, being appointed guardian of the Dauphin in 1668. In 1680 he was made chief chamberlain. Under his supervision Bossuet and Huet edited the classical writers in *Usum Delphini*. He was distinguished for strict morality and love of the truth, in fact his character was inclined to be sombre, from which fact he was used by Molière as the original Misanthrope. He married Julie Lucine d'Angennes, daughter of Marquis de Rambouillet, a lady of great beauty and whose talents made their home the centre of the most noted sages

and artists of the day, notably Jean Racine and Nicolas Boileau-Despréaux.

MONTBELIARD, môn-bā-lyàr′, commune, France; in Doubs Department. It is situated 43 miles east-northeast of Besançon, on the Rhine-Rhone Canal and the Paris-Lyon railway. There is a Protestant church, St. Martin's, which was built in the 17th century; and a monument to the naturalist Georges Cuvier (1769–1832), who was born here. Montbéliard is in an industrial region, has foundries and cotton mills, manufactures clocks, and has a considerable trade in lumber, cheeses, and wine.

The town grew up around the medieval castle of the counts of Montbéliard, which was rebuilt in 1751. With the surrounding area, it became a countship of the Holy Roman Empire, passing by marriage to Württemberg in 1397. It was repeatedly occupied by the French (1674–1697, 1723–1748, and 1793–1801), becoming French territory in 1801 by the Treaty of Lunéville. Pop. (1946) 13,596.

MONTCALM DE SAINT-VERAN, môn-kàlm′ dē săn-vā-răn′ (Anglicized mŏnt-kăm), Marquis **Louis Joseph de,** French soldier: b. near Nimes, Feb. 29, 1712; d. Quebec, Sept. 14, 1759. He entered the army at 15, distinguished himself in the War of the Austrian Succession, and gained the rank of colonel. He was wounded at the Battle of Piacenza, Italy, in 1746, and was promoted brigadier general the next year.

In 1756 he was promoted to major general and was sent to command the French troops in Canada, where he began operations against the British with great activity and success. Fort Ontario at Oswego was carried on Aug. 14, 1756, after a well-conducted attack, and French control of the lake was restored. The next year (Aug. 9, 1757) he took Fort William Henry, at the head of Lake George, which was held by a garrison of over 2,500 men; and thus became possessed of 42 guns and large stores of ammunition and provisions. In the campaign of 1758 he occupied the strong position of Fort Carillon (Ticonderoga), made it still stronger by entrenchments, and on July 8 held it with 3,600 men against a British force of over 15,000 led by the incapable Gen. James Abercromby.

His personal bravery gained him great popularity among his soldiers; but want of energy on the part of the home government, the scarcity of food all over New France, and personal dissensions between himself and the civil governor, the marquis de Vaudreuil-Cavagnal, forbade him to look for much assistance. Montcalm expressed his conviction that in a few months the English would be masters of the French colonies in America; yet he prepared as best he could for the campaign of 1759. The English had sent strong reinforcements and were preparing for an attack on Quebec. As the success of the whole campaign and indeed the conquest of Canada depended upon the taking of that city, Montcalm concentrated his principal forces on the banks of the Montmorency River to protect it. In the first attack, July 31, the English general, James Wolfe, was repulsed; he later succeeded in landing his troops above Quebec, and on September 13 brought his whole force to the Heights of Abraham. Montcalm at once opposed his advance, but though he led the attack in person, his more numerous but inferior troops broke before the fire of the British. Wolfe fell in the moment of triumph; Montcalm was mortally wounded and died the next morning.

Consult Parkman, F., *Wolfe and Montcalm* (Boston 1884); Chapais, T., *Le marquis de Montcalm* (Quebec 1911); Lichtenberger, A., *Montcalm et la tragédie canadienne* (Paris 1934); Robitaille, G., *Montcalm et ses historiens* (Montreal 1936).

MONTCEAU-LES-MINES, môn-sō′lā-mēn′, commune, France; in Saône-et-Loire Department; nine miles south-southwest of Le Creusot, which it supplies with coal. It is a center of coal mining, lime burning, and oopper foundries, and has hosiery factories. Pop. (1946) 26,902.

MONTCHRETIEN, môn-krā-tyăn′, **Antoine de,** French playwright and economist: b. Falaise, Calvados, about 1575; d. Tourailles, near Domfront, Orne, Oct. 8, 1621. He was at first an adventurer, and having killed his adversary in a duel, fled to England about 1605. He returned to France in 1611 and established ironworks at Ousonne-sur-Loire and later at Châtillon-sur-Loire. He was killed while taking part in a Huguenot uprising.

Among his tragedies are *Sophonisbe* (1594), *Aman* (1599), and *L'écossaise, ou Marie Stuart* (1601). His most important work was *Traicté de l'oeconomie politique* (1615; new ed. by T. Funck-Brentano, Paris 1889), a treatise on the French economy of the time. Montchrétien condemns monopolies; and advocates protection for the most important industries, freedom for the others.

MONTCLAIR, mŏnt-klâr, town, New Jersey; in Essex County; altitude 240 feet. It is situated six miles north-northwest of Newark and is served by the Delaware, Lackawanna and Western, and the Erie railroads. Montclair is a residential suburb of Newark and New York City, with an active local trade and manufactures of metal items, paints, and chemicals. It is noted for its fine homes, schools, churches, and civic and social organizations. There are three hospitals, an art museum, and a public library. New Jersey State Teachers College (founded 1908; coeducational) is in Upper Montclair, part of the town. Montclair was the home of the painter George Inness from 1878 until his death in 1894. The first settlement was made about 1666. Montclair was part of Bloomfield until 1868, when it seceded and incorporated. It has commission government. Pop. (1950) 43,927.

MONTDIDIER, môn-dē-dyā′, commune, France; in Somme Department; 21 miles southeast of Amiens. It is a market center for the surrounding country, has tanneries, and manufactures leather goods. There are two churches dating from the period of the 15th and 16th centuries. Montdidier dates from Merovingian times, and became a royal fief in the 12th century. During World War I it was heavily damaged in the fighting for Amiens in 1918, and again suffered in World War II. Pop. (1946) 4,601.

MONTE CARLO, mŏn′tē kär′lō, commune, Monaco, situated about a mile north of the capital of the principality; celebrated for its luxuriously appointed casino, founded in 1856, the most famous gambling establishment in the world. Monte Carlo is also noted for its scenic surroundings, its mild, healthful climate, and its attractive

appointments of perfect roads, magnificent gardens, handsome promenades and elegant residences. Its situation on an isolated elevation overlooking a bay of the Mediterranean is particularly beautiful. The "Association of the Watering-Place and Strangers Club of Monaco," with a capital of $6,000,000 in 60,00 shares, held the contract, which was made with the late M. François Blanc to expire in 1913, whereby the reigning prince was paid annually the sum of $350,000 for the concession to play. The society in 1898 was granted an extended concession to 1947, for a cumulative decennial increase in its annual payment; it originally bore the cost of the government of the principality but now contributes less than 10 per cent of the total expenses. Roulette and trente are the principal games played. Pop. (1947) 7,967. See also MONACO.

MONTE CASSINO, a Benedictine abbey near Cassino (q.v.), Italy, founded by St. Benedictine in 529, on the site of a temple of Apollo. It was destroyed several times between the 6th and the 10th century, the present buildings date from 1637–1727. Since 1866 it has been a national monument, and the abbot became the guardian.

MONTE ROSA. See ROSA, MONTE.

MONTE SAN GIULIANA, mōn-tā sän jo͞ol-yä'nô, Italy, town in the Sicilian province of Trapani and located 2,540 feet above sea-level on an isolated mountain, the Eryx of the ancients. Remains of the old Phoenician walls still exist and a few remnants of the ancient temple of Aphrodite as well as the cistern (Venus spring). It has a 14th century church and a castle affording a magnificent panoramic view. Its industrial life consists of olive culture and marble quarries. Pop. (1936) 32,933.

MONTEBELLO, mŏn-tâ-bĕl'ō, Italy, village in the province of Pavia, situated on the Coppa. It is noted through two battles fought here. The first occurred June 9, 1800, and is frequently called the Battle of Casteggio, in which General Lannes defeated the Austrians thereby gaining the title duke of Montebello. The second, fought May 20, 1859, was won by the French under Forey, while the Austrians were commanded by Stadion. Pop. 2,183.

MONTECRISTO, mŏn-tâ-krēs'tō, or krĭs'tō, a small island in the Mediterranean belonging to the Italian province of Leghorn, 28 miles south of Elba. In the 16th century it was ravaged by pirates, and as it is rocky and barren, rising 2,126 feet above the sea, it long remained uninhabited. A penal agricultural colony briefly from 1873, it passed to private hands, the last private owner being Victor Emmanuel III. The elder Dumas borrowed its name as title for his hero of *The Count of Monte Cristo* (q.v.).

MONTECUCCOLI or **MONTECUCCULI,** mŏn'tâ-ko͞o'kô-lē, **Raimund,** Austrian commander: b. near Modena, Feb. 21, 1609; d. Linz, Austria, Oct. 16, 1680. He entered the Austrian service and served during the Thirty Years' War with great distinction. After the Peace of Westphalia (1648) he visited Sweden and England in a diplomatic capacity; and in 1657 the emperor sent him to the aid of the king of Poland against Rakoczy and the Swedes, and next year he assisted the Danes against the latter. In 1664 he gained a great victory over the Turks after having driven them out of Transylvania. In 1673 he was placed at the head of the imperial troops and checked the progress of Louis XIV by the capture of Bonn and by forming a junction with the prince of Orange in spite of Turenne and Condé. Montecuccoli's subsequent advance into Alsace was repulsed by the prince of Condé. His last military exploit was the siege of Philipsburg. The Emperor Leopold made him a prince of the empire and the king of Naples gave him the duchy of Melfi. His memoir on the Turkish war, written in Italian (1703), was translated into several languages.

Consult Campori, *Raimondo Montecuccoli, la sua famiglia e i suoi tempi* (Florence 1876); Grossmann, J., *Raimund Montecuccoli* (Vienna 1878).

MONTEFIASCONE, mōn-tâ-fyäs-kō'nâ, Italy, town in the province of Rome and circuit of Viterbo, situated on a hill to the southwest of Lake Bolsena and on the Attigliano-Viterbo Railway. It is the see of a bishopric and has among its most prominent buildings a beautiful cathedral, a Romanesque church (San Flaviano), a 16th century castle, etc. The muscatel wine cultivated here is known as "Est, Est, Est," which has some connection with the grave inscription here dedicated to the Canon John von Fugger. Pop. (1936) town 3,307; commune 11,277.

MONTEFIORE, mŏn-tĕ-fī-ō'rĕ, **Claude Joseph Goldsmid,** English author and Jewish communal worker: b. London, 1858 d. London, July 9, 1938. He studied at Balliol College, Oxford; identified himself with Hebrew charities and educational movements in London; was president of the Jewish Historical Society (1899–1900); and was head of the Anglo-Jewish Association, the Jews' Infant Schools, etc. With Israel Abrahams he edited *The Jewish Quarterly Review* and wrote a series of sermons, *Aspects of Judaism* (1895). He has published besides the Hibbert Lectures for 1892, *The Origin of Religion, Illustrated by the Ancient Hebrews; Liberal Judaism* (1903); *The Synoptic Gospels* (1909); *Some Elements of the Religious Teachings of Jesus* (Jowett Lectures, 1910); and *Rabbinic Literature and Gospel Teachings* (1930). He also selected and arranged the *Rabbinic Anthology,* published in 1936.

MONTEFIORE, SIR Moses Haim, Anglo-Italian philanthropist: b. Leghorn, Italy, Oct. 24, 1784; d. Ramsgate, England, July 28, 1885. He was descended from a wealthy family of bankers; was educated in London; became a leading member of the Stock Exchange; and retired from active business in 1824. From that time he devoted himself to the service of his race, working for the removal of disabilities and oppression under which the Jews in England and elsewhere had suffered great hardship. His wife, whom he married in 1812, was Judith Cohen, a relative of the Rothschilds, and in her Montefiore found a companion who entered ardently into his philanthropic undertakings. He was for a time high sheriff of Kent, and after long exclusion and repeated

re-election was legally recognized as sheriff of London in 1837. In that year he was knighted and in 1846 raised to a baronetcy in recognition of his meritorious public services. He distinguished himself by his practical sympathy for his race in various countries, chiefly in Poland, Russia, Rumania and Damascus. He made seven journeys to the East, the first in 1827, and the last in 1874, mainly for the amelioration of the condition of the Jews. At Bucharest during an anti-Jewish tumult, he boldly faced the mob at the risk of his life. In 1865 he endowed a Jewish college in memory of his wife, who died three years before, at Ramsgate, where he passed the last years of his life, dying there in his 101st year. In his 100th year he was a type of hale and venerable manhood.

MONTEGO BAY, West Indies, harbor on the north coast of the island of Jamaica. It contains a teachers' seminary, hospital, etc., and has a considerable export trade in fruits and other produce. It is the seat of an American consular station and has about 7,000 inhabitants.

MONTELEONE DI CALABRIA, mŏn'tā-lā-ō'nā dē kạ-lä'brē-ạ, Italy, capital of a circuit in the province of Catanizara, near the Gulf of Sant Eufemia and located on the Naples-Reggio Railway. It contains the ruins of the castle built by Frederick II, and also of the 15th century San Michele Church, besides a lyceum and grammar school. Its commerce consists chiefly of silk and oil production. The town was utterly destroyed by earthquake in 1783, and again much injured in 1905. It has about 13,000 inhabitants. Consult Pignatari 'Sunto di notizie storiche intorno alla città di Monteleone' (Monteleone 1896).

MONTELIMAR, mŏn'tā'lē'mär, France, capital town of the arrondissement in department Drôme, located at the juncture of the rivers Roubion and Jahron on the Mediterranean Railway. It contains an ancient castle, now a prison, with a Romanesque chapel, a college, library, museum, Chamber of Agriculture, etc. Among its manufactures are hats, silks, paper goods, agricultural instruments and its noted almond candy (nougat). It has also considerable trade in silk, wine, truffles, lime, etc. The town receives its name from Adémar de Monteil who rebuilt it after its destruction, in the 10th century, by the Saracens. In the 15th century the town fell into the possession of the French Crown. It withstood the siege of Coligny heroically in 1570 but was taken by the Huguenots in 1587.

MONTEMAYOR, mŏn-tā-mä'yōr, **Montemor Jorge,** Spanish-Portuguese poet and novelist: b. about 1520; d. 1561. His real name was Montemôr, but it assumed the Spanish form Montemayor in Spain. There is little definitely known of the life of Montemayor. He was one of the poet musicians of his day who found refuge and welcome at the Spanish court where he was already on familiar terms in 1548. Six years later he accompanied Juana, the Infanta, to Lisbon where she was to be married to Dom João. He seems to have visited England and Holland with Philip II, and he may have been to Paris. He was assassinated in 1561. His most famous work is a pastoral novel entitled 'Diana Enamorada' (Madrid, between 1545 and 1559). Inflated in style, artificial in its depicting of character, indifferent in poetical value yet, as Cervantes had said, "it has the honor of being the first of the books of its class." Partly in verse and partly in prose, the latter is much the superior. The 'Diana' is written principally in Spanish, but it contains songs and prose passages in Portuguese. It became immensely popular and was widely imitated not alone in Spain but in the other countries of southern and western Europe. It was translated into English by Bartholomew Young in 1583 and published in 1598 and was very widely read in England. Sidney's 'Arcadia' probably owed its existence to the 'Diana' and it was certainly strongly influenced by it; and Shakespeare, in 'Two Gentlemen of Verona' and in parts of other plays shows the effect that the 'Diana' had already had upon English literature. Montemayor's work, being modeled on the Italian pastoral novel which had, to a certain extent, already had its influence upon English literature, the 'Diana' found the proper soil in which to plant itself. Montemayor, who had not finished the 'Diana Enamorada' at the time of his death, left instructions that it should be completed by Dr. Alonso Pérez of Salamanca who wrote accordingly 'Segundo del Salamantino' in 1564. In the same year Gil Polo wrote a second 'Diana Enamorada.' Both of these books are patent imitations of Montemayor's novel. Scores of other imitations followed, among the authors thereof being no less personages than Cervantes and Lope de Vega. The 'Cancionero' of Montemayor (2 vols., Antwerp 1544-58) contains some of his own lyrics. An edition of Montemayor's works was published in Barcelona in 1886.

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MONTENEGRO (Serb, CRNA GORA, Black Mountain), formerly an independent kingdom; now one of the six autonomous republics which make up the Federal Peoples Republic of Yugoslavia. Covering 5,342 square miles and with a population of 360,044 (1931 census; prelim. 1948, 376,573), it lies in the southwestern part of Yugoslavia, bounded on the southeast by Albania, on the southwest by the Adriatic Sea, and on the remaining sides by other regions of Yugoslavia (Dalmatia, Hercegovina, Serbia). There are few towns in Montenegro. Titograd (formerly Podgorica; pop. 1948, 12,206) is the capital. Cetinje was the historic capital. Other

cities are Nikšić, and the two ports of Bar (Antivari) and Ulčinj (Dulcigno).

The country is a succession of elevated ridges, with some lofty mountain peaks, of which the highest is Mount Durmitor (8,294 feet), and a few beautiful and verdant valleys in which the soil is tolerably fertile. The principal river is the Morača, with its chief tributary the Zeta; it flows into the Lake of Scutari which is on the Yugoslav-Albanian border. Forests of oak, ash, beech, fir, and poplar cover many of the mountainsides.

Corn, potatoes, vegetables, and several kinds of fruit are grown, but the country is a food-deficit area. Pigs, sheep, and goats are raised in considerable numbers. Agricultural methods remain primitive. Manufacturing industry is virtually nonexistent. Fishing, carried on principally in the Lake of Scutari, is one of the major industries.

The Montenegrins belong to the Serbian branch of the South Slav peoples. Physically, they tend to be tall, well-proportioned, and robust. The women are often beautiful when young but soon lose their good looks because of the unceasing hard work which they perform. Throughout its history Montenegro has been known as a land of violence, where all men go fully armed. At the same time, the people are noted for their hospitality. They speak the Serbo-Croat language, using the Cyrillic alphabet (q.v.). In religion they are mostly all of the eastern Orthodox Church.

History.—Montenegro formed a part of the ancient Roman province of Illyria. During the barbarian invasions (5th century A.D.) it existed as the Serbian principality of Zeta and later formed part of the great Serbian empire of Stephen Dushan (Stevan Dušan, Uroš IV) which for a brief period in the mid-14th century included most of the Balkan Peninsula. After the overthrow of that empire and the disastrous defeat of the Serbs by the Turks at Kosovo in 1389, Montenegro maintained in succeeding centuries a *de facto* independence. Turkish armies made many attempts to subdue the country but, because of the difficulties of the terrain and the tenacity of the people, were never more than partially successful. From 1516 Montenegro was governed by a prince-bishop, or *vladika,* first elective but after 1696 hereditary in the family of Petrović. Early in the 18th century were established the close relations with Russia which were maintained for 200 years. In 1796, Prince Peter I (r. 1782–1830) inflicted such losses on the army of the pasha of Scutari, who had invaded Montenegro, that for many years the Turks left the country unmolested. Peter II (r. 1830–1851), who was a noted poet, made strenuous efforts to improve the condition of the people and to liberalize the governmental system. Peter's successor, Danilo I or II (r. 1851–1860), separated the princely from the ecclesiastical office, retaining only the former. His reign was marked by an epic victory over the Turks at Grahovo in 1858 known as the Montenegrin Marathon. Assassinated in 1860, Danilo was succeeded by Prince Nicholas, who reigned for 50 years as prince and for six more as King Nicholas I of Montenegro. In 1861, Montenegrins took part in a revolt against Turkish rule in neighboring Hercegovina, and when the revolt was put down Nicholas was compelled to agree to the occupation of a number of points in Montenegro by Turkish troops. In 1876, Montenegro and Serbia declared war on Turkey following the outbreak of a new revolt in Bosnia-Hercegovina; Russia entered the war in 1877. The Treaty of Berlin (1878), which concluded hostilities, gave Montenegro certain accessions of territory and formally recognized its independence (see BERLIN CONGRESS). Montenegro was a member of the Balkan League (q.v.) of 1912 and fought against Turkey in the First Balkan War, gaining additional territory (see BALKAN WARS). Montenegro joined Serbia when World War I began in 1914 and was overrun by the German-Austrian armies in the following year. While the government proposed to resist to the end, the king attempted to make a deal with the Central Powers but could reach no agreement. When Cetinje was occupied on Jan. 13, 1916, he and his government retired to Neuilly-sur-Seine, France. After the war Nicholas tried, without success, to induce the victorious Allied Powers to restore Montenegrin independence and his throne. Meanwhile, a National Assembly meeting at Podgorica on Nov. 26, 1918, declared the dynasty deposed and voted union with Serbia. Montenegro became a part of the new Kingdom of the Serbs, Croats and Slovenes (Yugoslavia) whose independence was proclaimed on Dec. 1, 1918.

During the inter-war period there was in Montenegro considerable opposition to the centralized administration run from Belgrade (Beograd), although as a compensating factor, many Montenegrins were able to achieve prominence in the broader field of Yugoslav government and politics. The Axis powers naturally attempted to make capital of Montenegrin discontent. When Yugoslavia was defeated and partitioned in 1941, Montenegro was made a protectorate of Italy, garrisoned by Italian troops; on Italian initiative it was declared independent on July 12, 1941. After the Italian surrender in September 1943 German troops occupied the key towns. During the course of the war, Montenegro was the scene of guerrilla activity on the part of both nationalist Chetniks and Communist-led Partisans. Toward the end of the war the latter got the upper hand and remained in effective control when the Germans withdrew.

Under the Tito regime, Montenegro has been given the status of a nominally autonomous "republic" with its own government, although through the centralized apparatus of the Communist Party of Yugoslavia its affairs are under the direct control of Belgrade.

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MONTENOTTE, mŏn-tā-nŏt'tĕ, village, Italy, situated in the commune of Cairo Montenotte, province of Savona, 26 miles west of Genoa. In a battle fought here on April 12, 1796, Napoleon won his first victory over the Austrians in the Italian campaign.

MONTEPULCIANO, mŏn-tā-pōōl-chä'nō, commune, Italy, situated in the province of Siena, Tuscany, 28 miles southeast of Siena. The town

is picturesquely located on a height (1,950 feet) overlooking the Lake of Montepulciano. It is the trading center of a wine-producing district and has woodworking establishments. Outstanding among its many old buildings are the Palazzo Cervini, designed by the elder Antonio da Sangallo; the Palazzo Contucci, begun by Sangallo in 1519 and completed by Baldassare Peruzzi; the Palazzo Ricci, by Peruzzi; the cathedral (1532–1617), designed by Ippolito Scalza and containing a triptych (1401) by Taddeo di Bartolo; the 14th century Palazzo Communale, which has Della Robbia terra cottas; and the Church of Sant' Agostino, with a Renaissance façade by Michelozzo. At a short distance from the town is the Church of San Biago, built from 1518 to 1545 from plans by Sangallo. Montepulciano was the birthplace of Robert Cardinal Bellarmine, Pope Marcellus II, and Politian (Angelo Ambrogini). It is the seat of a bishopric and has a museum containing Etruscan antiquities. Pop. (1951) 16,555.

MONTEREAU-FAUT-YONNE, môn-trō′fō-yôn′, town, France, situated in the Department of Seine-et-Marne, at the confluence of the Seine and Yonne Rivers, 17 miles southeast of Melun. Its numerous industrial establishments produce porcelain, pottery, mosaic tiles, bricks, electrical equipment, furniture, hosiery, and food products. It has a church dating from the 13th to 16th centuries and an equestrian statue of Napoleon I.

In Gallo-Roman times the town was known as Condate. The name of Montereau dates from the 8th century, when a monastery was dedicated to St. Martin. In 1419, John the Fearless, duke of Burgundy, was assassinated here by followers of the dauphin (later Charles VII). Nearby, on Feb. 18, 1814, Napoleon won a victory over the Allies. The town sustained some damage in World War II. Pop. (1946) 8,726.

MONTEREY, mŏn-tĕ-rā′, city, California, situated in Monterey County, on Monterey Bay, 19 miles southwest of Salinas, the county seat. It is served by the Southern Pacific Railroad and by United Air Lines and Southwest Airways. The airport, 3 miles east of the city, is a regular stop between San Francisco and Los Angeles. The harbor is protected by a 1,500-foot breakwater, and the port facilities are municipally owned. Inland, back from the bay, are orchards and stock farms, and the city has fruit and vegetable canneries. Along the coast the leading industries are fishing and fish packing. The principal commercial catch is sardines (pilchards), but abalone, mackerel, albacore, tuna, shrimp, lobsters, and crabs are also taken. The processing of fish oils, fish fertilizer, and fish meal supplements this activity. Del Monte sand, a white sand used in sandblasting stone buildings, is shipped from here.

Monterey spreads over a sloping shore, with residences on the hillsides to the east and mountains farther back from the sea. It pivots on Alvarado Street, which extends from Fishermen's Wharf to the northern end of the city. There are excellent recreational facilities, a public library, and a junior college (Monterey Peninsula College). In the old customhouse (1814) and the first California theater (1844) the state maintains museums; in the former a room is devoted to a collection of manuscripts of writers associated with the area, including Robert Louis Stevenson and Ambrose Bierce. Other historic buildings include Colton Hall, where California's first constitution was framed; and the chapel (1789) of the presidio. The Presidio of Monterey, now a United States Army post, has in its grounds statues of Father Junípero Serra, who in 1770 founded the Mission San Carlos Borromeo here (it was moved shortly thereafter to Carmel), and Commodore John D. Sloat, who captured the city for the United States in 1846. Nearby are the art and literary center of Carmel-by-the-Sea and Fort Ord.

The site of Monterey was visited by Juan Rodríguez Cabrillo in 1542, and the bay was named by Sebastián Vizcaíno in 1602. The first permanent settlement, called San Carlos Borromeo, was made in 1770, when Father Serra and Gaspar de Portolá established, respectively, a mission and a presidio here. Under both Spanish (to 1822) and Mexican rule, Monterey served as the capital of Alta California. On July 7, 1846, the American flag was raised over the courthouse. Three years later a constitutional convention was held in the city, and here the first state legislature assembled. Monterey was incorporated in 1850. Government is of the city manager type. Pop. (1950) 16,205.

MONTEREY BAY, bay, California, indenting the Pacific coast in Monterey and Santa Cruz counties. It is about 26 miles across from Santa Cruz in the north to Monterey in the south and extends inland for about 10 miles. The Salinas River flows into the bay.

MONTEREY PARK, city, California, situated in Los Angeles County, 5 miles east of downtown Los Angeles, of which it is a residential suburb. It is served by the Pacific Electric Railway. There are food-processing plants and factories producing engine parts and toys. Founded in 1910, Monterey Park was incorporated in 1916. Government is of the city manager type, and the water supply system is municipally owned. Pop. (1940) 8,531; (1950) 20,395.

MONTERO RIOS, môn-tā′rō rē′ōs, **Eugenio,** Spanish statesman and jurist: b. Santiago de Compostela, Nov. 13, 1832; d. Madrid, May 12, 1914. He was educated at the universities of Santiago and Madrid, and in 1864 became a professor of canon law at the latter. Elected to the Cortes in 1869, he served as minister of justice in 1870–1872 and again in 1889. He served as president of the Senate in 1894–1895, and in 1898 was president of the Spanish commission to negotiate peace after the Spanish American War. He was again president of the Senate in 1899, and in 1903 was recognized as the leader of the Liberal Party. He served as prime minister in 1905–1906, and for a third time as president of the Senate, in 1909–1914.

MONTERREY, môn-tĕr-rĕ′ē, city, Mexico, capital of the State of Nuevo León, on the Inter-American Highway, 440 miles north-northwest of Mexico City. With the exception of Mexico City, it is the most important manufacturing center in the republic. It is situated at an altitude of 1,624 feet on the Santa Catarina River in a fertile valley surrounded by the eastern foothills of the Sierra Madre Oriental at the northern end of the agricultural section of the state. South of the city is an extensive citrus country of mountainous

valleys and rolling hills, while the arid plains of northern Nuevo León lie immediately north of it. Before its conquest by the Spaniards, the region was inhabited by nomadic Indians. These were subdued during the 1560's, and the area was quickly settled. The town was first named León, receiving its present name in 1596. In the course of the Mexican War, United States troops under Gen. Zachary Taylor stormed Monterrey during a four-day battle in 1846 (see MONTERREY, BATTLE OF). The present city combines traditional Spanish architecture, largely confined to the older residences and public buildings, with numerous outstanding examples of modern industrial and commercial construction. The basis of Monterrey's prosperity is the smelting of iron ores carried on in mills east of the city, and the manufacture of iron and steel products. There are also lead smelters, refineries of nonferrous metals, cement plants, flour and textile mills, soft drink bottling works, and some celebrated breweries. The city is also one of Mexico's leading financial centers. Close commercial ties are maintained with the United States, and the influence of the neighboring country is strong. The city is the major rail and highway center of northern Mexico. It is the seat of the University of Nuevo León (1933) and of a technological institute. Pop. (1940) 186,092; (1950) 339,634.

MONTERREY, Battle of. In the early part of the Mexican War, Monterrey, which occupied a strong natural position and was well fortified, was held by Gen. Pedro de Ampudia with about 10,000 regular troops. In August 1846, Gen. Zachary Taylor, with a force of 6,625 men (mostly volunteers), marched from Matamoras to attack Monterrey. On September 9, he camped within 3 miles of the city. Ten days were spent in reconnoitering, and on the afternoon of September 19, Gen. William J. Worth was ordered to march with his division around the hill occcupied by the bishop's palace, to take a position on the road to Saltillo, and to carry the enemy's detached works in that quarter. The main body of the army was to make a diversion against the center and left of the city by batteries erected during the night. On the following morning these batteries opened on the city, which replied with heavy fire from the citadel and other works. The lower part of the city was assaulted and entered by the Americans, and a strong Mexican work was captured after hard fighting by a brigade under Gen. John A. Quitman. Gen. William Orlando Butler entered the city at another point with the 1st Ohio Regiment. Meanwhile, General Worth carried the heights south of the river and the Saltillo road and turned the guns of the Mexican works in that quarter on the bishop's palace. The Mexicans evacuated the lower part of Monterrey during the night, and early in the morning of September 21, General Worth stormed the height overlooking the bishop's palace. By noon the palace itself was taken, and its guns turned on the Mexicans. Since the houses of the city were solidly built and the streets strongly barricaded, the Americans were forced to take each house in succession by breaking through the walls until they reached the main plaza. The conflict lasted until September 23, the Mexicans contesting every foot of ground until only the citadel remained in their possession. On the morning of September 24, General de Ampudia capitulated and with his army was permitted to march out with the honors of war. United States losses during the battle were 120 killed and 368 wounded. Mexican losses were reported to total 29 officers and 338 men.

MONTES, môn'tās, **Ismael,** Bolivian lawyer, statesman, and soldier: b. La Paz, Oct. 5, 1861; d. there; Nov. 18, 1933. He was educated at the University of La Paz and became a member of the bar in 1886. He served as a judge, and in 1890 was elected as a Liberal to the House of Deputies. In 1899 and again in 1903 he served as minister of war, and from 1904 to 1909 was president of Bolivia. During his term of office a boundary dispute with Chile was settled, and progress was made in education, agriculture, and transportation. Montes was minister to France in 1910 and minister to Great Britain in 1911 From 1913 to 1917 he served a second term as president. He was again minister to France in 1917, and from 1920 lived there in exile. Returning to Bolivia in 1928, he became head of the Liberal Party.

MONTESA, môn-tâ'sà, **Order of Our Lady of,** a Spanish military order established by King James II of Aragon in 1319 after the suppression of the Knights Templars (1312). It was endowed with the latter's estates. In 1587 it became united with the Spanish crown. The order was abolished in 1872, but was re-established two years later. The badge is a gold lozenge with a red cross in the field, surmounted by a trophy on a red ribbon. Knights are divided into two classes.

MONTESANO, mŏn-tĕ-sā'nō, city, Washington, seat of Grays Harbor County, situated on the Chehalis River, at the head of tidewater navigation, 10 miles east of Aberdeen. It is served by the Northern Pacific, the Union Pacific, and the Chicago, Milwaukee, St. Paul and Pacific railroads. In a farming, lumbering, and fishing region, the city produces lumber, furniture, and dairy products. First settled in 1854, it was incorporated in 1883. Pop. (1950) 2,328.

MONTESPAN, môn-tĕs-pān', MARQUISE DE (nee FRANÇOISE ATHÉNAÏS ROCHECHOUART), mistress of King Louis XIV of France: b. Tonnay-Charente, near Rochefort, 1641; d. Bourbon-l'Archambault, May 27, 1707. The second daughter of the duc de Mortemart, she was married in 1663 to Louis de Pardaillan de Gondrin, marquis de Montespan. To great beauty she added a natural liveliness and wit and a highly cultivated mind. Soon after her appearance at court in 1660, she attracted the king's attention and in 1667 became his mistress. Until 1674 she shared his favor with Louise de La Vallière. Mme. de Montespan bore eight children to the king, two of whom died in infancy. The older children were entrusted to the care of Mme. Paul Scarron (later Mme. de Maintenon). They were legitimized in 1673. Mme. de Montespan's influence over the king continued until about 1679, when a growing attachment to Mme. de Maintenon finally estranged his affections from Mme. de Montespan. She rarely appeared at court after 1684, and in 1691 she left it entirely. Her last years were spent in retirement, devoted to religious exercises, acts of benevolence, and penitence. One of her daughters by the king, Mlle. de Blois, married Philippe II, duc d'Orléans, who served as regent during Louis XV's minority.

MONTESQUIEU, Charles Louis de Secondat, Baron de la Brède et dè, French philosophical historian: b. at La Bride, near Bordeaux, 18 Jan. 1689; d. La Brède, 10 Feb. 1755. He was of a noble family, received an excellent education and studied law which was the family traditional profession. From his father and his mother he inherited titles, property and position, and his uncle, who died in 1716, left him his whole fortune, his very important judicial office of «président a mortier» and his old and noble family name of «Montesquieu.» The office thus bequeathed him he held for 12 years, but his serious occupation was writing on philosophy, politics, natural science and various other subjects. In 1721 his 'Lettres persones' were published at Amsterdam anonymously. In these Montesquieu satirizes the follies of his age in literature, society, politics and religion. So popular were these letters that the public called for several editions in the first year following their publication. They pointed the way to a new field in literature and are credited with being the first book in the so-called «Philosophe» movement. Montesquieu became a sort of literary lion in Paris and he enjoyed his reputation and the peculiar advantages it brought him to the full. But to do this he sold the life tenure of his office in Brède and removed to the capitol in 1726, and two years later he was elected a member of the Académie Française. He suddenly resolved upon an extensive tour of Europe with the purpose of observing the life of the various countries visited. His tour took him to Austria, Hungary, Italy, England and the Rhine country and occupied nearly four years which were very fruitful in the life of the author. Returning to La Brède he set up a great study hall and library 60 feet long by 40 feet wide. The result of his work here was, in part, 'Considérations sur les causes de la grandeur et de la décadence des Romains' which was published anonymously in Amsterdam in 1734. This became at once popular, not alone in France, but all over Europe, and was probably the most widely read of all Montesquieu's works. It opened the wide field of the philosophy of history. In the meantime he was carrying on deep and original researches for a still greater work. But he loved the literary salons and the brilliant life of Paris and much of his time was spent in the capital, however, not to the neglect of his literary investigations, for the 'Esprit des lois,' the most original book of its age, appeared in Geneva in 1748. It was published in two volumes comprising in all 31 books. Though the 'Esprit' met with considerable opposition at first, in France, it became popular in other European countries, and France soon also fell into line and Montesquieu was looked upon as the greatest literary man of his day. His passion for literary work continued; but most of his subsequent writings remained unpublished during his lifetime. His fame continued long after his death and for more than a century he was the one great authority of the moderate reform party, not alone in France, but also in other countries where the spirit of reform was abroad. Of all the early writers on the science of comparative politics and history he easily stands first on account of the actual excellence of the work done, the originality of thought which he constantly displays and the deep and lasting influence he had upon the thought of his own day and upon succeeding generations. In France, however, Montesquieu's enemies and detractors have accused nim of being more English than French in literary form and in manner of thought; and, in fact, so great an admirer was he of everything English, that he was looked upon, during his lifetime and long afterward as an Anglomaniac. Montesquieu is a much more rational thinker than Voltaire, though the latter far outran him in popularity. The two men were, however, so far apart in their modes of thought that neither was able to appreciate the greatness of the other. The cool, moderate reasoning of Montesquieu was not only in every way fitted for the age in which he lived, but it was couched in language that attracted and commended itself to all men of liberal tendencies. Thus it was a preparation for the work that Voltaire himself was called upon to do; and both Montesquieu and Voltaire, though working along different lines and imbued each with a different spirit, were both on the broad road to the Revolution of 1789 and the rejuvenation of France. In an age when the real spirit of all just law was hidden from the sight of most men, the original, truthful and clear-cut views of Montesquieu on politics and their relation to law came as an inspiration and took hold of the imagination of thinking Europe. He made men think clearly and powerfully along lines that they had been unaccustomed to think rightly for centuries. His masterly genius for generalization may be said to have created the science of politics. His plain, unadorned, forceful language and withal beautiful composition is in marked contrast to the spirit that ruled the literature of his own and the following generation. To this simplicity of language and directness of thought he owed much of his popularity. Montesquieu was well known to the more inquiring spirits of the English colonies in America and his work had a strong influence over the revolutionary spirit that began to make itself felt among the colonies early in the latter half of the 18th century, where, during the struggle for independence, it became a veritable textbook of the Revolutionary party. There have been many editions of Montesquieu's works published in French and in all the languages of Europe. (See LES LETTRES PERSANES; SPIRIT OF THE LAWS). Consult Sorel (translated by Masson), 'Montesquieu' (London 1887); Vian, 'Histoire de la vie et des œuvres de Montesquieu' (Paris 1879); Lowell, E. J., 'Eve of the French Revolution' (Boston 1893); Ilbert, C. P., 'Montesquieu' (Oxford 1904); Dargan, E. P., 'Æsthetic Doctrine of Montesquieu' (Baltimore 1907).

MONTESQUIOU-FEZENSAC, môn-tĕs-kē-oo-fā-zän-săk, **Robert,** COUNT DE, French poet: b. Paris, 9 March 1855; d. 1920. He was known as an art collector and as an amateur goldsmith and enameler in 1892, when he published 'Les Chauves-souris,' a volume of verse symbolizing the mystery of night. It was followed by 'Chef des Odeurs suaves' (1893), of which the theme was flowers and perfumes 'Les Hortensias Bleus' (1896) and 'Perles Rouges' (1899), the latter a series of sonnets

evoking the departed glories of Versailles; by *Les Paons* (1901); and by two volumes of essays on neglected artists of distinction.

MONTESSORI, mŏn-tâs-sō'rē; Angl. mŏn-tĕ-sō'rē, **Maria,** Italian educator: b. Chiaravalle (Ancona), Aug. 31, 1870; d. Noordwijk, the Netherlands, May 6, 1952. Educated in Rome, she was the first woman awarded a medical degree in Italy, the University of Rome conferring on her the M.D. degree in 1894. While practicing as assistant physician at the university's psychiatric clinic Dr. Montessori became interested in child education and pursued studies in psychiatry and pedagogy. In 1898 she founded in Rome the Orthophrenic School for feeble-minded and defective children, applying the principles and methods of Édouard Séguin (q.v.). Her success suggested the idea that they might prove equally valuable in educating normal children. Meanwhile she had been lecturing at the university on pedagogy (1900–1907).

In 1907 she established in Rome the *Casa dei Bambini,* the first Montessori school for normal children and the prototype of many throughout Europe and America which featured the "Montessori Method." Essentially the method consists in encouraging the child's initiative and employing specially prepared teaching materials and games for sense and muscle development. Stress is laid on the child's freedom of expression, and the teacher's function is that of supervisor and guide rather than of formal instructor.

The basic idea of Dr. Montessori's system is that children are essentially serious-minded and educate themselves if only permitted to do so. Instinctively orderly and easily acquiring self-discipline, they have remarkable powers of mental concentration which only require release. At an early age they should be taught to dress and wash themselves. Naughtiness in a child is the expression of some inner disturbance.

Going to Spain in 1917, Dr. Montessori took charge of the Montessori Institute at Barcelona, and two years later directed training courses in London. Returning to Italy in 1922, she was appointed a government inspector of schools. Although Mussolini for some years approved her work, owing to her pacifist ideas he closed all her Italian schools in 1934. Whereupon she returned to her Barcelona Institute. The Spanish civil war forcing its discontinuance, in 1938 she established a training center at Laren, near Amsterdam. In 1939 she went to India to direct a training course at Adyar, Madras. Interned as an enemy alien in 1940, with her adopted son, Dr. Mario Montessori, she nevertheless was permitted to continue her courses at Ahmadabad and trained about 1,000 Indians in her system.

She published several books on her method which were translated into English and other languages. They include *The Montessori Method* (1912); *Pedagogical Anthropology* (1913); *Dr. Montessori's Own Handbook* (1914); *Advanced Montessori Method* (1917). She also published works on religious instruction, and *The Secret of Childhood* (1939).

MONTEVERDE, mōn-tâ-vār'dâ, **Giulio,** Italian sculptor: b. Bistagno, Oct. 8, 1837; d. Rome, Oct. 3, 1917. A cabinetmaker at Genoa, while still a youth he obtained a scholarship to study sculpture in Rome. The king of Württemberg admiring one of his group pieces purchased it for the munificent sum of 8,000 lira. The young sculptor's fame was enhanced by his *Columbus as a Boy* and *Genius of Franklin.* His most famous piece is his *Jenner* (1873), showing the great physician inoculating his child.

MONTEVERDI, mōn-tâ-vār'dē, or **MONTEVERDE, Claudio,** Italian composer: b. Cremona, May 15, 1567; d. Venice, Nov. 29, 1643. A pupil of Marcantonio Ingegneri, he seems to have been well grounded by his master in the contrapuntal method. His first work, the four-part *Madrigali spirituali,* was published in 1583, and was followed a year later by his *Canzonette à tre voci.* In 1589–1590 he obtained the post of violinist at the court of Mantua. He was a member of the retinue of Duke Vicenzo I Gonzaga during the ducal travels in Hungary and Flanders. Acquaintance with French models at Spa and Brussels inspired him to write his *Scherzi musicali* (1607) in the French style. Vicenzo gave him the post of choir master at the court (1602); but on his patron's death in 1612, the new duke did not retain him. After a brief visit in his native city Monteverdi proceeded to Venice where, in August 1613, he was appointed choir master of St. Mark's, a post he retained until his death.

Between 1587 and 1605 he published five books of five-part madrigals. His first significant operatic work, *Orfeo,* produced at Mantua in 1607, was followed by *Arianna* (1608), of which only the famous song *Lamento* survives. Most of his operas have been lost, among them *Mercurio e Marti* (1627), *Adone* (1639), and *Nozza d'Enea con Lavinia* (1641). His last operas, *Il ritorno d'Ulisse* (1641) and *L'incoronazione di Poppea* (1642), produced in Venice, and especially the latter with its sensuous re-creation of imperial Rome, securely established an operatic style that spread from Italy throughout Europe.

Consult Schrade, Leo, *Monteverdi: Creator of Modern Music* (New York 1950), and Redlich, Hans F., tr. by K. Dale, *Claudio Monteverdi: Life and Works* (London 1952).

MONTEVIDEO, city, Minnesota, and Chippewa County seat; altitude 922 feet; at the junction of the Minnesota and Chippewa rivers; 133 miles west of Minneapolis; on the Chicago, Milwaukee, St. Paul and Pacific Railroad. It is a trading center for livestock, poultry and dairy products. Leading industries include a packing house, bottling works and three creameries. Named for the Uruguayan capital, it was platted in 1870, incorporated as a village in 1879, and as a city in 1908. A monument in near-by Camp Release State Park commemorates the release of 269 white captives of the Sioux Indians in 1862. Pop. (1950) 5,459.

MONTEVIDEO, mŏn-tĕ-vĭd-ā'ō, *Span.* môn-tâ-vê-thā'ô, city, Uruguay, capital of the department of the same name, and of the republic. It is situated on the estuary of the Rio de la Plata (q.v.). Founded in 1726, the inhabitants numbered only 3,500 in 1818, and 9,000 in 1829. Captured by British forces in February 1807, the defeat of Lt. Gen. John Whitelocke's attempt against Buenos Aires in July compelled their withdrawal on September 9.

Demolition of the city walls, opening of new streets, and the beginning of foreign immigration in 1836 caused a phenomenal growth. There were 45,000 inhabitants in 1860; 105,000 in 1872; 238,080 in 1892; and at the beginning of 1902

about 278,186 in the territory of 256 square miles embraced in the department. By 1 Jan. 1930, the population had increased to 655,389.

Montevideo is 125 miles east of Buenos Aires, Argentina. The harbor is considered the best on the Rio de la Plata; but formerly was far from satisfactory. An elaborate system of moles and docks, projected for harbor improvement, began in July 1901. The water at the harbor's entrance being but 15 to 17 feet deep, vessels of great draught formerly anchored in the outer roadstead and discharged their cargoes on lighters. Since 1901 over $30,000,000 have been expended to increase the port's facilities. The city is built on a chain of hills of moderate elevation with a gradual slope toward the shore; the conditions are therefore favorable for efficient drainage. An active commerce is maintained with foreign countries and towns of the interior. As it is the only port of entry it furnishes nearly all of the revenue of the government, receiving or forwarding about 90 per cent of the importations of the entire country and about 67 per cent of the total exportations. The steamers of 20 different companies, including three British, two French, four German and three Italian lines, visit the port, some regularly, others more or less periodically. Conspicuous buildings are the Parliament House, Government Palace, National Bank, Solis and San Felipe theatres, Uruguay Club and School of Arts and Sciences. There are commenercial houses of every class, street railways, telegraph and telephone service, electric-light works, printing establishments and foundries. The streets are wide, straight and generally well kept. The water supply is obtained from the Saint Lucia River, at a point about 12 miles distant. Plazas, 16 in number, occupy high ground in the middle of the city, the most attractive of these public squares being the Zabala, Independencia and Constitución. The Universidad de Montevideo has over 10,000 students, and a very large teaching staff. There are also normal schools, a school of arts and trades, and primary schools. Banks are numerous, and include a branch of the National City Bank of New York. No city in South America is more cosmopolitan in character: nearly all the languages of the civilized world are heard in its streets. The environs contain beautiful residences surrounded by gardens; at a distance of about three miles from the city is the fine park called El Prado.

MARRION WILCOX.

MONTEVIDEO, Department of. See URUGUAY.

MONTEZ, Lola (assumed name of MARIE DOLORES ELIZA ROSANNA GILBERT), adventuress: b. Limerick, Ireland, 1818; d. Astoria, N. Y., 17 Jan. 1861. Her parents took the child to India, where her father died, and her mother, again marrying, sent Lola back to Europe. In 1837 she married a Captain James, went to India with him, tired of him and returned to England in 1842. She next became a public dancer, performing in London and in cities of the Continent, and in 1846 went to Munich, where she fascinated the old artist-king Louis I of Bavaria who made her his mistress, created her Countess of Landsfield and granted her a large annuity. For a while she also exercised great political power, which she directed against the Jesuits and in favor of liberalism; but with the outbreak of the Revolution of 1848 she was once more set adrift. In London she married a guardsman, Stafford Heald, was soon divorced from him and in 1851 sailed for the United States. After touring through this country with a play called 'Lola Montez in Bavaria,' she went to Australia, returned here, was twice married in California and in 1858 lectured in New York where she settled and spent her last days in rescue work among women. Her writings include 'Lectures,' with an autobiography, and 'The Arts of Beauty' (1858).

MONTEZUMA, mŏn-tę-zoo'mą (Aztec MONTECUHZOMA, the severe or sad one; found written also MONTEÇUMA, MOCTEZUMA, MUTECZUMA, MOTEZUMA), surnamed ILHUICAMINA (archer of heaven) and called MONTEZUMA I, chief, or emperor, of ancient Mexico: b. about 1390; d. 1464. He succeeded his brother Izcohuatl in the chieftainship in 1436, but was not inaugurated until 1440. His success in war with neighboring tribes was great, and he is said to have extended Mexican conquest to the Gulf. With Netzahualcoyotl, chief of Tezcuco, he built, to prevent inundations from Lake Tezcuco, huge dams, the ruins of which in the San Lorenzo Valley have shown them to have been a marvelous feat of engineering. He also rebuilt Tenochtitlan (on the site of the modern Mexico), the chief Aztec city, substituting for the primitive buildings others of lime and stone; established a severe legal code and developed the ceremonial and influence of the tribal religion. Consult Bancroft, H. H., 'Native Races' (San Francisco 1874–82).

MONTEZUMA, surnamed XOCOYOTZIN and called MONTEZUMA II, chief, or emperor, of ancient Mexico: b. 1479 (authority of Bernal Diaz); d. Tenochtitlan, Mexico, 30 June 1520. He is well known as the ruler of the Aztecs at the time of the Spanish invasion. He succeeded his uncle Ahuizotl as chief in 1503. Almost constant wars were carried on by him with the Tarascans and Tlascalans, and he is said to have led an expedition as far south as Honduras. His internal policy was in many respects wise. He severely enforced the laws, introduced valuable changes in the courts and built many public works, including temples, a new conduit for the water supply and a hospital for invalided warriors. But by his arrogance and pomp, his seclusion, his restriction of appointments to those only of noble rank and his heavy taxation he made himself greatly disliked. His conquests enlarged the empire, but the various parts were without cohesion, and insurrections were frequent. When news was brought in 1518 that ships and white men (of Jean de Grijälva's expedition) had been seen off the coast, Montezuma was greatly alarmed, because an ancient prophecy foretold that Quetzalcoatl, the white god, would at some time come to reign over Mexico. He sent presents to Cortéz, who had landed at Vera Cruz in April 1519, and tried to prevent him from marching to Tenochtitlan. Cortéz, however, arrived there in November and was well received. Fearing an outbreak of the people, who did not agree with the conciliating policy of the monarch, Cortéz then took Montezuma prisoner and retained him as a hostage in the

quarters of the Spaniards. In June 1520, when the Aztecs finally attacked the quarters, Montezuma, at the request of Cortés, attempted by a speech from the wall to end the hostilities. He was wounded by a volley of stones and died a few days later.

Consult Prescott, W. H., *History of the Conquest of Mexico*, new ed., with introduction by S. G. Morley (New York 1948).

MONTEZUMA, city, Georgia, situated in Macon County, at an altitude of 185 feet, on the Flint River, 49 miles southwest of Macon. It is served by the Atlantic Coast Line and the Central of Georgia railroads and has a municipal airport. The city is the trading and shipping center for an area producing peaches, vegetables, and other agricultural products, and it has fruit-packing plants, clothing factories, and lumber mills. Montezuma was incorporated in 1854. Pop. (1950) 2,921.

MONTEZUMA CASTLE NATIONAL MONUMENT, Arizona, situated on Beaver Creek, near the Verde River, about 40 miles south-southwest of Flagstaff. It has an area of 783 acres and contains the ruins of Pueblo Indian cliff dwellings. The best preserved of these, called Montezuma Castle by early travelers in the mistaken belief that it was of Aztec origin, consists of five stories, with walls two feet thick at the base. It contains 20 rooms, most of which extend along the cliffs that support the higher stories.

MONTFAUCON, môn-fō-kôn′, **Bernard de**, French Benedictine monk and scholar: b. Château de Soulage, Aude, Jan. 13, 1655; d. Paris, Dec. 21, 1741. He entered the army in 1672, but three years later joined the Congregation of St. Maur (see MAURISTS) and devoted himself thereafter to classical studies. In 1687 he went to St.-Germain-des-Prés, Paris, and there, except for a three-year stay (1698–1701) in Italy consulting libraries, he remained for the rest of his life. He became a member of the Académie des Inscriptions in 1719.

Montfaucon is considered the founder of scientific paleography. His great work, *Palaeographia Graeca*, published in 1708, is still useful. He also published editions of the writings of the early church fathers, including *Athanasii opera omnia* (3 vols., 1698), *Collectio nova patrum et scriptorum graecorum* (1706), and *Joannis Chrysostomi opera omnia* (13 vols., 1718–1738). In addition, he was the author of *L'antiquité expliquée et representée en figures* (15 vols., 1719–1724) and *Les monuments de la monarchie française* (5 vols., 1729–1733).

Consult Broglie, C. P. E. de, *La société de l'abbaye de St.-Germain-des-Prés au XVIII^e siècle: Bernard de Montfaucon et les Bernadins*, 2 vols. (Paris 1891).

MONTFERRAT, môn-fĕ-rà′ (Ital. MONFERRATO), former marquisate and duchy, Italy, whose territory lay almost entirely in what is now the province of Alessandria, Piedmont. Its capital (after 1435) was Casale Monferrato. The marquisate, which originated in the late 10th century, passed to a branch of the Palaeologi in 1305, and they held it until 1533. Three years later, Emperor Charles V granted it to Federigo II Gonzaga, duke of Mantua. It became a duchy in 1575. In 1631 a considerable part of Montferrat was ceded to Savoy, and in 1708 the remainder also became part of Savoy.

MONTFORT, mŏnt′fĕrt (Fr. môn-fôr′), **Simon de**, EARL OF LEICESTER, English statesman and soldier: b. Normandy, 1208?; d. Evesham, Worcestershire, Aug. 4, 1265. He was the son of Simon IV de Montfort l'Amaury, conqueror of the Albigenses (q.v.), and of Alice de Montmorency. His father had been disinherited of his English estates by King John in 1207 and hence had the more readily joined the orthodox French party in fighting the Albigenses, who were led by John's brother-in-law, Raymond VI, count of Toulouse. In 1229, however, the younger Simon was forced to leave France and throw himself on the mercy of the English king, Henry III, who restored to him his lands in Leicester (1231) and married him to his own sister Eleanor, the young widow of William Marshal, 2d earl of Pembroke, secretly and without dowry in 1238. The marriage aroused much antagonism among the nobles, who had not been consulted. Within 18 months, Simon had quarreled with the king over a debt, and he was saved only by taking a crusader's vow, which he fulfilled in 1240. He fought with the king in France in 1242, and in 1248 was made governor of Gascony. There he crushed several rebellions, but his severity occasioned charges of oppression, and although he was acquitted, the king forced his resignation in 1252. In the following year, however, Henry was forced to recall Simon. In 1257, Simon quarreled hotly with William de Valence, the king's half brother and one of his foreign favorites. Simon's boldness in this affair won him the leadership of the barons in the movement for administrative reform. In June 1258, he was one of the 24 commissioners who drew up the Provisions of Oxford, and one of the 15 who signed them in October of that year.

Simon had been the actual head of the reform movement since the conclusion of peace with France (Dec. 4, 1259), which had made reform possible. The cause of the nobles was now submitted to Louis IX of France for arbitration. His decision, made early in 1264, was entirely favorable to Henry, setting aside the Provisions of Oxford and reserving to the people only such rights as they had acquired before the provisions were signed. Meanwhile, in 1263, open warfare had broken out between the king and the barons (the Barons' War). Simon now made an alliance with Llewelyn ab Gruffydd, prince of North Wales. On May 16, 1264, after a brilliantly led engagement at Lewes, Simon succeeded in capturing the king. A constitution was drawn up giving power to a council of nine, over whom were three electors, and in this new regime Simon was practically master of the kingdom.

On Jan. 30, 1265, Simon summoned a parliament of 120 churchmen, 23 barons, 2 knights from each shire, and 2 citizens from each borough. Known as the Model Parliament, it was the forerunner of the modern British Parliament. The session was marked by a quarrel between Simon and Gilbert de Clare, 8th earl of Gloucester, and the latter went over to the Royalist nobles on the Welsh border. After a short reconciliation, Gloucester joined Prince Edward (later Edward I) and fighting broke out again. On June 19, Simon made a treaty with Llewelyn, and set out to meet Gloucester. Reinforcements failing, he was killed in the ensuing battle. His forces were so greatly outnumbered by those

with Gloucester and Prince Edward that at sight of the enemy Simon is said to have exclaimed, "Let us commend our souls to God, for our bodies are theirs." To call him the "creator of the House of Commons" is a misapprehension of his work, which forwarded rather than fathered representative government.

Consult Bemont, C., *Simon de Montfort* (Eng. trans. by E. F. Jacob, 1930); Lodge, E. C., *Gascony under English Rule* (1926).

MONTGOLFIER, mŏn-gōl-fyā′, Anglicized mŏnt-gŏl′fĭ-ĕr, **Joseph Michel,** French inventor: b. Vidalon-lez-Annonay, 1740; d. Balaruc-les-Bains, June 26, 1810. Together with his brother, Jacques Étienne Montgolfier (b. Vidalon-lez-Annonay, Jan. 7, 1745; d. Serrières, Aug. 2, 1799), he invented the first practical balloon, consisting of a large linen bag inflated with heated air. On June 5, 1783, it ascended at Annonay, and in a flight lasting 10 minutes it covered a distance of one and one-half miles. Joseph also invented a water-ram which raised water to a height of 60 feet, and Jacques first made vellum paper. See Aeronautics.

MONTGOMERY, Bernard Law (1st Viscount Montgomery of Alamein), British army officer: b. Kennington, London, Nov. 17, 1887. Of Ulster stock, his grandfather was the cleric Dean Frederic William Farrar (q.v.), and his father, Henry Hutchinson Montgomery, was Anglican bishop of Tasmania, where his early years were spent. He, too, might have been a churchman instead of a soldier; it was his daily custom to read a passage from the Bible, a practice he recommended to his officers. After graduating from Sandhurst Military Academy in 1908, he was commissioned a lieutenant of infantry in the Royal Warwickshire Regiment. He served in France and Belgium for three years during the First World War, being twice wounded and six times mentioned in dispatches; he was awarded the Distinguished Service Order and the Croix de Guerre, and for several months before hostilities ended he held the rank of temporary lieutenant colonel. Later, he served as a staff officer on the Rhine, in Ireland, England, and India, and in 1937 he was promoted to brigadier. With the rank of major general, he commanded a division in Palestine and Trans-Jordan during 1938–1939, and on the outbreak of the Second World War he went to France as acting lieutenant general in command of the 3rd Division of the 2nd Corps. Having evacuated his men at Dunkerque during the night of May 31–June 1, 1940, he was given command of the 5th Corps in Britain; and in December 1941, he was entrusted with responsibility for the South-Eastern Command, the most vital post in the defenses against possible German invasion.

On Aug. 18, 1942, he assumed command of the 8th Army ("Army of the Nile"), which had been driven back into Egypt from Libya by German Field Marshal Erwin Rommel, and in North Africa, during ensuing months, he displayed the brilliant leadership which firmly established his reputation as one of the greatest generals in the war. After careful preparation, on October 23, he launched an attack upon the Germans and Italians entrenched at El Alamein, and, when their lines broke, he pursued the enemy remnants into Libya. By early November, Rommel had lost more than half his forces, Montgomery thus being the first of the Allied generals to inflict a decisive defeat upon a German army. In recognition of his accomplishment, on Nov. 10, 1942 he was knighted by King George VI (Knight Commander of the Order of the Bath) and promoted to full general. Continuing the pursuit with the utmost vigor, he drove the surviving Germans out of Libya into Tunisia, and there his 8th Army co-operated with Gen. Dwight David Eisenhower's forces in bringing the North African campaigns to a victorious conclusion in May 1943.

Still at the head of the 8th Army, Montgomery participated in the Allied landing on Sicily in July 1943, and he led the troops invading the Italian mainland two months later. He continued to serve in Italy until January 1944, when he returned to Britain to take command of all land forces under Eisenhower preparing for the invasion of France. Toughness, common sense, and a profound mutual respect between men and leader made it possible for Montgomery to say to the 8th Army in farewell: "In all the battles we have fought together, we have not had one single failure."

After the successful landing on the Normandy coast on June 6, 1944, Montgomery directed all land operations until August when, with a great increase in American land forces in France, a reorganization of commands became necessary. He was then assigned to command of the 21st Army Group, consisting of the 2d British and the 1st Canadian armies, which held the northern end of the Allied line in the Netherlands and Belgium. Further opportunities to justify his reputation as a skillful and resolute tactician came to him following his promotion on September 1 to the rank of field marshal, highest in the British Army. On Dec. 17, 1944, after a German thrust through the Ardennes had split Lieut. Gen. Omar N. Bradley's 12th Army Group, Montgomery was given temporary command of all Anglo-American troops on the north side of the bulging line, with the American 1st and 9th armies attached to his army group. On May 4, 1945 he accepted the surrender of 500,000 German troops in the Netherlands, northwest Germany, Helgoland, and the Frisian Islands, and on May 22 was appointed chief of British forces occupying Germany and British member of the Allied Control Commission.

Raised to the peerage as Viscount Montgomery of Alamein in 1946, he was made chief of the imperial general staff. When, on Sept. 28, 1948, the Western European Union nations (Britain, France, Belgium, Netherlands, Luxembourg) set up a "Permanent Defense Organization," Lord Montgomery was designated permanent military chairman. He resigned in early 1951 to accept the post of deputy supreme commander of the North Atlantic Treaty forces under Gen. Dwight D. Eisenhower, then supreme commander. He continued to serve in that capacity under Gen. Matthew B. Ridgway.

MONTGOMERY, môn-gôm-rē′, Comte **Gabriel de,** French soldier: b. about 1530; d. Paris, June 26, 1574. A lieutenant of the Scottish guards in the service of the king of France, he accidently killed King Henry II with whom he was tilting in a tournament in 1559. Montgomery was condemned to retirement in the country, where he read many religious books and was soon led to join the Protestant party. In 1562 he entered Condé's army, serving with bravery and

ability. He saved himself by the swiftness of his horse during the Massacre of St. Bartholomew. In 1574 he led a band of Huguenots and began war in Normandy. There he was captured at Domfront, taken to Paris, tried and beheaded.

MONTGOMERY, James, British poet and journalist: b. Irvine, Ayrshire, Nov. 4, 1771; d. Sheffield, Yorkshire, April 30, 1854. The son of a Moravian divine, he was educated for the ministry at the Fulneck Moravian Seminary near Leeds, but in 1792 he procured an engagement with a bookseller in Sheffield, the proprietor, editor and publisher of the local *Sheffield Register.* Montgomery succeeded him later as editor and publisher of the paper, the name of which he changed to the *Sheffield Iris.* The publication of a liberal journal was at that period fraught with manifold dangers. He was twice prosecuted for trivial offenses and condemned on the first occasoin to three and on the second to six months' imprisonment. During his confinement he composed a volume of poems, *Prison Amusements,* published in 1797. In 1806 appeared *The Wanderer of Switzerland,* his first popular effort. It was followed in 1809 by *The West Indies,* a poem exposing the iniquities of the slave trade. Later volumes were *The World Before the Flood* (1812); *Greenland,* a missionary poem (1819); and *The Pelican Island* (1826). In 1825 he resigned the editorship of the *Iris* and passed the remainder of his life in religious and literary work. His hymns, which numbered more than 100, included *Hail to the Lord's Anointed,* and *Prayer Is the Soul's Sincere Desire.* Authorship of his hymns has sometimes been attributed to Robert Montgomery (q.v.).

MONTGOMERY, Richard, American soldier: b. Swords, County Dublin, Ireland, Dec. 2, 1738; d. Quebec, Dec. 31, 1775. At 18 he obtained a commission in the British Army, in 1757 began his career of active service in America, and at the siege of Louisburg in 1758 and elsewhere gave evidence of high military capacity. After a period of residence in England from 1765, in 1772 he sold out his commission and, emigrating to New York, settled in Rhinebeck, Dutchess County. In 1775 he represented Dutchess County in the provincial Congress, and in the same year was appointed one of the eight brigadiers to serve in the newly organized army of the united colonies. He was second in command to Gen. Philip Schuyler in the invasion of Canada, and became commander when Schuyler fell ill. On Nov. 12, 1775 he captured Montreal. He joined forces with Benedict Arnold, and was killed in the assault on Quebec.

MONTGOMERY, Robert, English poet and Anglican clergyman: b. Bath, 1807; d. Brighton, Dec. 3, 1855. His name survives chiefly through the merciless criticism and ridicule of his work by Lord Macaulay in the *Edinburgh Review.* Having taken orders in the Church of England, he officiated at Percy Street Chapel in London till his death in 1855, with an interval of four years as pastor of St. Jude's Episcopal Chapel in Glasgow. His chief works, overpraised by uncritical sentiment for their popular vein, amply justify Macaulay's strictures, though hardly their offensively dogmatic tone. They include *The Omnipresence of the Deity* (1828); *Satan* (1830), whence his sobriquet of "Satan Montgomery"; and *The Messiah.*

MONTGOMERY, city, Alabama, is the state capital and seat of Montgomery County. It is located on the southern bank of the Alabama River, 410 miles north of the Gulf of Mexico by water and 180 miles by rail, and about 87 miles southeast of Birmingham by air. The city is built on a bluff bordering the river and stretching back to undulating hills. The altitude varies from about 160 to 222 feet. Montgomery lies in the heart of the famous Black Belt, that band of rich, dark soil which stretches almost the entire breadth of the state and embraces about 3,400 square miles. North of this belt are the state's vast coal and iron fields, and south of it are great forests of yellow pine. Six railroads serve Montgomery: the Louisville and Nashville; the Gulf, Mobile and Ohio; the Atlantic Coast Line; the Central of Georgia; the Seaboard Air Line; and the Western Railway of Alabama. Several federal and state roads converge on the city. Montgomery has its municipally owned airport. Dannelly Field, with scheduled airline service; and a commercial field, Allenport Air Field, for private aircraft and charter flights. Just outside the city are Maxwell and Gunter Air Force bases. At Maxwell Air Force Base is the Air University, the top level training command of the United States Air Force.

Commerce and Industry.—Montgomery is the main market of the central Alabama area, and one of the chief distributing points of the South. It is the largest cattle market south of the Ohio River and east of Fort Worth. Montgomery County itself is one of the heaviest populated counties in the United States in livestock. The city also ranks high as a cotton market and distributing point. Montgomery's location in the state gives it natural advantages for processing and manufacture. From its food processing plants come canned goods, soft drinks, sirup, pickles, meat, cottonseed oil, and other products. Among the city's numerous lumber companies are about a score that specialize in various types of woodwork. Montgomery is the manufacturing center of the United States for Victorian furniture reproductions, accounting for about 40 per cent of the total volume and about 75 per cent of the hand-carved variety. Chief among other manufactures are fertilizers, insecticides, textiles, clothing, glass, chemicals, and plumbing and heating supplies.

Buildings and Cultural Institutions.—The State Capitol, constructed of stucco-covered brick and designed in Greek Revival style, dates from 1851, when the central, white-domed portion was erected. Since then, wings have had to be added, but the building is still noted for the beauty of its design. It stands on a landscaped hill of lawn, trees, shrubbery, and gardens. In the rose garden, some variety of this flower blooms every month of the year in this city which is noted for its beautiful old gardens. On the capitol grounds are also a number of fine sculptural pieces, including the Confederate Monument, executed by Alexander Doyle but designed by Gorda Chipman Doud, one of Montgomery's own artists. Jefferson Davis laid the monument's cornerstone in 1886, and a statue of him by Frank Hibbard is on the capitol's front lawn. Gutzon Borglum's statue of John Allan Wyeth, son of Alabama and a world-famous surgeon and medical edu-

cator, is also on the grounds. Within the building are paintings and sculpture, such as the murals and bas relief panels by Roderick D. Mackenzie, and the bronze bust by Percy Bryant Baker of another of the state's famous sons—Gen. William C. Gorgas. The World War Memorial Building (1940) houses the state's Department of Archives and History with its library and historical museum, the latter including exhibits of the years when Alabama was part of the French colony of Louisiana. The city-owned Museum of Fine Arts, which also promotes interest in Southern history, contains period rooms, family heirlooms, and some rare collections of historic importance, including firearms and silverware. A frame structure, built in the early 1850's and now known as the First White House of the Confederacy, is a memento to Jefferson Davis, who lived in it when Montgomery was the capital of the Confederacy. The house is filled with his personal belongings and with relics of Civil War days. Several of the city's other beautiful buildings are even older, such as Pickett House (1830's) and the Seibels and Lomax houses (1840's). Church organizations of all denominations are represented in the city, several of which have handsome, modern edifices. St. John's Episcopal Church (1836) is of particular historic interest. Here, as president of the Confederacy, Jefferson Davis worshiped; and Montgomery women made it their headquarters for war work, until the church was temporarily closed by Federal troops following the bishop's advice to pray for the president of the Confederacy instead of the president of the United States.

Education.—Montgomery's public education includes elementary and secondary schools for white and for Negro children. The state's University of Alabama has a branch in Montgomery in which students can complete the first two years of college work. In 1951 this university center had an enrollment of more than 1,000 students. The Alabama State College for Negroes is also located in the city. In 1951 it had more than 4,000 enrolled students. Huntingdon College (Methodist, for women) is an accredited college of arts and science. There are reference libraries connected with all the educational institutions in the city, as well as a public library with a collection totalling 38,000 volumes.

Government and History.—Montgomery has a commission form of government, headed by a mayor and two commissioners. It was incorporated as a town in 1819, and as a city in 1837.

Near the site of Montgomery, before white settlement began, was the Alibamu village of Kanchati. A few white squatters settled there in 1814. When the lands in the Territory of Alabama were opened for sale in 1817, two closely adjoining settlements—Alabama and East Alabama—were made. In 1819, these rival communities merged under the name of Montgomery, honoring the Revolutionary War hero, Gen. Richard Montgomery. (The county had already been named for Maj. Lemuel P. Montgomery, who died during the decisive battle with the Creek Indians at Horseshoe Bend in the Tallapoosa River in 1814.) In 1821, Montgomery had stagecoach transportation to Tennessee and Georgia for passengers and mail, and steamboat connection with Mobile for the transportation of people and produce. It was already becoming a cotton market and distributing point for an increasing number of planters, and stores accepted either cash or cotton in exchange for purchases. In the 1820's, Montgomery's first newspapers were established, the *Advertiser* (1828), which exists to this day, soon becoming one of the most influential in the state. With the opening of a state bank and the beginning of construction of a railroad from Montgomery into western Georgia in the 1830's, population and business increased. In 1840, Montgomery's residents numbered 2,179. In 1846, the city was designated as the state capital, and by 1850 population reached 8,728.

By interest and by location, Montgomery was the focus of the secession movement. On Feb. 4, 1861, Alabama representatives met in the city with those from the five other states in the lower South which had decided to secede. With Jefferson Davis as chairman, they drafted the Confederacy's constitution, constituted themselves a provisional legislature, and set up the Confederate government with Montgomery as its first capital. In July the Confederacy's capital was moved to Richmond. On April 12, 1865, Maj. Gen. James Harrison Wilson took the city and destroyed whatever was of military value. He and his staff made the Teague House (which still stands) their headquarters, and the general read the Emancipation Proclamation from its porch. The years of reconstruction were difficult ones, but the city had so far recovered by 1885 that it replaced its horse-drawn transit with an electric trolley car system, said to be one of the first in the world. In 1890, the city's residents numbered 21,883. About 1900, Montgomery's possibilities as a manufacturing city were recognized and, from then on except during the years of national depression, progress was steady.

Population.—Population growth from 1900 is shown in the following figures: (1900) 31,346; (1910) 38,136; (1920) 43,464; (1930) 66,079; (1940) 78,084; (1950) 106,525. In 1940, the Negro population of the city was 39 per cent; in 1950, it was about 30 per cent.

PAUL B. FULLER,
General Manager, Montgomery Chamber of Commerce.

MONTH, a period of time derived from the motion of the moon. The sidereal month may be regarded as the period in which the moon, as seen from a fixed star, would appear to make a complete revolution round the earth; it is evidently the period in which she passes through the 12 signs of the zodiac; its mean value during the year is 27.32166 days. The synodical month, more commonly called a lunar month or lunation, is the period during which the moon goes through all her phases. It is usually reckoned from new moon to new moon; to complete the lunation the moon must not only pass through the 12 signs of the zodiac, but also come again to occupy her old position relatively to the sun, which has itself advanced in the zodiac, hence the lunar is longer than the sidereal month. The mean value of the lunation is 29.53059 days. The solar month is the 12th part of one solar year, or, 30.4368 days. The anomalistic month is the period in which the moon passes from perigee to perigee of her orbit; it differs from the sidereal month because the perigee varies its position. The line of nodes of the moon's orbit varies its position, and the nodical month, or the period of her motion from ascending to ascending node, differs from the

other months mentioned above. The 12 civil or calendar months of the year have from 28 to 31 days each. The lunar month was used by the Chaldeans and Egyptians, and is still by the Jews, Turks, and some uncivilized nations. The calendar months are not equal divisions of the year, some (April, June, September and November) consisting of 30, and the remainder of 31 days, except February, to which a period of only 28 days is assigned (see LEAP YEAR), with the addition every fourth year of one more day. In popular language a month is often understood to be four weeks, as this is very nearly an equal period, expressed in the division by weeks, to the month. See also CALENDAR; MOON; ZODIAC.

MONTHOLON, môn-tô-lôn′, COMTE **Charles Tristan de** (later MARQUIS), French soldier: b. Paris, July 21, 1783; d. Aug. 21, 1853. After service in the navy, he entered the army in 1798, took part in the Napoleonic campaigns in Italy, Austria and Prussia, distinguished himself at Wagram (July 5-6, 1809), was made chamberlain (1809), was sent on an important diplomatic mission to the Archduke Ferdinand of Austria (1811) and became general of brigade (1814). During the Hundred Days he was adjutant general to Napoleon, whom he accompanied in his exile to St. Helena, and by whom he was appointed one of his executors. Proclaimed chief of staff by Prince Louis Napoleon (later Emperor Napoleon III [q.v.]) when the latter landed at Bologne in 1840, he was condemned by the Peers to 20 years' imprisonment, but was liberated after the February revolution (1848). He was elected to the Legislative Assembly in 1849. He published *Mémoires pour servir à l'Histoire de France sous Napoléon, Écrits à Sainte Hélène sous sa Dictée* (with G. Gourgaud 1822–1823), and *Récits de la Captivité de Napoléon* (1846).

MONTH'S MIND, the requiem Mass celebrated in the Roman Catholic churches for the deceased the 30th day after death. The prayers of the Mass are the same as those of the requiem Mass celebrated on the day of decease or burial except the Collect, Secret and Post-Communion. In the early English church the prayers were offered daily for a month after the person's death. The anniversary of the death is commemorated similarly by the Mass called the YEAR'S MIND.

MONTI, mōn′tē, **Vincenzo,** Italian poet: b. Fusignano, near Ravenna, Feb. 19, 1754; d. Milan, Oct. 13, 1828. He was educated in law against his inclination; became secretary to Prince Luigi Braschi; won his literary spur with *Saggio di Poesie* in 1779; gained speedy popularity with various occasional odes; and in 1784 and 1787 brought out his two great tragedies, *Aristodemo* and *Galeotto Manfredi,* both in the style of Alfieri. His *Bassevilliana* (1793), a Dantesque poetic chronicle of recent happenings, notably the massacre of the French envoy Basville by the Roman populace, showed ability to treat a theme in politics; but from the detestation expressed in that poem for the excesses of the Revolution and his appeal to the Austrians against the French, he soon came to the most ardent praise of Napoleon and fled to France to escape punishment from Austria. His panegyric of the mathematician Lorenzo Mascheroni (1801) is largely an attack by the poet upon his personal enemies. (See MASCHERONIANA). After Marengo he returned to Italy and became professor of oratory at Pavia, imperial poet laureate in Milan, and, after the coronation of Napoleon, historiographer of the Italian kingdom. From that time until the restoration of Austrian rule in Italy, Monti was devoted to Napoleon and wrote numerous odes of victory in his honor. In his latter years, a period of study and adversity, he joined his son-in-law, Giulio Perticari, in his fight with the Della Cruscans, and published his single great work, a version of the *Iliad* (1810). His translation of Persius should be mentioned and his most successful drama, *Caio Gracco* (1802). Monti was an ardent classicist and in his *Sermone sopra la mitologia* (1825) combated romantic tendencies.

MONTICELLI, môn-tē-sĕ-lē′, **Adolphe Joseph Thomas,** French painter: b. Marseille, 1824; d. there, 1886. He made a short stay in Paris and contributed to the Salon; but, not meeting with success, returned to his native town, where he died poor, ignored and insane. Unappreciated, he sold his pictures in cafes for 10 or 20 francs; today they bring large sums. Collectors have made fortunes out of the small canvases which have given Monticelli posthumous fame. His *Court of the Princess* is in the Metropolitan Museum, New York. To use the words of the artist himself, "in the canvases the objects are the decoration, the touches are the scales and the light is the tenor." Monticelli created for himself an entirely personal technique, which can only be compared with that of Joseph Turner. He painted with a brush so full, fat and rich that some of the details are often modeled in relief, in a substance as precious as enamels, jewels, ceramics—a substance which is a delight in itself. Constructed upon one color, as upon a musical theme, a picture by Monticelli rises to an intensity which one would have thought impossible.

MONTICELLO, mŏn-tĭ-sĕl′ō, city, Arkansas, Drew County seat; altitude 272 feet; on the Missouri Pacific Railroad; 80 miles southeast of Little Rock; has an airport. Here are lumber mills, cotton and cottonseed oil mills, bottling works and canning plants. In the tomato season Monticello packs and ships tomatoes in carload lots. Monticello has good schools, and is the seat of Arkansas Agricultural and Mechanical College. Near by is a Soil Conservation Demonstration Area. The town has a mayor and council, and owns its water supply system. Pop. (1930) 3,076; (1940) 3,650; (1950) 4,501.

MONTICELLO, city, Indiana, White County seat, altitude 675 feet, on the Tippecanoe River; on the Pennsylvania and the Chicago, Indianapolis and Louisville railroads, 21 miles west of Logansport, 98 miles southeast of Chicago. With agricultural environment, the city has industrial establishments that employ approximately 1,200 workers, making television cabinets, and insulating wire. Much water power is furnished by the river. Mayor and council administer the government. The city owns its water supply system. Pop. (1940) 3,153; (1950) 3,467.

MONTICELLO, village, New York, Sullivan County seat; alt. 1,524 feet; on New York, Ontario and Western Railroad; 34 miles northwest

of Middletown. Located in a characteristic New York farming section where potatoes and apples, corn and wheat are grown, it has small local industries and is a mountain resort with both summer and winter recreations.

Monticello was founded by John P. Jones in 1804, and was named after Thomas Jefferson's estate in Virginia (see MONTICELLO). It has government by mayor and council. The water supply system is owned by the village. Pop. (1950) 4,223.

MONTICELLO, mŏn-tē-chĕl'lō (It. Little Mountain), Virginia, the estate and residence once owned by Thomas Jefferson (q.v.), third president of the United States. It is in Albemarle County, Va., about two miles from Charlottesville. The estate was an unbroken forest in the early part of the 18th century, until in 1735 the land came into possession of the father of Thomas. Peter Jefferson, the father, and his brother-in-law decided to "go West" and try a new country, so they left the tide-water settlements on the James River and journeyed about 100 miles toward the west, to what is now Albemarle County, and located 20 miles east of the Blue Ridge and among the foothills of the Southwest Mountains. Peter Jefferson "patented" a tract of land of about 1,000 acres. In looking over his new possession he found no site for a home, such as pleased him; his neighbor, Randolph, sold him from his tract 400 acres for "Henry Weatherbourne's biggest bowl of arrack punch." The place was then called Shadwell, after Shadwell Street in London, and the country around Goochland. Thomas Jefferson was born in the old residence at Shadwell, and this house was his home for 27 years. From his boyhood his favorite spot on the estate was Little Mountain. Often he and his most intimate friend, Dabney Carr, afterward his brother-in-law, ascended the mountain in the twilight, and in the long vacations they studied many an hour under an oak tree, their favorite of the forest. They agreed that whichever one died first, the other would have him buried under this tree, and at an early age Dabney Carr was here laid to rest. Later Jefferson, his wife, two daughters, and others of his descendants were buried in the little cemetery which was formed around this ancient oak.

It was when Jefferson was a member of the House of Burgesses of Virginia, to which he was elected in 1769, that he began the erection of his residence on the summit of the world-renowned eminence, Monticello. (Jefferson changed the English name to the Italian, Monticello). The Shadwell mansion was on a hill on the north bank of the Rivanna River, and Monticello is south, just where the stream cuts its channel through the outlying range of the Alleghenies, the Southwest Mountains. On the northeast Monticello has a steep rocky base, washed by the Rivanna, on the southwest is a dip of about one-third the height of the mountain which connects it with Carter's, a higher peak. Monticello is still covered by a dense growth of timber, mainly hardwood deciduous trees.

Before the residence on Monticello was completed, the Shadwell mansion was burned down, Feb. 1, 1770. The first building on Monticello was a brick story-and-a-half structure containing one good-sized room and some smaller rooms; it still stands as the south pavilion.

Here Jefferson brought his bride in 1772. He was often absent from this beloved home, but his own manuscripts, especially his garden-book, show his love for a quiet domestic life. This same garden-book shows that in 1769 he planted a variety of fruit trees on the southeast slope of the mountain, many of them still in existence. The house was enlarged to suit the needs of the family, and in accordance with the owner's plans. From his European journeys he brought back many new ideas, so that the architecture of the house is somewhat complex. It has the appearance of an Italian villa, with a Greek portico, and considerable of the features of Colonial architecture. The Marquis de Chastellux in a book of travels mentions a visit to Monticello in 1782, and says of Jefferson: "He is the first American who has consulted the fine arts to know how to shelter himself from the weather." Architecture in America has advanced since that time. Some of the plans, drawn by Jefferson himself, are still in existence. The part of the home that was to last was made of good material and possessed a certain elegance, but the furniture was most simple.

His last days saw the estate of Monticello so deeply in debt that it was feared he would have to end his life an exile from his beloved mountain. He sacrificed some of his estate hoping to save the residence and some land for his daughter. His friends assisted him so the estate was not lost to the Jefferson heirs until after his death; it had been his home for 56 years. No debt was allowed to defame the name of Jefferson; Thomas Jefferson Randolph, the grandson, and his daughters paid every dollar of debt their eminent ancestor owed after Monticello had been sold. The great granddaughters kept a school to assist their father in paying this debt. Ten years after Jefferson's death, Monticello was purchased by Uriah P. Levy, USN, who bequeathed it to the nation. His will was contested and the late Jefferson M. Levy, New York congressman, bought off the other heirs, and restored the building and estate to their original condition. In 1923, the Thomas Jefferson Memorial Foundation was incorporated in New York for the purpose of purchasing Monticello and maintaining it as a national shrine. A formal contract was entered into with Mr. Levy for the purchase of the property at a price of $500,000, and legal title to it, including 640 acres of land and numerous Jefferson relics, was taken on Dec. 1, 1923. Although the entire purchase price had not then been paid, Monticello was dedicated as a national shrine, July 4, 1926, with an impressive ceremony.

MONTIGNIES-SUR-SAMBRE, môn-tē-nyē'sür-säN'br', commune, Belgium, in the Province Hainaut, located on the Sambre, 30 miles south of Brussels and on the Lodelinsart-Givet Railway. It is the center of a coal mining industry and has manufactures of ovens, machinery, and steel ware. Pop. (1948) 23,145.

MONTIJO, Eugénie Marie de. See EUGÉNIE, empress of the French.

MONTJOYE SAINT DENIS, mŏnt-joi' săn dĕn-ē, a French war cry dating from the 12th century. The name is derived from the hill near Paris on which St. Denis suffered martyrdom.

MONTLOSIER, môn-lô-zyā′ Count de (François Dominique de Reynaud), French publicist and politician: b. Clermont, Auvergne, April 11, 1755; d. there, Dec. 9, 1838. He was elected a member of the States-General (1789) and favored protection of royalty and nobility. He fled (1791) to London where he started an anti-revolutionary paper, the *Courrier de Londres.* In 1800 he was won over by Bonaparte and given a position in the Ministry of Foreign Affairs. He frequently accompanied Napoleon I as political correspondent during his campaigns, but resigned in 1812. After the first Restoration his *Histoire de la monarchie française depuis son établissement jusqu'à nos jours* (Paris 1814) was a work in praise of the feudal state. Under the Restoration he took a prominant place fighting the activities of the Jesuits and published his *Mémoire à consulter* (1826), but in his *De la crise présente et de celle qui se prépare* (1829) he tries to intermediate between the parties, returning to his early aristocratic views in his *Mémoires sur la Révolution française, le Consulat, l'Empire et la Restauration* (1829). He defended the Louis Philippe government and was created a peer.

MONTLUCON, môn-lü-sôn′, France, town in the Department of Allier, located on the Cher, starting point of the Berry Canal and junction of the Orleans Railway. It consists of the old town with its 15th century castle, and the modern industrial section which has been built up since the opening up of the coal field of Commentry. It possesses a lyceum, commercial court, chambers of agriculture and manufactures, a library and theater. Its industries are important and consist chiefly of iron and steel works, glass and mirror factories, chemical products, machinery and considerable trade. It has a population of (1946) 47,074.

MONTMAGNY, môn-mà-nyē′, **Charles Jacques Huault,** French colonial governor: b. France, c.1600; d. Saint Christopher, W. I., after 1654. The second governor general of Canada, 1636–1648, he was an able administrator, and made peace with the Iroquois in 1645.

MONTMAGNY, môn-mà-nyē′, Canada, town and county seat of Montmagny County, Quebec, on the south shore of the St. Lawrence River, 34 miles east by north of Quebec, and on the Canadian National Railway. It has stove and boiler works, agricultural implement works, pulp mill, furniture factory, silk, casket, lumber and electrical appliance establishments. Montmagny has several good schools and was incorporated as a town in 1885. Pop. (1941) 4,585.

MONTMARTRE, môn-màr′tr, France, a northern district of Paris, a former suburban village, on a conical hill commanding an extensive view of the metropolis. See Paris.

MONTMEDY, môn-mā-dē′, France, town in the Department of Meuse, near the Belgian frontier about 25 miles north of Verdun. It consists of a citadel on a rock 960 feet above sea level with its old or upper town built in 1235, and the lower town (Médy-Bas). In 1659 it came under French rule. Louis XIV had the fortifications greatly strengthened. In 1815 the Prussian and North German allies besieged and then took the lower town by storm when it capitulated. In 1870 the Germans used it as a rail center. Twice again it was captured by the Germans, in World Wars I and II. Pop. (1946) 2,491.

MONTMORENCY, môn-mô-rän-sē′, Duc **Anne de,** French soldier: b. Chantilly, March 15, 1493; d. Paris, Nov. 11, 1567. He was a distinguished general in the wars of Francis I, and was taken prisoner at Pavia (1525). In 1537 he was made constable of France, but by a rapid change of fortune was banished from the court in 1541 under suspicion of conspiracy. He was restored by Henry II (1547), in 1557 was defeated by the Spaniards and taken prisoner at Saint-Quentin, and in 1562 was again captured while commanding against the Huguenots at Dreux. In 1563 he drove the English from Le Havre, and in 1567 received a fatal wound in the battle against Condé (Louis I de Bourbon) at Saint-Denis.

Consult the life by Decrue (1885–1889).

MONTMORENCY, Duc **Henri II de,** French soldier: b. Chantilly, April 30, 1595; d. Toulouse, Oct. 30, 1632. In 1612 he purchased the viceroyalty of Canada from the prince of Condé for 11,000 crowns, and was wise enough to retain Samuel de Champlain in command at Quebec. He wearied, however, of the post, which gave him constant trouble, and in turn sold it. His services against the Huguenots in the civil wars were distinguished, and included a victory over the duc de Rohan in 1628; but he took part in the insurrection of Gaston of Orleans in 1629, was made prisoner, condemned for treason, and beheaded.

MONTMORENCY FALLS, Canada, a beautiful cascade near the mouth of the Montmorency River, on the St. Lawrence River, six miles below Quebec. The river has an irregular course north and south of about 15 miles, and just above its confluence with the St. Lawrence falls over a precipice 265 feet high, and 100 feet wide at its crest. The falls are visited by great numbers of tourists, and are utilized to supply the power necessary for the electric and street railway plants of Quebec.

MONTOJO Y PASARON, môn-tō′hō ē pä-sä-rōn′, **Patricio,** Spanish naval officer: b. El Ferrol, La Coruña, Sept. 7, 1839; d. Madrid, Sept. 30, 1917. Entering the navy in his youth, he served with distinction and was awarded the Grand Cross of Maria Cristina in 1897. Commanding the Spanish fleet in the Pacific at the outbreak of the Spanish-American War, his ships in Manila Bay were attacked by Commodore Dewey's American Pacific squadron on May 1, 1898. Montojo's flagship the *Reina Cristina,* successively engaged by the *Olympia, Baltimore, Raleigh,* and *Boston,* was struck by 70 shells that killed 52 and wounded 150 of the crew. After it caught fire Montojo transferred his flag to a gunboat. Court-martialed in Madrid in September 1899, he argued that the government, not he, was at fault for failing to provide proper equipment.

MONTORO, môn-tō′rō, Spain, town in the province of Córdoba on the rocky left bank of the Guadalquivir and on the Madrid-Sevilla Railway. It has a beautiful church and a fine bridge built in the 16th century and remains of

the ancient Moorish fortifications. Its chief industry is olive oil production, sawmilling, and cultivation of tropical fruits. Pop. (1940) 9,541.

MONTORSOLI, Fra Giovanni Angelico da, frä jō-vän'nē än-jêl'ē-kō dä mŏn-tŏr'sō-lē, Florentine sculptor and architect: b. Montorsoli, 1507; d. Florence, Aug. 31, 1563. He was a member of the religious order known as Servites; worked at Genoa, after retiring from that order, and by building the Serra and Doria palaces and adding a chantry and Doria tomb to the church of San Mateo, established his reputation as a sculptor and architect (1525). He was soon afterward engaged as assistant by Michelangelo in his work on the chapel of the Medici at Florence; the statue of Saint Cosmas there is by him. Among his other productions are the fountain in the cathedral square at Messina (1547); he also designed several chapels in the cathedral there and built the lighthouse.

MONTOUR, mŏn-tŏŏr', **Esther** (called Queen Esther), American half-breed Indian of the 18th century. She had French blood in her veins and was supposed to have been a descendant of Louis de Buade, Count de Frontenac, governor of New France. She married Eghobund, chief of the village of Sheshequin, and her keen intelligence enabled her to completely dominate the Senecas over whom she reigned as "Queen Esther." She was friendly to a Moravian mission which was located near her village for some years, and accompanied the delegates to various congresses of the Six Nations in Philadelphia, where she was well received because of her pleasing manners and beautiful person. In the Wyoming massacre in July 1778 the savage in her nature, asserted itself, however, and to avenge the death of her son she tomahawked 14 prisoners.

MONTPELIER, mŏnt-pēl'yĕr, city, Vermont, capital of the state, and Washington County seat, altitude 523 feet. Located 37 miles southwest of Burlington, on the Winooski River, it is served by the Central Vermont, and the Barre Chelsea railroads. Airline service is furnished through a municipal airport, three miles distant.

The city is on the main pass through the Green Mountains. Its three principal streets follow the Winooski and its tributary, the North Branch, which was earlier known as the "Onion River" or the "French River" because of its use by the French and Indians.

Barre's world famous granite quarries are ten miles distant. Industrial products include granite memorials; sawmill and granite-working machinery, wood and plastic products, concrete pipe; maple sirup and maple sugar.

The city is a center of the insurance business with the home offices of three fire insurance companies, a casualty company, and the National Life Insurance Company founded in 1850. These and the various departments of the state government furnish the bulk of employment. There are several libraries, a state law library, state historical library, state traveling library, and the city public library. The Wood Art Gallery, established in 1899, has a permanent collection of paintings by Thomas Waterman Wood and some other artists and puts on a variety of exhibitions annually. The city is the site of Vermont Junior College, coeducational, and of the recently enlarged Heaton Hospital. A flood control dam, first in the country built by CCC, is a nearby feature. The city has an excellent recreation field and swimming pool. The first State House, dating from 1809 to 1836, was a wooden structure; the second, built of Barre granite, was gutted by fire in 1857; the third and present edifice is of Vermont granite with a golden dome and a colonnaded portico. It is topped with a heroic statue of Ceres, the work of Larkin Mead of Brattleboro. The Supreme Court building, the county courthouse, the city hall, and some of the insurance office buildings are notable. One of the interesting historic buildings is the Dewey House in which Admiral George Dewey was born.

The city's history begins with 1787 when land for a settlement was granted to Colonel Timothy Bigelow of Worcester, Massachusetts. Colonel Jacob Davis, a Revolutionary War veteran, named the settlement after the French city of Montpellier. It became the capital of the state in 1805, and in the same year it was chartered as a city. The municipal government is of the mayor-council-city manager type. The water supply system is owned and operated by the city. Pop. (1950) 8,599.

MONTPELLIER, môn-pĕ-lyā', city, France, capital of the Department of Hérault, is located on the Lez River, 6 miles north of the Mediterranean Sea, and 77 miles northwest of Marseille. It is a manufacturing city, and also a tourist, winter, and health resort. Its manufactures include cottons, candles, soap, verdigris, chemicals, candies, perfumes, and hosiery. It has an active trade in wines and alcohol. Among its noteworthy features are the Peyrou, a promenade on which is the Château d'Eau at the termination of a lofty double-arched aqueduct; the citadel; the cathedral; the Palais de Justice; the university buildings; and Porte de Peyrou, a triumphal arch of the Doric order. Its school of medicine has been famous since the 12th century and is now merged in the celebrated University of Montpellier, founded in 1289. The botanical garden, begun under Henri IV in 1593, is the oldest in France. Montpellier dates from the 8th century. It was a Huguenot stronghold in the 16th century and suffered much in the religious wars. The Edict of Montpellier (Oct. 20, 1622) granted the free exercise of their religion to Protestants and confirmed the Edict of Nantes. The philosopher, Auguste Comte, was born here in 1798. Pop. (1946) 80,673.

MONTPENSIER, Duchesse de (Anne Marie Louise d' Orleans, ăn mà-rē' lwēz' dôr-lā-ăn' môn-păn-syā'), French princess, better known as Mademoiselle or La Grande Mademoiselle: b. Paris, May 29, 1627; d. there, April 5, 1693. Her father was Gaston d'Orleans, brother of Louis XIII. Her mother, Marie de Bourbon-Montpensier, died when her daughter was five days old, leaving her the wealthiest princess in Europe. Rich, proud, and romantic, she aspired to a high match, but in 1646 refused the prince of Wales, later Charles II. Her chance to marry Louis XIV was ruined in 1652, when she sided with the prince de Condé in the revolt of the Fronde, and for his protection had the canon at the Bastille fired on the royal

troops. Upon her return to the court in 1657 she fell in love with the future duc de Lauzun (q.v.), whom Louis refused to let her marry. Lauzun was imprisoned for 10 years, but Mademoiselle seems to have married him secretly, in spite of the king, only to find him a brutal husband; they were separated and her last years were spent in pious devotion. Her *Memoirs,* covering the years 1630–1688, are particularly valuable for the light they throw upon the history of the Fronde; they are edited by Chêruel (1858).

Consult Barine, *La Jeunesse de la Grande Mademoiselle 1627–1652* (New York 1901); Price, E. C., *A Princess of the Old World* (New York 1907).

MONTPENSIER, Duc de (Antoine Marie Philippe Louis d'Orléans), French prince and claimant to the Spanish throne: b. Neuilly, July 31, 1824; d. Sanlúcar de Barrameda, Spain, Feb. 4, 1890. The fifth son of King Louis Philippe, he studied at the Collège Henri IV, entered the army in 1842, served in Algiers, and in 1846 married the Spanish infanta Maria Luisa Fernanda. After the revolution of 1848 he lived in England and Holland; then settled in Spain, where he received the title of infante and was made captain general of the Spanish Army. He was suspected of a plot against the crown and was exiled from Spain, returning only after the revolution of 1868. In 1870 he quarreled with Henry, duke of Seville, also a claimant for the throne, and killed him in a duel. During the reign of King Amadeus (1871–1873), Montpensier was exiled to the Balearic Islands; upon his recall in 1873 he sided with Alfonso XII, and married to that prince his daughter, María de las Mercedes, who died without issue in 1878, the close of Montpensier's political activity. His eldest daughter, Isabelle, married Philippe d'Orléans, comte de Paris, and his son Antoine became the husband of the Infanta Eulalia in 1886.

MONTREAL, mŏn-trē-ôl′ (French spelling Montréal, môn-rā-âl′), city and island, Quebec, Canada. The city is situated on Montreal Island between the St. Lawrence River and the Rivière des Prairies, at latitude 45° 30′ 21″ N and longitude 73° 34′ 30″ W. The largest city in Canada, it is the second largest French-speaking city in the world, and the largest inland seaport on the globe. First peopled by French settlers, then by English immigrants, it has grown from turbulent days under two widely different regimes into a worldly, bilingual city with unusual opportunities for cultural and economic development. It is old France and New World, churches and factories, "habitant" Bonsecours Market and International Civil Aviation Association, congested traffic and quiet mountain paths, more French than English, yet sounding more English than French (at least to casual visitors), a vital city of contrasts, a mosaic of Canadian life.

Climate.—Montreal has a cold winter with an abundant snowfall, a warm and pleasant summer, a long, delayed spring, and a gorgeous, lingering autumn. Climate variations can be sudden and disconcerting. Rigorous polar storms may be followed by almost tropical heat waves, with, or without, the expected gradations. Over a period ranging from 37 to 93 years, extreme temperatures such as 29°F. below zero and 59°F. above in December, and 46° to 96°F. above zero in July, have been registered in Montreal. But, generally, cold and heat attain their maximum intensity in the proper seasons, and then only for a few days. The average snowfall is 100 inches; rainfall, 30 inches.

Topography.—Montreal Island is situated in the middle of a plain that extends from the Laurentians to the Adirondacks and from the Atlantic to the Great Lakes. It lies in the confluence of the St. Lawrence and Ottawa rivers, at the foot of inland navigation which starts 1,200 miles away to the west, and at the head of ocean navigation which travels 1,000 miles to the sea over one of the world's greatest commercial waterways. The Island of Montreal is part of the Hochelaga group of islands, which comprises Île Jésus, next largest, separated from Montreal by the Rivière des Prairies, and a number of smaller islands, notably St. Helen's, Heron's, and Devil's. Almost triangular in shape, Montreal Island is 32 miles long and 10 wide in the broadest part and has an area of 200 square miles. In its center stands Mount Royal ("the Mountain," 769 feet), of volcanic origin. The city stretches from its lower terraces to the water front.

When the glacial sea of 20,000 years ago receded, beaches and terraces were left on the slopes of the Mountain. (Sea shells are still found on the highest of these, at 568 feet.) The main streets of the city, Sherbrooke, St. Catherine, Dorchester, and St. James, follow the level course of those former beaches, while the cross streets, such as Guy, Beaver Hall Hill, Bleury, and St. Denis, ascend from one to another. Thus the city is divided into more or less regular rectangles. Originally laid out by Dollier de Casson, Notre Dame was the first street of what was then called Ville-Marie de Montréal, though St. Paul's existed before as a path to the woods. Today, both Notre Dame and Sherbrooke streets extend 18 miles across the city, leading from Montreal West to the eastern extremity of the island. St. Lawrence Boulevard runs across the island, from the water front to the Rivière des Prairies, dividing the city into east and west sections, and arbitrarily into French and English ones. There are, in all, 1,000 miles of streets.

Industrial activity stretches for miles along the Lachine Canal and the harbor front; wholesale and finance districts are just beyond, in Lower town; retail trade in Uptown, along with the large hotels and theaters; residential areas spread from there in all directions, slowly invading the Mountain. The city proper covers 55 square miles; Greater Montreal, 95. It is connected with the mainland by 13 bridges, of which the three largest are Jacques Cartier, Mercier and Victoria bridges.

Points of Interest.—***Churches.***—Montreal has a great number of churches and religious institutions. In the city proper there are more than 375 temples, over 200 of them of the Roman Catholic faith. Other denominations include Anglican, United, Presbyterian, Baptist, Greek Orthodox, German Lutheran, and Jewish. The church of Notre-Dame, in Place d'Armes, is successor to the first birch-bark chapel constructed by the early settlers in the fort of Ville-Marie. Actually the Sulpician Order erected two churches (1672 and 1757) on the site before beginning the present one in 1824. Of cut limestone, in Gothic style, it is one of the largest and most impressive churches in North America, and contains stained glass windows illustrating the early history of Montreal. Its twin towers are

quaintly named Tower of Temperance and Tower of Perseverance. The carillon includes "Le Gros Bourdon," one of the biggest bells of the continent, weighing 12.39 tons. The architect of the building was James O'Donnell, a New Yorker, who lies buried in the crypt. Other Roman Catholic churches of importance include St. James Cathedral, seat of the archdiocese, a smaller replica of St. Peter's Basilica in Rome; St. Joseph's Shrine, 500 feet up the mountainside, drawing millions of pilgrims who come to ask the intercession of the revered Brother André (d. 1937), a lay brother of the Order of the Holy Cross, who founded the oratory in 1904; Notre-Dame-de-Bonsecours, the sailors' church, on the waterfront; Notre-Dame-de-Lourdes, the Gésu, Saint-Jacques-le-Mineur, and St. Patrick's. Protestant churches number more than 130, chief of which is Christ Church Cathedral, seat of the Anglican bishop. Another Anglican church of note is St. George's on Dominion Square. Center of the Presbyterian faith is the Church of St. Andrew and St. Paul, while the United denomination is primarily represented by St. James United Church. There are 41 synagogues in this city in which the first synagogue in Canada was erected (Spanish-Portuguese, 1777).

Hospitals.—There are more than 65 hospitals of all kinds in the metropolitan area. These are financed one third by the provincial government, one third by the municipal authority, with the remaining third being absorbed in indigent cases by the institution. Oldest hospital is Hôtel-Dieu, founded in 1642 by Jeanne Mance, and operated by the Hospitalières de Saint-Joseph Sisters; the present building, on Pine Avenue, was erected in 1861. Montreal General, home of the city's first medical school, was opened in 1822. Notre-Dame was founded in 1860 by Dr. Persillier Lachapelle who called in the Grey Nuns to manage it; rebuilt in 1921, it now faces Lafontaine Park, on Sherbrooke East. Royal Victoria Hospital, comprising a magnificent group of buildings, lies on the south slope of the Mountain. Erected in 1887, it was named for Queen Victoria, and endowed originally by Lords Strathcona and Mount Stephen, who donated a million dollars each. Hospitals of more recent foundation are too numerous to be enumerated here. One of these is the Sanatorium de Saint-Joseph, in Rosemont, a 500-bed hospital for the tubercular, erected in 1950.

Historic Sites, Monuments, and Buildings.—The walls of the old French town enclosed an area which is, today, Montreal's financial district. History is written all over the narrow streets where old and new buildings now alternate. It starts with Place Royale, on the water front, quaintly called "Le Berceau de (The Cradle of) Ville-Marie." An obelisk marks the spot where the first settlers landed, in 1642. Memorial plaques and monuments radiate from there, recalling a series of gallant deeds. In Place d'Armes, where Maisonneuve nearly lost his life fighting 200 Iroquois with 30 men, stands the superb bronze monument to this founder of Montreal, by the Canadian sculptor Philippe Hébert. Facing it are Notre-Dame Church (described above), and the Seminary of Saint-Sulpice, (1683), the oldest building still in use. Across is the Bank of Montreal, completed in 1848 by the architect Stanford White; its banking room is one of the largest and finest in the world. Aldred Building (1929) and other modern office buildings flank the square. The Royal Bank of Canada Building, highest in the city (397 feet, 1928), is nearby, on St. James Street. Place Jacques Cartier includes the Nelson Monument, the picturesque Bonsecours Market, and the historic Château de Ramezay (1705), residence of French and English governors, today a museum. The upper part of the square was called Place des Jésuites in 1692; there lived Father Pierre François Xavier de Charlevoix, historian of New France. It comprises the City Hall (1878), built in Renaissance style, the Champ de Mars, an esplanade leveled over ancient fortifications, the Vauquelin Monument, and the Old Court House (rebuilt in 1850) where are treasured all public records, from the French regime to the present. Opposite is the New Court House (1922), also the Montreal seat of the provincial government. On Bonsecours Street nearby is the sailors' church of Notre-Dame-de-Bonsecours. Molson's Brewery, on Notre Dame Street, is another landmark of old Montreal, the first industry of its kind in the country; the vaults of 1782 are still in existence. At the foot of Jacques Cartier Bridge is the monument to the Patriots of 1837–1838. In Place d'Youville is the statue of John Young (1811–1878), who played an important part in the development of the harbor. There is a statue of young Queen Victoria in Victoria Square, one of King Edward VII in Phillips Square; from one to the other climbs Beaver Hall Hill, named after the residence of fur-trader John Frobisher, who used it as headquarters for the Beaver Club, founded in 1785. It is crowned today by the Bell Telephone Building (1929) and the adjoining Belmont Building (completed 1949); both largest and tallest telephone head office and toll buildings in the British Empire. C.I.L. House (Canadian Industries Limited), built in 1931, also stands in Beaver Hall Hill. The Canadian National Railway's Central Station, on Dorchester Street, faces the end of a tunnel, 3½ miles long, cut through the Mountain; its concourse features an artistic representation of Canadian life. In Dominion Square, where 100,000 tulips bloom every spring, a token of gratitude from the Netherlands government to the city after World War II, there are the Cenotaph erected by Montreal to its heroes of two world wars, the monuments of Sir John MacDonald, a Father of Confederation, and Msgr. Ignace Bourget, second bishop of Montreal, and the memorial to the Strathcona Horse Regiment, an outstanding piece of sculpture by the Canadian George William Hill. Surrounding the square are St. James Roman Catholic Cathedral; the Sun Life Building (1931), largest office building in the British Empire; the Dominion Square Building; the Windsor Hotel, the Laurentien Hotel; St. George's Anglican Cathedral; and Windsor Station and head offices of the Canadian Pacific Railway. The Radio-Canada Building, inaugurated in May 1951, is the latest link in the Canadian Broadcasting Corporation's world-wide radio system; located on Dorchester West, it is open to visitors. Also west, on Sherbrooke Street, are two martello towers, part of the fortifications erected in 1694 by the Sulpicians around their Fort de la Montagne; in one of these, Marguerite Bourgeoys taught Indian children.

There are many public halls of fine proportions and unusual quality in this city of few skyscrapers: Hall of Honor in City Hall; the banking rooms of the Bank of Montreal and the Royal

Bank of Canada; the reading halls of the Civic and St. Sulpice libraries; McGill University's Moyse Hall; and the University of Montreal's entrance hall and library among others.

Though all skyscrapers and many churches have lookouts, no tour of Montreal is complete without a drive to the mountain top which offers a magnificent view of city and river.

Museums.—The Montreal Museum of Fine Arts shows an interesting collection of Dutch, French, and British paintings, and a very representative one of contemporary Canadian paintings. Its collection of decorative arts includes French and German silver, South American textiles, and French-Canadian provincial furniture and handicrafts. It maintains a bilingual reference library, an art center for children, and a School of Art and Design under the direction of Arthur Lismer, founder of the famous "group of seven," which revolutionized Canadian painting. The Canadian Historical Museum depicts the life of early Christians and Canadian scenes in life-size wax figures. The Château de Ramezay is a repository of Canadiana in the hands of the Numismatic and Antiquarian Society. The McGill University museums, the Notre-Dame Church Museum, and the Commercial and Industrial Museum, all present special interest.

Parks and Playgrounds.—Montreal has over 2,800 acres of parks and playgrounds, of which Mount Royal Park is the largest. Blessed with a mountain in the heart of their city, Montrealers enjoy its 480 acres of natural park in all seasons. The mountain top is a vast hollow, the crater of a volcano; in the bottom is Beaver Lake, an artificial pond that really was a beaver pond at first. Nearby stands the Mountain Play-House. At the Chalet are presented summer concerts "under the stars," and two lookouts offer a magnificent panorama of city and river. Criss-crossed by riding and hiking paths, the Mountain is also a unique center of winter sports. A picturesque feature is the police ski-squad that patrols its slopes all winter. A winding path leads to the huge cross on the summit, lighted at night, and visible from a distance of fifty miles. Historic St. Helen's Island, named by Samuel de Champlain for his wife, lies in the St. Lawrence near Montreal Island and is reached through a side road leading from Jacques Cartier Bridge. It also is of volcanic origin and its strategic position made it in former times an excellent fortress for the French and then the British, while during World War II it was used to isolate German prisoners brought to Canada from the battlefronts. Many of its original earthworks and fortifications are still in an excellent state of preservation, and some of its acres have been landscaped into a beautiful park and recreation center. Another large park of interest is Lafontaine Park, with a lake for boating, a lovely luminous fountain, tennis and baseball courts; a school, a teachers' library, and a concert hall stand in its grounds. Part of Maisonneuve Park, the Montreal Botanical Gardens were established through the efforts of Brother Marie-Victorin, a widely-known botanist. An area of 260 acres and an educational and research center, it is the focal point of Eastern Canada horticulture, though it also displays collections of tropical plants. One of its most interesting initiatives is the children's individual gardens. Adjoining the botanical gardens are the municipal golf course and 18 tennis courts. Band concerts by the units of Montreal's garrisons are given in city parks during summer.

Since 1940, the city acquired and developed 120 playgrounds where an educational program of folklore songs and dances, handicrafts, puppet shows, swimming lessons, and industrial visits is followed by children throughout summer. The Verdun Natatorium, one of the finest open-air swimming pools on the continent, is 200 feet long, has an adjacent diving pool and underwater lighting. Belmont Park, alongside the Rivière des Prairies, is a small version of New York's Coney Island.

Education.—There is no federal department of education in Canada as each province makes its own laws in relation to education. The Province of Quebec has two distinct school systems that operate under a common law; one for Roman Catholics, one for Protestants and other non-Catholics, an arrangement that is a tribute to the good-will of government and public bodies. In Montreal there are two great universities, McGill University (English, interdenominational) and the University of Montreal (French, Roman Catholic), 14 classical colleges, 11 technical schools, 3 normal schools, and hundreds of public and private ones. The education field is broad, its scope bilingual.

McGill University is the headquarters of Anglo-Saxon culture. Its founder was James McGill (1744–1813), a fur-trader from Glasgow, who bequeathed his house, Burnside Hall, 46 acres of land and 10,000 pounds to the Royal Institute for the Advancement of Learning. Burnside Hall opened its doors as a university under royal charter in 1829. The first of McGill's 48 buildings was completed in 1843. The official entrance to the campus is through the beautiful Roddick Gates erected in 1924 in memory of Sir Thomas Roddick, first Canadian to be president of the British Medical Association. The university has eight faculties and as many schools; its School of Medicine is one of the most notable in the world. Affiliates are the Macdonald College of Agriculture and Household Science, and the Victoria College for Women. In McGill's Physics Building, Ernest Rutherford first split the atom; behind its ivy-covered walls Dr. Frederick G. Banting and Dr. James B. Collip discovered "Collips mixture," later known as insulin. Its Neurological Institute, partly endowed by the Rockefeller Foundation, has a worldwide reputation.

On the north slope of Mount Royal, the University of Montreal is a masterpiece of modern architecture, grouping 16 units around a central tower 270 feet in height. First established in 1876 as a branch of the famous Laval University at Quebec, the University of Montreal obtained a pontifical and civil charter in 1919. It has 10 faculties and 27 affiliated schools and colleges. The university maintains a high tradition of classical education, its literary and scientific teaching rooted in the Sorbonne at Paris, its theological and philosophical methods coming from Rome. A Radium Institute was created in 1922 when the university was presented with one gram of radium by the provincial government; it is affiliated with the Curie Foundation in Paris, and is recognized by the American College of Surgeons. Also of outstanding interest is the Experimental Medicine and Surgery Institute, under the direction of the internationally known Dr. Hans Selye after 1945.

The Montreal Catholic School Commission

operates 240 schools, 193 French, 47 English; a special committee looks after neo-Canadian children. The Protestant School Board operates 74 English elementary and high schools. There are six Jewish private schools with the same curriculum as the Protestant. A great number of technical, art, trade, and vocational schools sponsored by the provincial government have been established in the city, as well as schools for the deaf, the blind, and the crippled.

Classical education is almost entirely in the hands of religious orders, the Sulpicians, the Jesuits, and the Fathers of the Holy Cross. The Congregation of Notre-Dame Sisters, founded in 1653 by Marguerite Bourgeoys, maintains the largest number of schools and colleges for girls in the country, and also has establishments in dioceses in the United States.

The first Young Men's Christian Association on the North American continent was organized in Montreal (November 25, 1851), and today includes Sir George Williams College. The first English schoolmaster was John Pullman, who came from New York in 1773.

The duality of culture so typical of Montreal is likewise reflected in libraries: the Civic Library, bilingual, has many branches and a large collection of Canadiana; Saint-Sulpice, a reference library, is mostly French; Fraser Institute, McGill University's Redpath Library, Mechanics Institute, and Westmount Public Library are among the oldest institutions. All children's libraries are bilingual. Special libraries number over a hundred.

Both French and English groups have their own art, literary, musical, and historical associations, and often exchange guest speakers.

Recreation.—Montreal attracts larger and more enthusiastic musical audiences than any other city in Canada. The Société des Concerts Symphoniques de Montréal, founded in 1938, invites a large number of internationally known artists every year. First directed by Wilfrid Pelletier, former conductor of the New York Metropolitan Opera, the société later engaged Désiré Defauw as a permanent conductor; it presents summer concerts "under the stars" at the Chalet atop the Mountain, and arranges "matinées symphoniques" for children similar to the celebrated children's concert series led by Walter Damrosch. The Variétés Lyriques, founded in 1936 by Charles Goulet and Lionel Daunais, and actually co-directors of the troupe, give regular performances of musical comedy in French. And in the realm of song one must mention Les Disciples de Massenet, an outstanding mixed vocal group of 50, under the direction of Charles Goulet, which in 1950 won the Chicago Land Music Festival award. There is also a Ladies Morning Musical Club, a Women's Symphony led by Ethel Stark, several notable chamber music groups, and yearly music festivals.

Montreal, unfortunately, has no professional theater, but the Montreal Repertory Theatre, Little Theatre, Les Compagnons, and Negro and Jewish groups, to name but a few, fill a definite niche for those interested in amateur dramatics.

Montreal has eight radio stations, with the Canadian Broadcasting Corporation maintaining a large bilingual establishment. It entered the television field in 1951. Through its International Service, CBC speaks to the world in 14 languages.

In sports, Montreal is unrivalled in Canada. Baseball, hockey, football, racing, tennis, golf, fishing, and riding are readily at hand everywhere. In winter, the Laurentian area just to the north of the city is one of the finest ski playgrounds in the world and attracts enthusiasts from the United States in large numbers, though all winter sports facilities are found in Montreal as well.

Economic Activity.—Center of the Dominion's industrial and financial activity, Montreal is undergoing an unprecedented development. Wheels of more than 3,000 factories whir to provide employment for 400,000 workers. Principal industries include the manufacture of railway rolling stock, aircraft, electrical supplies, tobacco products, brass and copper wares, vegetable products, boots and shoes, fur goods, paints and petroleum products; in the lead is the clothing industry. Along the river and canal banks are to be found rolling mills, packing industries, breweries, and shipbuilding and repair plants. Montreal handles the largest grain shipping-trade in the world. Industry alone consumed 2 billion kilowatts in 1950, a fraction of Montreal's vast reservoir of electric power. The increase in commerce is also phenomenal: between 1940 and 1950, 150,000 new jobs were created, and purchasing power increased in proportion; 2,860 new stores opened and merchants did a billion dollars worth of business.

Finance is centered on St. James Street, where the two largest banks of the country have their head offices: the Royal Bank of Canada, with 700 branches in Canada and foreign countries, and the Bank of Montreal, with 500 branches. There are, in all, ten chartered banks with head offices in the city, and 400 branch banks. Canada's leading life insurance company, the Sun Life Assurance Company, and most prominent trust companies also maintain their headquarters in the city.

Montreal's growth is reflected, too, in tonnage and passenger traffic through the harbor, in new hotels and railway stations, new airlines and terminals. Civic buildings number 150, and the civic budget is in the neighborhood of 100 million dollars.

Transportation.—Montreal is the hub of Eastern Canada's inland waterways system; the headquarters of Canada's two largest railway systems, the Canadian Pacific and the Canadian National; and an air crossroads of the world.

It is the seat of the International Air Transport Association and of the International Civil Aviation Association. From the Montreal airport at Dorval, planes arrive and take off daily for airfields all over the globe; called "a pilot's dream," it is not more than 10 miles from the center of the city. The Royal Canadian Air Force maintains a large Eastern Canada airbase at Montreal's St. Hubert Airport, and civil private aviation interest centers round Montreal's Cartierville Airport. There is also a hydroplane base.

Montreal is the converging point of all Canadian railroads and many lines from the United States. Motor coach lines and truck services operate between the city and important points in Canada and the United States. In June 1951, the city administration took over from a private company the management of Montreal Tramways, which operates throughout the city and suburban areas over 280 miles of track, and carries 350,000,000 persons annually. An electric railway

operated by Canadian National Railways runs through the tunnel under the Mount Royal in 9 minutes.

Three systems of canals converge at Montreal: the St. Lawrence canals, a connection with Fort William, 1,215 miles to the west on Lake Superior; the Ottawa River and connecting canals; and the Hudson-Champlain-Richelieu system, oldest water route in northeastern America, which connects the city with New York. The city is the headquarters, too, of eleven large steamship companies with regular service to all parts of the world.

Harbor.—The world's largest inland seaport, a thousand miles from the Atlantic, the Montreal harbor is closer by water to Liverpool than to any seaport in the United States. There is no tide to hamper operations, though for several months each winter the harbor area is in the grip of ice. It handles more grain than any other port in America. Dating back to the romantic period of sailing ships, and timber rafts rushing down the Lachine Rapids, it is today thoroughly modern, and berths ocean-going vessels which approach through a channel 35 feet in depth at low summer water. Equipment includes a terminal railway of 61 miles, completely dieselized; floating and locomotive cranes; fireproof grain elevators with a storage capacity of 15,000,000 bushels; a cold-storage warehouse with a capacity of nearly 3,000,000 cubic feet; and many fireproof transit sheds; all under the operation of the federal harbors board. In 1949, 4,480 vessels used the harbor, and landed a total of 185,000 passengers. Waterborne cargo tonnage loaded and unloaded was more than 13 millions of tons in the same year. Summer mean level of the port (and river) is 24 feet above sea level. The water area is about 12,000 acres, and the river is 2 miles wide between the city and the south shore.

Population.—Between 1900 and 1950 the population increased from 328,172 to 1,002,703 (estimated) for the city proper, and to 1,370,044 for Greater Montreal and its suburban towns. Among those are, on the islands: Outremont, Westmount, Hampstead, St. Laurent, Mount Royal, Montreal North, Rosemont, Montreal East, Pointe-aux-Trembles, Ville Lasalle, Lachine, Verdun, and Montreal West; on the south shore, connected with the city by Victoria, Mercier, and Jacques Cartier bridges: Longueuil, St. Lambert, Montreal South, Mackayville, and others. For reasons underlying the economic growth of the metropolitan area, the number of municipalities composing Greater Montreal has been extended from 46 in 1941 to 57 in 1950.

The proportional division of the population by racial origin has not changed noticeably in recent years, except for a slight increase in European immigrants after World War II. Approximately 67.1% are French, 19.5% British (including Irish and Scots), 6% Jewish; the remaining 7.4% being mostly Italian, Ukrainian, Polish, German, Chinese, and Negro.

The French and English languages are official, and the majority of the population is bilingual. There are 5 French and 3 English daily newspapers.

French as spoken by Montrealers is sometimes, and rather inaccurately, referred to as "patois" by English-speaking visitors. It is true that Montrealers, the working class especially, perforce include in their vocabulary a large number of locally accepted English words, some without change, some oddly spelled, some mispronounced from an English viewpoint. The written French of the books and the press, however, and the spoken French of educated French-Canadians is as French as the speech of English-speaking Canadians is English. No English-Canadians are ever mistaken for English in England, and visitors from France readily understand not only Montrealers but French-Canadian "habitants" as well, whose language has retained much of the flavor of old France.

Municipal Administration.—The City of Montreal is divided into 11 electoral districts, each of which sends six deputies—or councillors—to City Hall. Three are elected by all voters, three by property owners only. Thirty-three additional councillors are chosen by 13 public bodies determined by bylaw, such as the Board of Trade, the Canadian Manufacturers Association, and the universities. Thus, a total of 99 members form the council at the head of which is the mayor, elected by all electors. Elections are held every third year on the second Monday of December.

At the first sitting of the council six members are elected from within its own body to form the Executive Committee, two from each of the three groups. From among the six, a president and vice president are chosen by the council. Members of the Executive Committee receive a salary, while members of the council are granted indemnities. The council is the legislative body in the municipal government, while the Executive Committee administers the city's business from day to day.

The mayor represents the city at civic functions and on all official occasions, and acts as chairman of the council. In 1949 an act of the provincial legislature gave him additional powers. He became a member ex officio of the Executive Committee and possesses all the powers, attributes, and prerogatives attached to such function. He is, moreover, a member ex officio of all the committees and commissions appointed by the council. He exercises the right of superintendence, investigation, and control over all the departments and offices of the city.

In addition to the council and the Executive Committee, there is a Montreal Metropolitan Commission which serves to coordinate the management of the city with that of the other outlying communities on the island. Its members are chosen by the municipalities concerned, and there is one representative of the provincial government.

History.—Outpost of French civilization in the heart of Indian barbarism, rallying point of missionaries and discoverers, strategic objective of enemy forces for more than a century, Montreal evokes a multitude of historical associations. The first European to view its site was Jacques Cartier, in 1535, who visited the Indian settlement of Hochelaga and climbed the mountain he named, in the French of his time, Mont Réal (Mont Royal). Then came Samuel de Champlain who laid out a settlement he called Place Royale on his second trip to the island, in 1611. Thirty years later in France, Sieur de La Dauversière, a burgher from La Flèche, and Jean-Jacques Olier, founder of the Sulpician Order in Paris, had the same dream of a religious establishment in the still vaguely known region of Montreal. Through their efforts the Company of Notre Dame of Montreal was formed with the

MONTREAL: *Top:* General view of Canada's greatest city and chief seaport situated on the St. Lawrence River. *Bottom:* Dominion Square with St. James Cathedral which was patterned after St. Peter's Basilica in Rome.

Photographs (1) courtesy Canadian National Railways, (2) © Philip Gendreau, N. Y.

MONTREAL

Top: The Château de Ramezay, in 1776 headquarters for a delegation from the Continental Congress sent in an unsuccessful effort to win Canadian adherence to the American Revolution.

Left: The Royal Victoria Hospital, Montreal.

Bottom: Buildings of the University of Montreal, which are celebrated for their modern architecture.

Photographs (1) courtesy Canadian Pacific Railway, (2) © Ewing Galloway, N. Y., (3) courtesy Province of Quebec Tourist Bureau

three-fold purpose of establishing an order of priests to direct the settlers and convert the Indians, an order of nuns to nurse the sick, and another to teach white and red children. As neither Olier nor La Dauversière were in a position to lead the expedition, Paul de Chomedey de Maisonneuve (1612–1676) was chosen. He sailed in August 1641 with three vessels, two from La Rochelle and one from Dieppe; after the winter in Quebec, he continued his voyage up the river and landed on the island on May 18, 1642 with a small group of fifty settlers, including Jeanne Mance, Madame de la Peltrie and several Jesuit priests. Father Vimont then celebrated the first Mass at Ville-Marie, the name by which the settlement was known until about 1700.

From that day four main works tell the story. The first is the fort built to protect settlers against the Iroquois on a triangle formed by the St. Lawrence River, the St. Peter River (now gone) and swamps later dried. It was flooded the same year at Christmas time and Maisonneuve vowed to carry a cross on his back to the mountain top if the waters receded. They did, and on January 6, Maisonneuve kept his promise. A lighted iron cross 103 feet high, erected in 1924 by the Société Saint-Jean-Baptiste, commemorates this act of faith. The second building, the Hôtel-Dieu founded by Jeanne Mance to care for the sick, was built in 1644, a little distance from the fort. Its small chapel was used as a first parish church. Burnt and rebuilt three times, it has stood on Pine Avenue since 1861. The school, the third building, was founded by Marguerite Bourgeoys in 1658, and at first occupied a stable 36 feet by 18. In those humble quarters the Sisters of the Congregation of Notre Dame started what is today one of the largest educational institutions in the country. Their founder was beatified by Pope Pius XII in 1950. The fourth building, the Seminary of Saint-Sulpice, built in 1685 and still in existence, was the home of the secular priests sent by Olier to found and administer the parishes. They became the feudal holders of the island, and their superior, Dollier de Casson, was the first historian of Montreal. Notre-Dame parish church opened in 1683, and twice rebuilt, now stands beside the seminary on the Place d'Armes.

But there is more to Ville-Marie than a list of dates and facts. The full significance of its foundation cannot be understood without some knowledge of the terrible dangers that surrounded it, and of the manner in which they were met by a small group of dedicated men and women. The whole incredible adventure is neatly wrapped up in Stephen Leacock's understatement: "Whatever Montreal is today, it began well."

Under French regime until 1760, Montreal was the last place to surrender when Canada fell to the British. Governor Pierre François de Rigaud had no choice but to capitulate to Gen. Jeffrey Amherst, who refused all military honors. On the eve of capitulation Chevalier François Gaston de Lévis burned the French flags on St. Helen's Island (Sept. 7, 1760).

The great French explorers and missionaries Pierre de la Vérendrye, Louis Joliet, Robert de la Salle, Jean Nicolet, Jacques Marquette, Antoine de la Mothe Cadillac, Daniel Duluth, Louis Hennepin, Pierre Radisson and others, had endeavored to carry the name of France all across America to the "Western Sea," using Montreal as a starting point. When their country failed to support such vast claims and lost Canada to the British, Montreal shifted from adventure to business, and settled down to make the most of its own wealthy possibilities. The first English-speaking immigrants were American merchants called locally "les Bostonnais," who came on the heels of General Amherst, and were soon joined by Scottish fur-traders; the English and Irish followed, and in 1778 there started to pour in the 40,000 American Loyalists who were to found the Eastern Townships and transform the country.

During the American War of Independence, Montreal was occupied by the Army of Congress under General Richard Montgomery, which remained from November 13, 1775 to June 17, 1776. Benjamin Franklin, Samuel Chase, and Charles Carroll were sent to convert Canadians to their cause. They brought with them a French printer, Fleury Mesplet, and their printing press, the first in Montreal, and were all lodged in the Château de Ramezay. When their mission failed and they left, both printer and printing press stayed behind. Mesplet got out a French newspaper, *La Gazette* (1778), which later became bilingual, and today is Montreal's English morning paper, oldest in the country. That was the last war invasion for Montreal. The War of 1812 and the Fenian Raids of 1870 had but little repercussion in a city busy expanding in every direction. Significant dates are the following: 1782, North West Company is formed (fur-trade is leading commerce), the timber and shipping trades are started; 1791, the Canada Act divides Quebec Province into Upper and Lower Canada, Montreal in the latter; 1800, the Court House is built, Montreal waterworks begun; 1803, the city knocks down its old walls and starts moving up the Mountain; 1809, John Molson's first steamship, the *Accommodation* is built and makes the first Quebec-Montreal trip; 1811, James McGill gives 10,000 pounds and 46 acres for a university; 1817, the Bank of Montreal is established; 1818 a police department is started with 24 night watchmen, the first Roman Catholic bishop arrives, Msgr. J. J. Lartigue; 1822, formation of the Board of Trade; 1824, a new Notre-Dame Church is erected; 1825, the Lachine Canal is opened; 1829, McGill University gets a royal charter; 1832, city is incorporated, the first mayor, Jacques Viger, is elected and gives the city its motto "In Concordia Salus"; 1836, first railway at Laprairie connects Montreal with New York.

In 1837–1838, however, this peaceful development was broken by a rebellion which centered in Montreal because that was where the French and the English were most mixed, and bitterness was most acute. It was inevitable that two peoples of such different backgrounds would struggle to reach a satisfactory form of government; it was unfortunate that the struggles had to turn into dreadful riots, and be dreadfully repressed. Patriots executed as rebels now have their monument at the foot of Jacques Cartier Bridge, and the whole episode reminds one of Charles James Fox's saying that "all saviours of their country have been called rebels."

Following the rebellion, the Union Act of 1840 reunited Upper and Lower Canada. Montreal was a parliamentary capital from 1844 to 1849, but lost this position when Montrealers burned their Parliament in a fresh outburst of anger over the Rebellion Losses Bill (1849).

Apart from riots, the city was harassed for

more than a century by disastrous fires, epidemics, and floods before public works took a hand. Yet commerce went on, intent on fixing Montreal's destiny as a transportation center. In 1843, the Bonsecours Market was built, its upper floor used as a civic reception hall; in 1851, the Harbour Commission was appointed, wharves built, the river dredged, and Montreal became an Atlantic port; in 1860, the Victoria Bridge was inaugurated, a tubular, 6,600-foot bridge, a triumph of engineering at the time. Railway expansion followed immediately. When the Confederation of Canada was proclaimed, on July 1, 1867, Montreal was already on its way to a metropolitan position. Increasing wealth and population meant extended suburbs, new industries, organized education, and development of public utilities. Laval University established a branch in Montreal in 1876, the municipal area was 30 square miles in 1883; telegraph, telephone, and electricity were installed, street railways replaced horse-drawn carriages in 1892, and an all-stone wall built with aid from the federal government to protect the city against spring floods was built in 1901. A 35-foot channel was begun in 1910; a 3½-mile tunnel was carved through the mountain rock in 1917; a 2-mile harbor bridge, later called Jacques Cartier, was built in 1930. Montreal became an airport in 1940; an air crossroads of the world in 1951.

Between the cross of Maisonneuve and the television aerial on top of Mount Royal are crowded three hundred years of fortitude.

CÉCILE SAINT-JORRE,
Civic Librarian, Montreal.

MONTREAL, University of, Montreal, Canada, until 1919 a branch of Laval University at Quebec, thereafter by virtue of an apostolic constitution and a royal charter becoming an independent, Catholic educational institution.

A construction program which began in 1931 has housed the university in what might be called one gigantic building, a central tower 270 feet tall with 16 unit-buildings grouped around it, the whole designed along strictly modern lines, in a university park of 200 acres.

In 1876, following a request from Msgr. Bourget, bishop of Montreal, to secure a Catholic university in his episcopal city, the Sacred Congregation of the Propaganda enjoined Laval University to establish a section at Montreal, to give therein the same instruction as at Quebec. This curriculum was inaugurated in 1878 in the faculties of theology and law, in 1879 in the faculty of medicine, and in 1887 in the faculty of arts. Since becoming independent, the university has possessed its own government and a complete local administration. It comprises the faculties of theology, law, medicine, philosophy, letters, sciences, and dental surgery, and schools of pharmacy, social, economic, and political science, a polytechnic school, and a school for commercial studies. The last two are affiliated schools, as are also the Agricultural Institute at Oka, a school of optometry and a school of veterinary medicine.

The university perpetuates the stages by which a degree was, and still is, reached in the University of Paris. The *baccalauréat* (B. ès A.) is an official certificate recognized by the government and showing that the student has successfully completed his arts' course leading to professional studies in law, medicine, or science. It is obtained before he leaves the affiliated institute, seminary, or college at which he has studied. Students who reach a certain standing in both letters and science obtain the B. ès A. The *licentiate* degree requires a course of two years in philosophy or letters or social sciences, and three years in theology or law or pure science. To obtain the Ph.D. in law, philosophy, literature, pure and social science, it is necessary to support successfully in public a thesis and propositions as in the French universities. The D. en Th., and the D. en M., or the M.D., are granted after examination.

Since 1922, the following colleges, all for young men, have become affiliated with Montreal University, each with secondary ranking, and each an institution in which courses and degrees are directly controlled by the university: the seminaries of Montreal, St. Hyacinthe, Ste. Thérèse, Joliette, and the colleges Bourget, St. Laurent, Valleyfield, L'Assomption, Rigaud, Sherbrooke, and several others. Marguerite Bourgeois College, the first school opened in the Province of Quebec for secondary instruction of young women, was inaugurated on Oct. 9, 1908. Instruction in this college falls into two sections: the English and the French. Each is independent of the other, and each has its own faculty. The college became, affiliated with Montreal University in February 1922, and its students receive, following the successful completion of their studies, the grade of *bachelier* precisely as in the colleges for young men. Five other colleges for young women have since been established.

In the main section of the university, the faculty of theology is conducted by the Grand Seminary of Montreal, directed by the priests of Saint Sulpice. The ordinary course is four years and three months, but a good many students remain an extra six months to prepare for a later doctorate of divinity. A large number of students go to the Canadian College, at Rome, to finish their formal education for the church. The faculty of medicine was originally incorporated in 1845 as the Montreal School of Medicine and Surgery; in 1891 it became the medical faculty of Laval University in Montreal; and in 1919 it merged with the University of Montreal. The faculty of dentistry, formerly the School of Dental Surgery of Montreal, became affiliated with Laval University in 1904, and in 1920 was made part of the University of Montreal.

Among other affiliated institutions with the university is the Institute of Instruction in Modern Pedagogy for women. Its program comprises general cultural courses in philosophy, the sciences, French and English languages and literatures, and of course the professional subjects. To be admitted to it one must have accredited standing from a normal school, or pass the examinations given by the Central Bureau of Catholic Examiners, or hold a certificate of equivalence to the passing of these examinations. The St. George Pedagogic Institute for men, founded in 1929, is a superior normal school of pedagogy. Its purpose is to complete the professional preparation of all those who choose teaching for a lifework.

MONTREUIL, môn-trû'y', town, France, in the arrondissement Sceaux and department of Seine, five miles east of Paris and north of Vincennes. It has a church dating from the 12th–14th century. The place is noted for its remarkably fine fruit, especially its cherry

orchards. It processes hides and skins, has distilleries, and manufactures chemicals, metal containers, porcelain, and biscuits. Pop. (1946) 69,698.

MONTREUX, môn-trû′, resort, Switzerland, in the canton of Vaud and on the east shore of the Lake of Geneva. It comprises three communes: Le Châlelard (pop. 1950: 11,540), Les Planches (5,189), and Veytaux (695). Because of its beautiful scenery and mild, healthful climate the year round, Montreux is a popular tourist center and resort for invalids. Nearby is the Rochers de Naye (6,709 feet) and also the famous Castle of Chillon.

MONTROSE, mŏn-trōz′, a distinguished family in the Scottish peerage. William Graham, 4th Lord Graham, was created earl of Montrose in 1505. Most notable of his descendants was James Graham, 5th Earl of Montrose (1612–1650), who signed the National Covenant in 1638 and became foremost champion of the crown. In the Civil War he fought in Scotland for Charles I, who created him marquess in 1644. Captured by the Scots government, he was hanged and dismembered as a traitor.

MONTROSE, city, Colorado, and seat of Montrose County; altitude 5,810 feet; on the Uncompahgre River; served by the Denver and Rio Grande Western Railroad; 62 miles southeast of Grand Junction. Engineering projects of the 1930's provided irrigation for the Uncompahgre Valley, and fruits, grains, and vegetables are grown there. Sheep and cattle are raised and there is some mining. Nearby points of interest are the Black Canyon of the Gunnison National Monument, and the Gunnison Tunnel, a six-mile bore through the mountains carrying water to Uncompahgre Valley. Incorporated in 1882, the city has mayor and council and a city manager. Pop. (1940) 4,764; (1950) 4,964.

MONTROSE, borough, Pennsylvania, seat of Susquehanna County; altitude 1,660 feet; 31 miles northwest of Scranton, on the Lehigh Valley Railroad. The surrounding region has dairy and turkey farms. Industries include the manufacture of machinery and shoes and there is a printing plant. The cool summer climate and the beauty of the region make the town a favored summer resort. The three-story brick courthouse with its domed cupola, and the borough hall, built in 1843 and originally a church, are notable buildings. The borough was settled in 1799 and incorporated in 1824. Government is by burgess and council. Pop. (1950) 2,075.

MONTROSE, seaport and royal burgh, Scotland, located in Angus County, 25 miles northeast of Dundee. It is on the North Sea at the mouth of the South Esk River which widens into Montrose Basin, a broad tidal lagoon to the west of the town. The river is crossed by a suspension bridge and a drawbridge. Besides being an important fishing center, the town carries on shipbuilding, sawmilling, and flax and jute spinning. Several excellent golf courses are located nearby and there are many summer visitors.

Montrose received its charter from David I in the 10th century. The town was rebuilt after being destroyed by fire in 1244. It was here that John de Baliol surrendered to Edward I in 1296. Pop. (1951) 10,760.

MONTROYDITE, mŏn-troi′dīt, natural oxide of mercury, HgO, mined in Texas. It is named after Montroyd Sharpe, one of the owners of the mine where it was found.

MONTS, môn, Sieur de (Pierre du Guast, dü gä′), French explorer and colonizer of Canada: b. Saintonge, France, about 1560; d. apparently between 1628 and 1632. He was educated in the Roman Catholic faith, but became a Protestant, fought on the Protestant side in the wars of religion, and was made governor of Pons in Saintonge. He made several voyages to America, and is believed to have accompanied Pierre Chauvin's expedition of 1600. In 1604 he secured a royal patent for planting a colony in New France, coupled with a trade monopoly for 10 years. In return de Monts and his company had to send out 60 colonists a year. In May he sailed from Le Havre with Samuel Champlain and the colonists and steered for Acadia, a loosely defined territory which included the present Nova Scotia, New Brunswick, and part of Maine. After exploring the Bay of Fundy, they discovered Annapolis Basin which they called Port Royal, and then explored and named the St. John River. De Monts established his colony first on the island of St. Croix, but the next year (1605) he moved it across the bay to Port Royal. He then returned to France with Champlain. His patent was canceled in 1607 and the Port Royal colonists returned to France. But in 1608 the patent was renewed for a year. De Monts then sent Champlain to found a trading post on the St. Lawrence; this was Quebec. Upon the death of Henry IV in 1610, de Monts lost favor at court. See also Canada—*Era of Early Discovery.*

MONTSERRAT, mônt-sĕr-răt′, mountain, Spain, located in Barcelona Province, 30 miles northwest of Barcelona. About 4,070 feet high, it is jagged and deeply eroded, hence its old Roman name, *mons serratus.* It is famous for its ancient Benedictine monastery, composed, in part, of 13 hermitages, accessible only by steps hewn out of the steep rock, and founded on the spot where a miracle-working image of the Virgin Mary was found in the 9th century. It is said that the image was carved by St. Luke and brought to Barcelona by St. Peter in 30 A.D. It was enlarged and richly endowed by Philip II. Learned Benedictines had established themselves here as early as 976; and they and their successors formed a large library, which was destroyed when the monastery was pillaged by the French and partly destroyed in 1811. After the restoration of Ferdinand VII, the rebuilding of the monastery was begun, but was stopped again when the monks were expelled by the Carlists in 1835. The monastery has fallen more and more into decay since the abolition of the order to which it belonged. While living in this monastery Ignatius of Loyola conceived the idea of founding the order of the Jesuits. According to legend Montserrat was the site of the castle of the Holy Grail.

MONTSERRAT, mŏnt-sĕ-răt′, West Indies, a British island of the Leeward group, almost

at the same distance (about 30 miles) from the islands of Nevis, Antigua and Guadeloupe. It is 32 square miles in extent, nearly two-thirds of which is mountainous and barren. Its culminating point is the Souffrière, a volcano 3,000 feet high. The climate is on the whole healthful. The principal exports are sugar, molasses, tamarinds and lime-juice, and the principal imports, cottons and clothing materials, hardware and other manufactures. Revenue (1929–30), £27,389; expenditure, £31,007; imports, £92,570; exports, £65,565. The government of the island is vested in the governor-in-chief of the Leeward Islands, who is represented by a commissioner, assisted by a nominated executive and legislative council. Plymouth, the capital (pop. 1,800), is on the southwest side of the island. The island was discovered by Columbus and was colonized by the British in 1632. It was twice in the hands of the French, but since 1783 has been uninterruptedly possessed by the British. Pop. 11,954, of whom not more than 200 are whites.

MONTT, Manuel, Chilean statesman: b Petorca, Chile, 5 Sept. 1809; d. Santiago, Chile, 20 Sept. 1880. He was graduated from the National Institute in Santiago and was engaged as instructor there until he entered upon his political career. As assistant secretary of state he sternly suppressed the revolt of 1837, and in 1838 was made a judge of the Supreme Court. His election to the chamber of deputies followed and he was for a time president of that body. He was Minister of Justice 1841–45 and of the Interior 1846–48, was elected President in 1851 and under his firm, conservative policy a succession of revolts were crushed, many industrial improvements were introduced and the laws reorganized and codified.

MONTUCLA, môn'tü'klą', **Jean Étienne,** French mathematician: b. Lyons, 5 Sept. 1725; d. Versailles, 18 Dec. 1799. He was surveyor-in-chief of the royal buildings in Paris (1766–92). He wrote 'Histoire des recherches sur la quadrature du cercle, etc.' (2d ed, Paris 1831); 'Histoire des mathematiques' (ib. 1758, 2 vols.; 2d ed., 1799–1802, 4 vols.), the first and most important work on the scientific history of mathematics up to the time of Moritz Cantor (1860).

MONTYON (môn-tē-ôn) **PRIZES,** rewards from a fund left in charge of the French Academy by Jean Baptiste Robert Auger, Baron de Montyon (b. 1733; d. 1820), a French economist and philanthropist and a friend of Franklin. He founded in his lifetime six prizes, of which two, that for useful discoveries in the arts, and that for valuable medical discoveries, lapsed after his death. The others are (1) a prize, founded in 1782, granted annually to the author of a literary work adjudged the most beneficial to the temporal good of mankind; (2) a prize, founded in 1782, for the most important discovery making more healthful the occupations of workingmen; (3) a prize, founded 1783, to promote mechanical research, and (4) a prize, first given in 1783, for the most heroic act on the part of any poor French citizen. For each of these prizes he left a capital fund of 10,000 francs ($2,000).

MONUMENTA GERMANIÆ HISTORICA, a great historical work dealing with the monuments and antiquities of Germany, the first volume of which was published in 1826. It was begun in 1819 and later was placed under the direction of the Prussian Academy of Sciences. Well over one hundred volumes have been issued.

MONUMENTAL INTERIOR DECORATION. See Interior Decoration.

MONUMENTS. The term monument is applied to structures which are characteristic or remarkable on account of their being erected as memorials, and also, though loosely, to those buildings which express some form of worship, or have peculiar prominence on account of their beauty, proportion or grandeur. In modern times, churches are often erected as memorials to individuals, and yet the term monument is not applied to them except in the vague general sense named above. It is evident, therefore, that such buildings may be commemorative monuments, as well as columns or tombs. Sepulchral monuments are the memorials most commonly erected. In Egypt, pyramids are monumental on account of their size, showing very little of so-called architectural art. There are about 100 of these, each containing a room which was used as a royal sepulchre. The Great Pyramid built by Khu-fu, called by the Greeks, Cheops, about 950 B.C., measures 764 feet square at its base and is 482 feet high. As Saint Peter's, at Rome, is about 15 feet less in height, it could be covered by the shell of this pyramid. In Assyria and Chaldæa there are few temples and no tombs remaining of sufficient architectural importance to be classed as monuments. Important buildings in these countries were placed on huge mounds or terraces of earth, which raised them above the surrounding country, but as these structures were mainly of unburned bricks, they have fallen into shapeless mounds.

The earliest existing Greek monuments are found at Mycenæ and Tiryns. The Lion Gate at Mycenæ shows two large lions rampant on each side of a column, carved in bas-relief above the lintel; and this sculpture is wholly monumental in character, related both to religious and dynastic associations. The gateway at Mycenæ is one of the earliest of porches or towers of entrance which were among the chief monuments of Greek art: these were the Propylæa of which the most important was that of the Acropolis of Athens, with the small Ionic temple of Nike Apteros close by. The choragic monument erected by Lysicrates to commemorate his choral victory may still be seen at Athens. This was built at the time of Alexander's conquest, when Athens was declining and Asia Minor was being filled with magnificent temples of the Corinthian order. Other choragic monuments still exist at Athens in a partly ruined condition. The Tower of Winds, or Clepsydra of Andronicus, was erected at Athens about 100 B.C., but this was rather a utilitarian structure, as it served as a measure of time. Other Greek monuments were the Arch of Hadrian, of the later Roman period; entrances to other temple sites, similar to the Propylæa of the Acropolis, as that of Eleusis; theaters, colonnades, stadia and gymnasia. Greek tombs that remain at the present time are nearly all to be found in Asia Minor, the best known being the Mausoleum at Halicarnassus. The

small Greek monuments and tombstones are very simple and refined in detail. Of the same epoch are the rock-cut tombs of Asia Minor. Some of these are of great beauty, the exterior face of the living rock having been smoothed and made vertical, and adorned with magnificent bas-reliefs of very large size.

The principal Roman monuments were on a large scale, the rough work being executed by cheap labor, soldiers, barbarians or slaves. The Roman Forum was crowded with temples, arches and individual memorials. Arches were characteristic products of Roman civilization and were generally erected in honor of some victorious general or in commemoration of some great event.

Columns were also frequently erected. The column of Trajan is still standing in Rome. It is 133 feet high and has a spiral line of figures in relief from the foot to the top of the shaft, showing the story of one of Trajan's campaigns. There is a staircase within the column leading to the top. The sepulchral monuments of the Romans were generally small. One of the larger ones was the circular tomb of Hadrian, now the castle of San Angelo. Small sepulchral monuments lined the sides of Roman roads for miles outside the city. Many have been found at Pompeii. The tomb of Cæcilia Metella, a characteristic example, was built by Crassus, about 60 B.C. It was circular in plan, with a square base.

The principal monumental buildings of the Byzantine period were in Syria, where from the 4th to the 8th century what we call Syrian architecture was in full luxuriance. The noble tombs of cut stone are, together with the churches and villas built of the same material, rather Græco-Syrian than strictly Byzantine in construction and design. Romanesque architecture in western Europe has not left us many monuments of great size and importance, but some tombs of great beauty remain in the churches of England, France and Germany.

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MONVEL, Louis Maurice Bou et de, loo-ē mō-rēs boo-tā dė mōn-vĕl, French painter and illustrator: b. Orleans, 1850; d. 16 March 1913. He studied with Rudder, Cabanal and Carolus Duran, with the last, after some work in the Atelier Julien. His first picture exhibited in the Salon appeared in 1874. He preferred the decorative to the realistic effect in color and modeling. The illustrations which he made for the 'Life of Jeanne d'Arc' (1897) in the *Century Magazine* are supremely successful both in line and color. In the Memorial Church at Domrémy he has painted six panels illustrating the career of La Pucelle. Among his best-known pictures is 'The Apotheosis' (1885) and his portraits are famous.

MONYPENNY, William Flavelle, English journalist: b. 1866; d. 23 Nov. 1912. He joined the staff of the London *Times* in 1893, and in 1899, shortly before the outbreak of the South African War, became editor of the *Johannesburg Star*. Under his direction the *Star* had strongly advocated the cause of the Uitlanders against the Kruger régime. The Boer President ordered his arrest, but Monypenny escaped in female garb and joined the Imperial Light Horse. He went through the siege of Ladysmith and after the war returned to his editorial duties in Johannesburg. He disapproved of the Chinese Labor Ordnance and resigned, returning to England in 1903. He was there appointed to write the authoritative 'Life' of Disraeli, but died before the work was completed. It was carried on by Mr. George E. Buckle, retired editor of *The Times*.

MONZA, mōn'zä, Italy, a town of Lombardy in the province of Milan, 11 miles by rail northeast of Milan, on the Lambro. The town is of great antiquity and has a quiet, venerable air. The most remarkable edifice is the cathedral of Saint John the Baptist, originally founded at the end of the 6th century by the celebrated Lombard queen, Theodalinda, but subsequently renovated and enlarged. It contains the iron crown of Lombardy, which according to tradition was beaten out of one of the nails used at the Crucifixion and which was restored to the Italians by Austria in October 1866, as well as various other relics and some valuable art treasures. There is also an old imperial palace surrounded by a large and well-laid-out park. It has been a residence and the place of coronation of the kings of Lombardy for 900 years. Here, while on a visit, King Humbert of Italy was assassinated 29 July 1900. It has a technical school, a lyceum and gymnasium and there are manufactures of silk, hats, leather, bricks, tiles and sausages, for which the town has long been famous. Pop. 43,000.

MONZONITE, an igneous rock of granular texture often quarried and sold as «granite» which it closely resembles. In mineral composition, however, it is intermediate between syenite and diorite; both alkali feldspars (or orthoclase) and lime-soda feldspar (or plagioclase) being present in approximately equal amounts.

MOODY, Dan, American public official: b. Taylor, Texas, 1 June 1893. He was educated at the University of Texas, and admitted to the Texas bar in 1914. From 1920 to 1922 he was county attorney of his native county, Williamson, and the following three years district attorney of the 26th Judicial District. It was while he was attorney general of Texas in 1925–26, that he came into national prominence by his opposition to the Ferguson régime in

Texas politics, which led to the defeat of Mrs. Miriam A. Ferguson for re-election as governor, and to his own election for the 1927–1929 term. He was re-elected for the 1929–1931 term.

MOODY, Dwight Lyman, American evangelist: b. Northfield, Mass., Feb. 5, 1837; d. there, Dec. 22, 1899. Attending school until he was 13, he then worked on neighboring farms for a few years and at 17 became a clerk in his uncles' shoe store in Boston. While there he joined the Congregational Church. In 1856 he went to Chicago, became a traveling salesman for a wholesale shoe firm, and was soon making a good income. His main interest, however, was religion and human welfare, and in 1858 he organized a Sunday school in connection with which he developed a program of social welfare work. In 1860 he resigned from business to give all his time to this work. During the Civil War he served with the United States Christian Commission in their service to the troops, often working at the front. In 1863 he organized and built an undenominational church in Chicago, and in 1866 became president of the Chicago Young Men's Christian Association. For them he built Farwell Hall (sponsored by John V. Farwell), the first YMCA building in America. With the organist and singer Ira D. Sankey, Moody went to England in 1873 to conduct a remarkably successful series of revivals throughout the British Isles, in which the evangelical churches cooperated. After his return to the United States in August 1875, he made his home at Northfield, and for the next six years conducted revivals in cities from Boston to San Francisco.

Meanwhile, encouraged by Henry F. Durant, founder of Wellesley College, Moody established the Northfield Seminary (1879) for girls, and in 1881 Mount Hermon School for boys. That same year he returned to England, by invitation, to conduct a second series of evangelistic meetings which continued until June 1884. It was at one of the London meetings which closed this series that Wilfred T. Grenfell was inspired to devote his life to medical missionary work in Labrador. Moody spent the years from 1884 to 1891 in evangelistic work in the United States and Canada, in 1889 founding the Chicago Bible Institute (now called the Moody Bible Institute). University students in both Great Britain and the United States were interested in his work. In 1886 he held a conference of college students at Mount Hermon, and the following year in Northfield. At this meeting Henry Drummond gave his address on *The Greatest Thing in the World,* which has become an American classic. Held annually, these conferences stimulated the growth of the YMCA and similar student organizations in colleges. In 1891 Moody was again in England, and visited Palestine in 1892. From May to November 1893 he conducted evangelistic meetings in Chicago during the World's Fair. His sincerity and pronounced business ability gained him the confidence of responsible businessmen who supported his work. His preaching was simple, vigorous, and moving, emphasizing God's love rather than the terrors of hell. He accepted no financial profits, and all royalties from the Moody and Sankey hymnals were administered by a board of trustees chiefly for the endowment of the Northfield schools.

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MOODY, James, American Loyalist spy: b. New Jersey, 1744; d. Weymouth, Nova Scotia, April 6, 1809. He was a New Jersey farmer at the outbreak of the American Revolution, but in 1777 joined the British forces and soon became the most noted British spy of that period. Daring and unscrupulous, he spied on the troops of Washington, Gen. John Sullivan, and Gen. Horatio Gates. In the latter part of 1780 he was captured and imprisoned at West Point, but made his escape. Because of impaired health, he went to England in 1782, where he was given a pension of £100 a year and an award of £1,330 for his services. Obtaining a large grant of land on the Sissibou River in Nova Scotia, he settled there in 1786 and served as a colonel of militia until his death. He published an account of his adventures, called *Lieutenant James Moody's Narrative of His Exertions and Sufferings in the Cause of Government Since the Year 1776* (2d ed., London 1783).

MOODY, John, American financial writer: b. Jersey City, N. J., May 2, 1868. At first engaged in newspaper work, in 1890 he entered the employ of Spencer Trask and Company, investment bankers, remaining with them for 10 years. In 1900 he founded *Moody's Manual of Railroads and Corporation Securities* which he edited until 1907. In 1905 he founded *Moody's Magazine,* an investor's monthly, and in 1909 the annual, *Moody's Analyses of Investments,* both of which he edited. He also wrote *The Truth About the Trusts* (1904); *The Art of Wall Street Investing* (1906); *The Investor's Primer* (1907); *How to Invest Money Wisely* (1912); and other books. His autobiography was published in two volumes, *The Long Road Home* (1933) and *Fast by the Road* (1942).

MOODY, William Henry, American lawyer and public official: b. Newbury, Mass., Dec. 23, 1853; d. Haverhill, July 2, 1917. Graduating from Harvard in 1876, he studied law in the office of Richard Henry Dana, author of *Two Years Before the Mast,* and began practice in Haverhill. He was city solicitor for a time, and from 1890 to 1895 was district attorney for the Eastern District of Massachusetts. He also served as a special assistant prosecutor in the Lizzie Borden murder trial. Elected to Congress by the Republicans in 1895, he was re-elected three times. He was secretary of the navy (1902–1904), succeeding John D. Long, and attorney general of the United States (1904–1906), succeeding Philander C. Knox. On Dec. 17, 1906 he was appointed an associate justice of the United States Supreme Court, but resigned in 1910 because of ill health.

MOODY, William Vaughn, American poet and playwright: b. Spencer, Ind., July 8, 1869; d. Colorado Springs, Colo., Oct. 17, 1910. After graduating from Harvard University in 1893, he became assistant in the English department there the following year. In 1895 he was appointed instructor in English at the University of Chicago and assistant professor in 1901, but he

resigned in 1907 to devote all his time to writing. Besides his *Poems* (1901), he wrote the verse drama *The Masque of Judgment* (1900), and *The Fire-Bringer* (1904), a Promethean drama in verse. With Robert Morss Lovett he wrote the textbook *A First View of English Literature* (1905), the income from which enabled him to travel and write the play *The Sabine Women*, which Margaret Anglin produced in 1906 as *The Great Divide* (q.v.). It was a pronounced success. His next play, *The Faith Healer* (1909, q.v.), had high merit but was not so successful. His *Ode in Time of Hesitation* (1900) is considered his best poem. His complete works were published in three volumes in 1912, and *Some Letters of William Vaughn Moody*, edited by Daniel Gregory Mason, in 1913.

Consult Lewis, Edwin Herbert, *William Vaughn Moody* (Chicago 1914); Henry, David D., *William Vaughn Moody: a Study* (Boston 1934).

MOON, mōōn, **William**, English philanthropist: b. Horsemonden, Kent, England, Dec. 18, 1818; d. Brighton, Sussex, Oct. 10, 1894. He studied for the church, but becoming totally blind in 1840, turned his attention to teaching the blind, using various systems of embossed type with which he was familiar. In 1845 he invented a simplified system of his own, using a modified form of Roman capitals with very few contractions. He had discovered that the 26 letters of the alphabet are basically nine characters placed in different positions. In 1848 he invented an inexpensive process of stereotyping. He produced the embossed *Pictures for the Blind* which enabled them to "realize" the forms of common objects, and he published embossed diagrams for geometry, music, and geographical and astronomical maps. Through his efforts, societies and lending libraries for the blind were widely established. He was a fellow of the Royal Geographic Society (1852) and of the Society of Arts (1859); the University of Pennsylvania conferred the honorary LL.D degree on him in 1871. He visited the United States in 1882. See also LIBRARIES—*3. United States Libraries.*

MOON, the satellite of the Earth, around which, bound by the force of gravitation, it revolves in a monthly cycle of phases. This recurring lunar cycle was used by many early peoples both to denote the passing of the months and to establish a rudimentary calendar (q.v.); today, the paschal full moon is still used by the Christian Church to fix the dates of important religious holidays and festivals (see EASTER; EPACTS). The position and motion of the Moon are of deep practical importance in navigation and in computation of the tides (q.v.), and the lunar orb unquestionably plays an aesthetic role as a purveyor of light and beauty in the sky.

Despite many prevalent superstitious beliefs, the Moon has no proven effect on day-to-day weather, the growth of crops, or many other fanciful representations ascribed to it. Its physical effects are manifest solely in: (1) its gravitational influence on the production of tides in the waters of the Earth and to a minute degree in its atmosphere; (2) certain minor daily variations in the Earth's magnetic field; (3) a cumulative tidal action in altering the speed of the Earth's rotation (see SOLAR SYSTEM).

Astronomically, the Moon is a solid, very nearly spherical body, 2,162 miles in diameter, which shines wholly by reflected light from the Sun, and makes the circuit of its orbit once each lunar month (see data of Table 1).

Table 1—LUNAR DATA

Diameter (linear)	2,162 mi.
Average apparent (angular) diameter	0.5°
Average (mean) distance from Earth	238,857 mi.
Least distance from Earth (at *perigee*)	221,463 mi.
Greatest distance from Earth (at *apogee*)	252,710 mi.
Average *albedo* (reflectivity of surface)	0.07
Physical constants (Earth = 1)	Mass 0.0123 Surface area 0.037 Surface gravity 0.1645 Volume 0.02 Density 0.60 Density (water = 1) 3.33
Mean geocentric horizontal *parallax*	57′ 2.7″
Average daily angular motion in orbit	13°
Eccentricity (q.v.) of orbit	0.05490
Inclination of orbit to ecliptic plane	5° 8′
Inclination of orbit to Earth's equator (max.)	− 28.5° to + 28.5°
(min.)	− 18.5° to + 18.5°
Period of *sidereal* revolution and rotation, the time between two successive meridian transits of the same star	$27^d\ 7^h\ 43^m\ 11.5^s$
Period of *synodical* revolution, from *conjunction* to *conjunction* (approximately new moon to new moon)	$29^d\ 12^h\ 44^m\ 2.8^s$

Surface Features.—The selenography, or surface description of the Moon, includes:

Maria.—These are the so-called lunar seas, named by Galileo because of their darker shade and resemblance to sizable bodies of water. Actually, the *maria* are broad, flat plains, which appear dark because of their smoothness and lesser reflectivity compared with the rough surface of adjacent mountains. Fig. 1 identifies the largest of these *maria* by their Latin names.

Mountains.—The principal mountains and mountain chains of the Moon are as large as the largest on Earth, and have been given similar names. The Apennines reach 18,500 feet above the floor of the *Mare Imbrium;* the Caucasus Range has approximately the same elevation; and the Alps average 12,000 feet. The Leibnitz Mountains near the south pole of the Moon tower to 30,000 feet, as high as Mt. Everest, the highest peak on Earth. The altitudes of such features of the Moon may be determined from the lengths of the shadows cast by them when the Sun is at a known angle.

Craters.—More than 32,000 of these ringlike formations dot the visible face of the Moon, and may be divided into three classes: (1) craters proper, 4-12 miles in diameter, with a central volcanic cone; (2) ring plains, 20-60 miles wide, with central floors always lower than the surrounding plain; (3) walled plains, 40-150 miles wide, usually surrounded by several crater walls.

Among the largest of the walled plains is Grimaldi, 147 miles in diameter (see Fig. 1). The circular rim of this crater, although towering as much as 20,000 feet above the lunar surface, would still be below the horizon and invisible to an observer standing at its center. Plato, a walled plain 60 miles wide, located to the east of the lunar Alps (see Fig. 1), is noteworthy for its smooth central floor, conspicuously dark in appearance. Other principal craters may be identified from the key diagram.

The origin of lunar craters is a mystery. One

Fig. 1. Key to photograph of Moon opposite (as seen in an inverting telescope).

theory ascribes their origin to the action of meteorites (q.v.). Since the Moon has no protecting blanket of atmosphere to retard the passage of meteorites, these small missiles fall with tremendous speeds toward the lunar surface constantly. Proponents of the meteoritic theory argue that the effect of such activity near the end of the long period of time during which the Moon was in a molten state may have been responsible for at least the smallest craterlike "splashes" which cover the lunar surface. More conservative scientists have argued for the gradual release of internal gases as the cause. Other lines of evidence are used to show that they may be of volcanic origin. Still other scientists more recently have maintained that the craters were formed by explosions within the molten material of the lunar crust, caused by the heat of impact of meteorites. The large craters closely resemble such explosion pits.

Rays, Rills, and Clefts.—At time of full moon (see Fig. 1), long fingers of light appear to radiate from the craters Tycho, Kepler, Copernicus, Aristarchus, and others, and extend for hundreds of miles. These bright streaks, probably produced by glint from outthrown, finely pulverized products of explosion, are called rays. Long, narrow rifts or valleys in the lunar mountains which appear dark because the Sun's rays do not penetrate to the bottom, are called rills; corresponding fissures in the lunar plains are called clefts; both features are usually less than 2½ miles in width. The Straight Wall is an escarpment 900 feet high, 60-70 miles long, located near the crater Thebit.

Physical Conditions on the Moon.—In contrast to the ever-changing panorama of relief on the Earth, the Moon is a changeless world, without winds, weather, or forces of erosion other than alternation of heat and cold. Its features stand gaunt and unworn, although some exfoliation (q.v.) may occur in the abrupt thermal changes (270°F. in one hour) caused by lunar eclipses.

The length of the lunar "day" is equal to one half the synodical revolution period of 29.53 earth days. Affected by this slow rotation, during each lunar day, the temperature of a point on the sunlit surface rises gradually from —58°F. at sunrise position to 214°F. directly beneath the Sun at "noon," and then falls again to —243°F. at "midnight." However, since there is no atmosphere on the Moon to soften or absorb the Sun's radiant heat, the transition from hot to cold may be very sudden when moving from light to shadow on its surface. A point on the Moon exposed to the Sun's direct overhead rays remains at a temperature above the boiling point of water, but when it is subjected to complete darkness, as in the sharp-edged shadow of a crater or mountain, the temperature must drop rapidly to well below the freezing point of water. However, with no atmosphere, there can be no water on the Moon. Any water once present would long since have boiled away by the recurring high temperature of its surface. The lack of any atmosphere is confirmed by the instantaneous, rather than gradual disappearance of a star behind the Moon's limb at the time of an occultation (q.v.). Without air to transmit sound, the Moon is a totally silent world, and from its surface, the Sun shines in an absolutely black sky.

The force of surface gravity (see GRAVITY) on the Moon is only about ⅙ that on Earth. Accordingly, a person who could, in jumping, raise the center of gravity of his body 3 feet above the Earth's surface, could leap 18 feet vertically on the surface of the Moon with the same energy expended. It is this same small attraction of surface gravity which is responsible for the loss of lunar atmosphere. Because of the high speeds of molecular motion in gases, compared with the

MOON

© Lick Observatory, Mount Hamilton, Californ

The photograph shows the Moon at age 14.9 days.

MOON

Upper left: Lunar detail showing central-peaked Eratosthenes at upper end of Apennine Mts.; large ring-plain Archimedes near center; dark slash of Alpine Valley (lower left), Plato (bottom center). *Upper right.* Composite photograph, last-quarter moon. *Lower:* South central region. Courtesy Mt. Wilson and Palomar Observatories.

Moon's low velocity of escape, any such atmosphere once formed has long ago diffused into outer space.

The surface of the Moon has a reflectivity, or albedo (see Table 1), which resembles that of volcanic ash or pumice, a good heat insulator and poor absorber. If, as seems probable from other evidence, a layer of such ash covers the lunar surface, the heat of the Sun's rays cannot be absorbed far below the surface as a source of reradiation and warmth during the lunar night. The above facts, especially the absence of a breathable atmosphere on the Moon, its lack of water and other life-sustaining essentials, can hardly be said to encourage the existence of a high order of animal life on the satellite, although basic forms of plant life might possibly survive.

Lunar Phases, Rotation, and Revolution.—The reason for the changing lunar phases is shown in Fig. 2, which illustrates the cycle from new moon to crescent, first quarter, gibbous, and full as the Moon in its orbital motion changes in relative angular aspect with respect to Earth and Sun; and

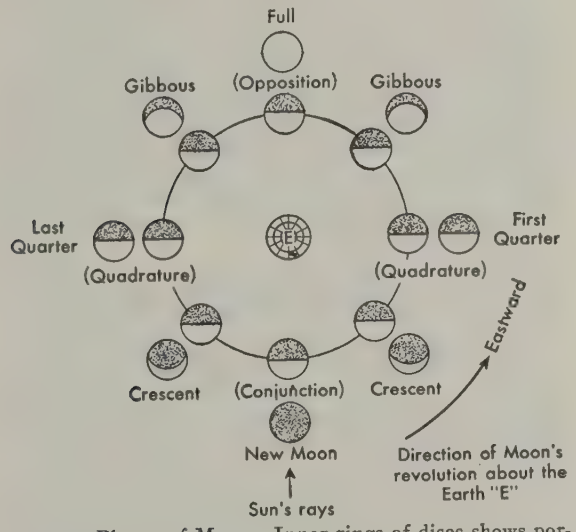

Fig. 2. Phases of Moon. Inner rings of discs shows portion of Moon illuminated by Sun; outer ring, the Moon as seen in sky, with horizon toward *E*.

the reverse cycle through gibbous to last quarter to crescent and back to new moon.

In the dynamic process which created it (see COSMOGONY) the Moon attained a distance from the Earth in which its period of revolution became exactly equal to its period of rotation. In Fig. 3, the revolution of the Moon around the Earth is represented by the motion of a watch twirled about a central point on a string. During the course of one revolution, while the 12 o'clock position of the dial is at all times directed inward toward the center of the circle, the figure 12 successively points in all directions in space. The watch must therefore have rotated once on its axis. Because the Moon's rotation and revolution periods are exactly equal, in the same fashion it always keeps one face turned toward the Earth.

However, certain actual and apparent motions of the Moon known as *librations* enable us to see slightly more than half of the satellite's surface. *Libration in longitude* is due to the fact that the Moon does not move in a circle as does the watch in Fig. 3, but in an ellipse. In accordance with Kepler's laws (q.v.), the Moon must move faster in the portion of its orbit M_4 to M_1 to M_2, when it is closer to the Earth, than when farther from the Earth between M_2, M_3, and M_4. Since between M_1 and M_2 the Moon revolves through 96° rather than 90° of its orbit, but its angular rotation remains the same (90°), we are allowed to see an average 7¾° more around the western edge. At M_4, we can see 7¾° around the eastern edge; at M_1 and M_3, the Moon is seen in "stage center." In a similar fashion (see Fig. 4), at time of moonrise and moonset, the daily rotation of the Earth brings us to a position laterally 4,000 miles farther out from the line of centers connecting Earth and Moon, thus permitting a view about 1° around the edge (*diurnal libration*). Also, since the Moon's orbit is slightly

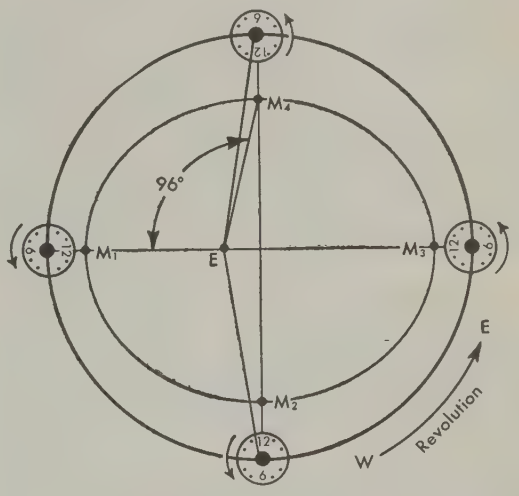

Fig. 3. Libration in longitude, showing why the Moon always keeps one side turned toward Earth, yet how we are permitted to see more than one half of its surface. (See text explanation.)

inclined to that of the Earth around the Sun, when the Moon moves farthest north or south in its orbit, we may then see 6½° over the top or underneath (in figurative terms), a phenomenon called *libration in latitude*. Finally, because of a slightly greater diameter in the direction toward Earth, produced by tidal attraction, the Moon wobbles a little bit in a motion known as *physical libration*. As a result of all these variations, the same 41 per cent of the total surface area of the Moon is visible at each full moon, 41 per cent is never seen, and a varying 9 per cent of the remaining 18 per cent affected by librations will be turned toward the Earth at any instant of time. It is thus possible

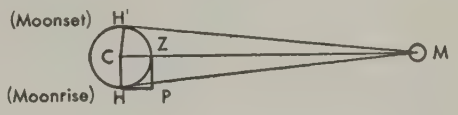

Fig. 4. Diurnal libration, and effect of augmentation.

over a space of time to see 59 per cent of the Moon's surface from Earth.

Common Lunar Expressions and Phenomena.—The full moon occurring nearest to the autumnal equinox, September 23, in the Northern Hemisphere, is known as the *harvest moon*. The name arises from the fact that, at this time, the full moon appears to hang suspended low on the eastern horizon at sunset, and rises very slowly, providing extra hours in the day for the farmer to harvest his crops. The effect is especially noticeable in high latitudes and is produced because, at the time of the autumnal equinox, the orbit of the Moon is inclined at a shallow angle to the horizon; thus the Moon's vertical motion is very gradual.

The common allusion to "the old moon in the new moon's arms" refers to a faintly luminous lunar disc cradled between the horns of a thin crescent moon and lighted by earthshine reflected back to the Moon by the "full" Earth.

The paradox in which the Moon's apparent size is actually a trifle larger when seen in the zenith directly overhead than when seen on the horizon is known as *augmentation* (see Fig. 4). When seen at position *Z*, in the zenith, the Moon is 4,000 miles nearer an observer on the Earth's surface than when seen from *H* or *H'*, just rising or setting. The Moon in the zenith is lost in the vault of the heavens with no known reference objects against which to gauge its size, and hence psychologically it seems very small. When seen against the horizon, projected alongside objects whose size we know, the Moon appears to be huge (see ILLUSION). See also ECLIPSE; LUNAR THEORY; METONIC CYCLE; MOON, *Blue*.

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FERGUS J. WOOD,
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MOON, Blue, a comparatively rare phenomenon of meteorological optics, which in its infrequency and seeming improbability of occurrence is undoubtedly responsible for the commonly heard expression "once in a blue moon."

During the occurrence of this phenomenon, well documented in scientific literature, the entire illuminated portion of the Moon, normally white or yellowish against its sky surroundings, acquires a distinct blue tone, substantially darker than the blueness imparted to the dark-patch lunar "seas" by atmospheric suffusion in dry, cerulean skies of daylight. That portion of the atmosphere illuminated by the Moon likewise takes on a steel blue appearance, quite distinct from the violet hues of late twilight or auroral radiation of the night sky.

The phenomenon has been observed at all seasons of the year, and in a variety of latitudes and longitudes. Several cases have been observed in perfectly clear skies on the high seas, hundreds of miles from land. It has been observed to recur on two nights in succession. Whether seen, as variously reported, through a thin veil of transient high clouds colored red by the Sun below the horizon, or after their passage, in clear sky, the azure appearance of the Moon remains unchanged. In a persistence of several hours, it has sometimes been seen to exhibit a slow progression up the chromatic scale from blue to green, and both the Moon and the Sun have also been witnessed in green light alone.

The occurrence of the blue-green coloration can be reduced to a phenomenon of colloidal dimensions (see COLLOID CHEMISTRY), resulting from the presence in the atmosphere of numerous extremely minute, suspended particles (aerosols), individually too small to be seen, yet collectively having a sensible effect on transmitted light rays.

Case 1 (Large Particle Scattering).—This more general case involves the phenomenon of a blue moon or sun caused by the presence in the atmosphere of colloidal particles larger than the wavelength of the incident light, with resultant diffraction and preferential scattering of red rays, and transmission of blue. Large particle scattering, whose theory has been established by Gustav Mie and by Augustin Boutaric, is exactly the opposite of Rayleigh (small particle) scattering, in which the particles are comparable in size with the wavelength of the incident light (see LIGHT).

Rayleigh scattering results in the blue of the sky, blue haze, and blue smoke from burning leaves, through deep optical layers of which the setting Sun is seen as orange or red by transmitted light. Since the scattered blue light (Tyndall effect) by which these layers are seen is structural rather than body color, the image of a light source under these more usual conditions must be of complementary, or reddish hue.

Conversely, in large particle scattering, the scattered light is red, and the transmitted light is blue. In the atmosphere, strong turbulence is required to support these larger particles in free suspension against the action of gravity, else the particles will coalesce and precipitate out. Therefore, this case is uncommon except in instances of strong vertical currents (at least initially) to carry the particles upward. These currents are provided by the heat associated with forest fires and volcanoes.

Actual visible proof of the selective absorption properties of volcanic dust for red light was provided by an observation made by Edward Whymper during a minor eruption of Mt. Cotopaxi in the Andes of Ecuador in 1880. As the visible cloud of volcanic dust poured upward and outward and passed over the Sun, a green disc was seen, which subsequently changed to reddish hues as the larger particles coalesced into group aggregates and fell out, leaving only finely dispersed blue-scattering particles.

Numerous examples of highly colored atmospheric phenomena also occurred during and after the eruption of Krakatau on Aug. 27, 1883, and were seen at points around the world. Cases of blue suns, blue moons, and even colored stars were reported. Under the force of the explosion, volcanic dust was diffused to great heights and, carried by the prevailing winds of these levels, was distributed widely.

Such volcanic ejecta of dust and powdered pumice provide excellent light-scattering media of large particle size. Other common sources exist in desert sandstorms of the harmattan type (see WINDS), in loess-bearing winds, in smoke from forest fires; and, to a more limited extent, in dust from blasting operations, and even the burst of exploding shells. These larger particles are all classified colloidally as dusts (particle size greater than 10^{-3} centimeter in diameter).

Particles of smoke from forest fires and volcanic dust may be carried to very high levels, where they become invisible from the ground. Carried by strong winds aloft, the particles travel far. On Sept. 27, 1950, thousands of people in England, Scotland, and Denmark were startled to see both a blue moon and blue sun in the sky within a 24-hour period, caused by uncontrolled forest fires in Alberta, Canada, 4,500 miles away.

Related laboratory examples of Case 1 in fluid media are to be found in colloidal suspensions of sulphur, silver, and certain dispersions of gold, all of which under controlled conditions and in certain stages of agglomeration may be made to transmit blue light alone.

Case 2 (Pressurized Aqueous Vapor).—Of much less importance in nature, this case includes the phenomenon of blue images of light sources observed through clouds of steam, issuing under high pressure from jets, and mixed with sand, dust, or other solid particles. The phenomenon is es-

sentially one of laboratory demonstration, yet blue and green suns have been reported as seen in nature over exhausts and safety valves of steamboats, railroad steam engines, and the like. A wide range of green and blue colors may be created in the laboratory by varying the proportions of dust and steam. See also DUST; VOLCANO.

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FERGUS J. WOOD,
Science Editor, The Encyclopedia Americana.

MOON, Mountains of the, Africa, a mythical chain of mountains designated by Ptolemy as containing the sources of the Nile and extending across the broadest part of Africa from Cape Guardafui, on the Indian Ocean, to the Bight of Benin, on the Atlantic Ocean. They are often identified with the Ruwenzori (q.v.) mountain range.

MOON GODDESS. See MYTHOLOGY—*Man and Nature.*

MOONEY, Edward, American cardinal: b. Mt. Savage, Md., May 9, 1882. He was the youngest of four children born to Thomas and Sarah Heneghan Mooney. In 1887, his parents established their home in Youngstown, Ohio. His classical studies were begun at St. Charles College, Ellicott City, Md., and he studied philosophy at St. Mary's Seminary, Baltimore, Md. In 1905, he entered the North American College, Rome, to begin theological training. Four years later, April 10, 1909, he was ordained by Pietro Cardinal Respighi. Returning to the United States, the future cardinal taught dogmatic theology at St. Mary's Seminary, Cleveland, Ohio. In 1916, he was named first principal of the new Cathedral Latin School which was founded that year by Bishop Farrelly of Cleveland. Before returning to Rome in 1923 to be spiritual director of the North American College, he had served for a few months as pastor of St. Patrick's Church, Youngstown, his home city. On Jan. 8, 1926, he was consecrated archbishop of Irenopolis and appointed apostolic delegate to India by Pius XI. He served in India until Feb. 25, 1931, when he was directed by the same pope to fill a similar office in Japan. His appointment to govern the see of Rochester, N. Y., came in August 1933, and in May 1937, he was named first archbishop of Detroit, Mich. In February 1946, he returned to Rome where on February 21 he was elevated to membership in the Sacred College of Cardinals by Pius XII. Cardinal Mooney's extraordinary talents for leadership and organization were recognized by the whole Catholic hierarchy in the United States by his election in 1935 as chairman of the administrative board of the National Catholic Welfare Conference. In this position, the cardinal became known nationally as a champion of justice in labor relations, a defender of the rights of Poland and of all despoiled nations, and an ardent advocate for persecuted racial minorities. Cardinal Mooney was blessed with an amiable disposition. He makes friends easily. His mind may be best described as keenly analytical. Always a student and a methodical worker, he could ever make others enjoy joining him in the most arduous labor. One of his secretaries who worked with him in the Far East once remarked, "I would gladly sweep the streets if he asked me to do it."

LEO DEBARRY,
Diocesan Director of the Society for the Propagation of the Faith, Detroit.

MOONEY, James, American ethnologist: b. Richmond, Ind., Feb. 10, 1861; d. Dec. 22, 1921. He was educated in the public schools and began his career as a teacher. In 1879, he engaged in journalism and, in 1885, began his connection with the Bureau of American Ethnology, Washington, D.C., which lasted until his death.

MOONEYE, a fish of the small family Hiodontidae, related to the herrings and sometimes called toothed herrings. They inhabit the rivers and lakes of the interior of North America, and are silvery, large-eyed fish, 8 to 12 inches long, extraordinarily well supplied with teeth, and voracious.

The mooneye cisco is a small whitefish (*Argyrosomus* or *Leucichthys hoyi*), related to the lake herring. See also WHITEFISHES.

MOONFISH, any of the compressed ovate highly silvery fishes of the family Carangidae, genera *Selene* and *Vomer,* including small tropical forms allied to the pompanos. One greenish species (*Vomer setipinnis*) is well known in New York Bay and markets as a pan fish, sometimes called blunt-nosed shiner. More widely recognized is the horsehead (*Selene vomer*), which reaches a length of more than a foot, and is regarded along the south Atlantic coast as one of the best of food fishes; it also occurs along the western coast of Mexico and Central America, as do certain other species.

MOONLIGHT SONATA, a term used popularly in Germany and England for the Beethoven *Sonata quasi una Fantasia* in C sharp minor (1801). The term arose from the critic Heinrich F. L. Rellstab (1799–1860) comparing the first movement to a boat gliding by moonlight on Lake Lucerne.

MOONRAT or **RAFFLE'S GYMNURUS** (*Echinosorex gymnurus*), a member of the hedgehog family (Erinaceidae) and largest living species of the mammalian order Insectivora (q.v.). It is found in the Malay States, Tenasserim, lower Thailand, Sumatra, and Borneo. Anatomically, it is one of the most primitive and generalized of modern mammals. The fur is thick, coarse, black, with a mixture of whitish hairs on upper back, shoulders, and head. Length, from tip of long pointed, shrew-like snout to base of tail averages about 16 inches; the bare, scaly tail is about 9½ inches long. There are five toes on each limb. The moonrat is nocturnal and feeds on insects, grubs, and small animals in general.

Other names for the animal include "white shrew" and, in Malayan, *Ticus bulan.* See also HEDGEHOG.

MOONSEED, a woody vine of the genera *Menispermum* and *Cocculus* of the family Menispermaceae. The Carolina moonseed is native in southeastern United States.

MOONSTONE. A translucent or transparent variety of the mineral feldspar (orthoclase, albite, or labradorite) which exhibits a delicate pearly opalescent play of colors. Used as a gem.

MOONWORT. See BOTRYCHIUM.

MOORCROFT, William, English veterinary surgeon and traveler: b. Lancashire, England, about 1765; d. Andekhui, Afghan Turkestan, Aug. 27, 1825. He studied veterinary science in France, settled in London, and made a fortune which he lost in patents, and then became veterinary surgeon (1808) to the Bengal Army. He crossed the Himalayas, explored (1811–1812) the sources of the Sutlej and Indus rivers, explored (1819–1822) Lahore and Kashmir, visited Bukhara in 1825, and died at Andekhui.

MOORE, mo͝or; mōr, **Addison Webster,** American professor of philosophy: b. Plainfield, Ind., July 30, 1866; d. London, England, Aug. 25, 1930. He was graduated at De Pauw University in 1890, taking his M.A. in 1893; Ph.D., Chicago University, 1898. He served in the University of Chicago as assistant in philosophy (1895–1897), associate (1897–1898), instructor (1898–1902), assistant professor (1902–1904), associate professor (1904–1909), and professor (1909). He lectured on philosophy at Harvard in 1918. Among his works are *Existence, Meaning and Reality* (1903), and *Pragmatism and Its Critics* (1910). He was president of the Western Philosophical Association in 1911 and of the American Philosophical Association in 1917, and he was associate author of *Creative Intelligence* (1916).

MOORE, Alfred, American jurist, son of Maurice Moore (q.v.): b. New Hanover County, N. C., May 21, 1755; d. Bladen County, Oct. 15, 1810. At 20 he became captain in a regiment of North Carolina troops, but was soon afterward obliged to resign in order to provide for his destitute relatives. When the British seized Wilmington (1781), he raised a troop of volunteers, with whom he rendered great service to the American cause. In order to alleviate the distress to which his patriotism had reduced him, the general assembly in 1782 made him attorney general. He had been licensed to practice law in 1775, and he soon attained, by hard study, a foremost rank in his profession. He was raised to the bench in 1798 and became associate justice of the Supreme Court of the United States in 1799. He resigned in 1804.

MOORE, Benjamin, American Protestant Episcopal clergyman: b. Newtown, Long Island, N. Y., Oct. 5, 1748; d. New York City, Feb. 27, 1816. He was graduated at King's (now Columbia) College in 1768, studied theology, and in May 1774 went to England to obtain orders and, in June of the same year, was ordained deacon and priest. On his return to New York he became an assistant minister of Trinity Church and succeeded to the rectorship in December 1800. In 1801 he was consecrated bishop of New York. He was also president and professor of logic in Columbia College.

MOORE, Charles Herbert, American artist: b. New York City, April 10, 1840; d. Hampshire, England, Feb. 15, 1930. He was educated in the public schools of New York City. In 1871 he became instructor in art in the Lawrence Scientific School at Harvard University. Three years later he began his career of teaching the fine arts to the Harvard undergraduates. He was made professor in 1896, a position he held until his retirement in 1909. He was curator and later director of the Fogg Art Museum (1896–1909). He published *The Development and Character of Gothic Architecture; Examples for Elementary Practice in Delineation; Character of Renaissance Architecture; Swedenborg: Servant of God;* and *Mediaeval Church Architecture of England.*

MOORE, Charles Leonard, American poet and essayist: b. Philadelphia, Pa., March 16, 1854; deceased. He was educated in the schools of his native city. In 1878–1879 he was one of the managers of the Madeira and Mamoré Railroad Construction Company and was United States consular agent at San Antonio, Brazil, the headquarters of that operation. He was afterward engaged in railroad construction in Pennsylvania. He was then secretary of one of the Disston Florida Sand companies for four years. During the next 20 years he was occupied with literary work. He was a constant contributor to *The Dial* during that time. He published *Atlas* (1881); *Poems Antique and Modern* (1883); *Book of Day Dreams* (1887); *Banquet of Palacios* (1889); *Odes* (1896); *Ghost of Rosalys* (1900); *The Red Branch Crests—a Trilogy* (1904); *Incense and Iconoclasm* (1915); and *Idols and Ideals* (1919).

MOORE, Clarence Bloomfield, American archaeologist: b. Philadelphia, Pa., Jan. 14, 1852; d. 1936. He was graduated at Harvard (1873), then traveled through most of Europe, Asia, and Egypt. He crossed the Andes and traveled down the Amazon (1876) and made a journey around the world (1878–1879). He spent more than 20 years exploring the Indian mounds of South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana.

MOORE, Clement Clarke, American educator and poet: b. New York City, July 15, 1779; d. Newport, R.I., July 10, 1863. He was a son of Benjamin Moore (q.v.); was graduated at Columbia College in 1798; in 1823 became professor of Oriental and Greek literature at the General Theological Seminary, New York, and retired from that position in 1850. He gave to the seminary the ground on which it stands. A collection of *Poems* which he published in 1844 included *A Visit from Saint Nicholas,* better known under another title—*'Twas the Night Before Christmas*—which has long had great popularity with grown people as well as with children. Written in 1822 for his own children, these verses were printed anonymously and without Moore's knowledge in the Troy *Sentinel,* Dec. 23, 1823. He also compiled *A Compendious*

Lexicon of the Hebrew Language (1809) and wrote *George Castriot, Surnamed Scanderbeg, King of Albania* (1850).

MOORE, Clifford Herschel, American Latin professor: b. Sudbury, Mass., March 11, 1866; d. Cambridge, Mass., Aug. 31, 1931. He was graduated (1889) at Harvard University and received the Ph.D. degree (1897) at the University of Munich. He was classical master (1889–1892) at the Belmont School for Boys, Belmont, Calif., professor of Greek (1892–1894) at Phillips Academy, Andover, Mass., instructor (1894–1895), then assistant professor of Latin (1895–1898) at the University of Chicago. He then joined the faculty of Harvard University, and was assistant professor of Greek and Latin (1898–1905); professor of Latin thereafter, and dean of the faculty of arts and sciences after 1925. In 1905–1906 he was professor of Latin at the American School of Classical Studies in Rome. He edited Frederic De Forest Allen's *Medea of Euripides* (1899); Horace's *Odes and Epodes . . .* (1902); and published *The Religious Thought of the Greeks . . .* (1916, 2d ed. 1925); *Pagan Ideas of Immortality* (1918); also numerous articles on classical philology and the history of religion.

MOORE, David Hastings, American Methodist Episcopal bishop: b. Athens, Ohio, Sept. 4, 1838; d. Cincinnati, Nov. 23, 1915. He was graduated from the Ohio University in 1860 and ordained to the ministry in that year, but entered the Union Army at the outbreak of the Civil War, remaining in it till the close of the war and attaining the rank of lieutenant colonel. He was president of the Cincinnati Wesleyan Female College (1875–1880) and of the Colorado Seminary, and chancellor of the University of Denver (1880–1889). He was elected bishop in 1900 and had his episcopal residence during the three ensuing quadrennial periods in Shanghai, China, Portland, Oreg., and Cincinnati, Ohio. He retired in 1912.

MOORE, Edward, English Dante scholar: b. Cardiff, Wales, Feb. 28, 1835; d. Chagford, Devon, Eng., Sept. 2, 1916. He was educated at Pembroke College, Oxford, where he received high honors and became honorary fellow, and was principal of St. Edmund Hall, 1864–1913 and a canon of Canterbury from 1903. He is favorably known for his studies of Dante, and published *The Time References in the 'Divina Commedia'* (1887; rev. in Italian, 1900); *Contributions to the Textual Criticism of the 'Divina Commedia'* (1889); *Dante and His Early Biographers* (1890); the *Oxford Dante* (complete in one volume, 1894); and *Studies in Dante* (3 series: 1896, 1899, 1903).

MOORE, Edward, English playwright: b. Abingdon, Berkshire, England, March 22, 1712; d. Lambeth, March 1, 1757. He was, by trade, a linen draper but failed in business and took up literature. His first work was *Fables for the Female Sex* (1744), and in 1748 his *Trial of Selim the Persian* and *The Foundling* were published. He owed, no doubt, some of his success in the literary world to such prominent patrons as George Lyttelton, 1st Baron Lyttelton, and Henry Pelham. His *Gil Blas* was published in 1751 and *The Gamester* in 1753, David Garrick probably assisting him in the work. From 1753–1757 he was editor of *The World,* a satirical periodical. A collection of his works under title of *Poems, Fables and Plays* was published in 1756.

MOORE, Edward Caldwell, American theologian: b. West Chester, Pa., Sept. 1, 1857; d. Cambridge, Mass., March 26, 1943. He was graduated (1877) at Marietta College, then at Union Theological Seminary (1884). He studied (1884–1886) at the universities of Berlin, Göttingen, and Giessen, then received (1891) the Ph.D. degree at Brown University. In 1884 he was ordained to the Presbyterian ministry and served as pastor at Yonkers, N. Y. (1886–1889), and Central Congregational Church, Providence, R. I. (1889–1901). In the latter year he became Parkman professor of theology at Harvard University, and in 1915 became also Plummer professor of Christian morals in the same institution. After 1905 he was university preacher and chairman of the board of preachers at Harvard. He was lecturer at Mansfield College, Oxford, England, 1894 and 1914; at Andover Theological Seminary, 1900; at Lowell Institute, 1903; and at Yale Divinity School, 1906. He published *The New Testament in the Christian Church* (1904); *History of Christian Thought Since Kant* (1912); *The Spread of Christianity in the Modern World* (1919); *West and East* (1919); and *The Nature of Religion* (1936).

MOORE, Edward Mott, American surgeon: b. Rahway, N. J., July 15, 1814; d. Rochester, N. Y., March 3, 1902. He studied medicine in New York and Philadelphia and was graduated (1838) as M.D. at the University of Pennsylvania. He settled in Rochester in 1840. In 1842 he received a call to the chair of surgery at the Vermont Medical College in Woodstock, Vt., where he lectured for 11 years. He served then successively at Berkshire Medical College, Pittsfield, Mass. (1853–1854); Starling Medical College, Columbus, Ohio (1854–1855); then went (1858) to Buffalo Medical College, serving in the same capacity until 1882. His greatest work was done in research and experiments on the heart's action. He was president of the New York State Medical Society; a founder of the American Surgical Association, succeeding Dr. Samuel D. Gross (1883) as its president; and was president of the American Medical Association (1889–1890).

MOORE, Eliakim Hastings, American mathematician: b. Marietta, Ohio, Jan. 26, 1862; d. Chicago, Ill., Dec. 30, 1932. He was graduated (1883) at Yale, receiving the Ph.D. degree in 1885. He then studied at Berlin (1885–1886) and was appointed tutor in mathematics at Yale (1887–1889), becoming assistant professor (1889–1891) at Northwestern University and associate professor (1891–1892). In 1892 he was made professor of mathematics at the University of Chicago, becoming head of the department from 1896–1931. He edited *Transactions* of the American Mathematical Society (1899–1907) and was associate editor of the *Proceedings* of the National Academy of Sciences after 1915. His articles appeared in many mathematical periodicals.

MOORE, Frank Frankfort, British novelist and dramatist: b. Limerick, Ireland, May 15,

1855; d. 11 May 1931. He was educated at the Royal Academical Institution, Belfast, traveled extensively in Africa, India and South America and in 1876–92 was art editor of the Belfast *News Letter*. Thereafter he lived in London. His later works include 'Nell Gwyn' (1900); 'The Other World' (1904); 'The King's Messenger' (1907); 'Life of Goldsmith' (1910); 'The Commonsense Collection' (1911); 'The Marriage of Barbara' (1912); 'Fanny's First Novel' (1913); 'The Land of the Reef' (1915); 'The Rise of Raymond' (1916); 'The Fall of Raymond' (1917); 'The Courtship of Prince Charming' (1920). His plays include 'A March Hare' (1877); 'Broken Fetters' (1881); 'Forgotten' (1889); 'The Queen's Room' (1891); 'The Mayflower' (1892); 'Oliver Goldsmith' (1892); 'Kitty Clive, Actress' (1895).

MOORE, Frank Gardner, American educator: b. West Chester, Pa., 25 Sept. 1865. He was graduated (1886) at Yale, receiving the Ph.D. diploma in 1890. He studied (1890–91) at the University of Berlin, and was tutor in Latin at Yale, 1888–93; assistant professor of Latin, 1893–1900, and associate professor of Latin and Roman archaeology at Dartmouth College, 1900–08; professor of Latin at Trinity College, Hartford, Conn., 1908–10. He then joined the faculty of Columbia University as professor of classical philology, and in 1919 was made professor of Latin. He was secretary of the American Philological Association, 1904–16; president, 1917. In 1918 he was chairman of Local Exemption Board, 135. He edited Cicero's 'Cato Major' (1904); Tacitus' 'Histories I and II' (1910); 'Orations of Cicero' (1925).

MOORE, George, English author: b. Ireland, 1853. He studied art in London under Luyten, but completed his education in France and became thoroughly imbued with a Gallic spirit. Apart from a few contributions to periodicals, his first literary work was contained in two volumes of quasi-French verse, 'Flowers of Passion' (1877) and 'Pagan Poems' (1881). With his entry into fiction he allied himself immediately with the French realistic or naturalistic school, as may be seen in 'A Mummer's Wife' (1884), a story of the degeneration of a clerk's wife, her elopement with a strolling player, and the sufficiently squalid sequel; in 'Mike Fletcher' (1891), in which a gay young Irishman wins a fortune by his wits and his social success, and then swings from his riotous living to remorse and back again, only to commit suicide at the end; or in 'Esther Waters' (1894), a detailed sketch of life among the servant class and in a country inn, the theme being the allurements of gambling. 'Evelyn Innes' (1898) and its sequel, 'Sister Teresa' (1901), are a keen analysis of a musical and sensuous temperament under the successive influence of social temptation and of convent life. What he exemplified in these novels he stated abstractly but over-eagerly and passionately in 'Confessions of a Young Man' (1888) and 'Impressions and Opinions' (1890), both urging the dead level of mediocrity or worse in English literature of the day as contrasted with French. His desire to found an English «Theatre Libre» and his growing conviction that the English stage and English novel were far gone led him to assist in founding the Irish Literary Theatre in Dublin and to take a prominent part in the movement styled the Irish Renaissance, a movement of which his 'Bending of the Bough' (1900) is one of the most promising dramatic productions and ranking above 'The Strike at Arlingford' (1893). His later works include 'The Untilled Field' (1903); 'The Lake' (1905); 'Memoirs of My Dead Life,' which purports to be autobiographical; the autobiographicals 'Hail and Farewell' (3 vols., New York 1911–14); 'The Brook Kerith' (1916); 'Palestine in the Time of Christ'; 'A Storyteller's Holiday' (1921); 'Heloise and Abelard' (1921); 'In Single Strictness' (1922); 'Anthology of Pure Poetry' (1925); 'Ulick and Soracha' (1926). D. London 21 Jan. 1933.

MOORE, George Foot, American Orientalist: b. West Chester, Pa., 15 Oct. 1851; d. Cambridge, Mass., 16 May 1931. He was graduated at Yale in 1872 and at Union Theological Seminary in 1877. He was pastor of the Putnam Presbyterian Church, Zanesville, Ohio, 1878–83, and in the latter year became Hitchcock professor of Hebrew and the history of religions at Andover Theological Seminary, and from 1899 to 1901 was president of the faculty there. In 1902 he was appointed professor of theology at Harvard and in 1904 Frothingham professor of the history of religions. For some years he edited the 'Journal of the American Oriental Society,' of which he was president 1911–12. He published 'A Commentary on Judges' (1895); 'The Book of Judges,' a translation with notes for the Polychrome Bible (1898); and 'The Book of Judges in Hebrew' (1900); 'The Literature of the Old Testament' (1913); 'History of Religions' (Vol. I., 1913; rev. ed. 1920; Vol. II. 1919); and 'Judaism' (2 vols. 1927).

MOORE, George Henry, American historical writer: b. Concord, N. H., 20 April 1823; d. New York, 5 May 1892. In 1839 he removed to New York and was graduated at the University of the City of New York (now New York University) in 1843. As assistant to his father, Jacob Bailey Moore (q.v.), librarian of the New York Historical Society, he had been long connected with that institution when, in 1849, he succeeded to his father's position, which he held until 1872, and then became first superintendent of the Lenox Library. This office he retained until his death. His contributions to the proceedings of historical societies and to historical magazines were numerous. He also published 'The Treason of Charles Lee' (1858); 'The Employment of Negroes in the Revolutionary Army' (1862); 'Notes on the History of Slavery in Massachusetts' (1866); and 'A History of the Jurisprudence of New York' (1872).

MOORE, George Thomas, American botanist: b. Indianapolis, 23 Feb. 1871. He was educated at Wabash College and graduated A.B. at Harvard (1895), A.M. 1896 and Ph.D. 1900. He was appointed assistant in cryptogamic botany at Harvard and teacher at Radcliffe College. From 1899–1901 he had charge of the botany department at Dartmouth College and was (1903–05) physiologist and algologist at the Bureau of Plant Industry, Department of Agriculture. He had charge of botany at the Marine Biological Laboratory at Woods Hole, Mass., and became professor of applied botany and plant physiology at Shaw School

of Botany, Washington University (1909–12), as well as being physiologist to the Missouri Botanical Garden, of which latter he became director from 1912. Among his most useful work was the discovery of a method of preventing water supply pollution through algæ and pathogenic bacteria, and the perfection of a method of increasing crops by impregnation of the soil, through bacteria, with atmospheric nitrogen. He has contributed many useful scientific articles to the botanical periodicals.

MOORE, Harry Humphrey, American artist: b. New York, 1844; d. Paris, France, 2 Jan. 1926. He studied under Gérôme at Paris and Fortuny in Madrid, and made painting tours through Germany, Italy and Japan. He devoted himself to such genre pictures as his two masters excelled in, and his best-known works are 'Gypsy Encampment, Granada'; 'Moorish Water-Carrier'; 'Almeh'; 'The Blind Guitar-Player'; and 'A Moorish Beggar.' He was deaf and dumb.

MOORE, Sir Henry, English colonial governor: b. Vere, Jamaica, 1713; d. 1769. In 1756 he became lieutenant-governor of the island, and until 1762 was practically in control of its affairs. He suppressed the slave insurrection of 1760, and for that service was rewarded with a baronetcy. Appointed governor of New York in July 1765, he reached there at the outbreak of the Stamp Act excitement. Public opinion was strongly pronounced against the act, and Moore, yielding to the demands of the colonists, suspended its enforcement. He remained governor until his death.

MOORE, Henry, Irish Wesleyan clergyman: b. near Dublin, 1751; d 1844. After conversion, he joined a Methodist class in 1777, began to preach, gave up his trade of woodcarver, opened a school, and in 1779 was appointed by Wesley to the Londonderry circuit. Called later to London, he assisted Wesley (1784–86) as traveling companion and amanuensis, serving again in the same capacities 1788–90. Wesley appointed him one of his three literary executors, and also selected him to become (after Wesley's death) one of 12 ministers in charge of services at the City Road Chapel, London. In 1804, and again in 1823, Moore was president of the Wesleyan Conference. Refusing ordination in the Church of England, he was ordained by Wesley, with two Episcopal clergymen assisting. The proposal to establish a hierarchy in the Methodist Church was opposed by Moore, who also objected to the scheme for establishing a Methodist theological school, and to the proposed acquisition of land by the Methodist body in 1839, when the centenary fund was created. In 1792, with Thomas Coke, he published a Life of the Rev. John Wesley.' Although the work was authorized by the Conference, the third literary executor prevented them from using Wesley's papers in its preparation. With the aid of these he wrote a new 'Life,' which was published in 1824–25. Moore also wrote 'A Reply to Considerations on the Separation of the Methodists from the Established Church' (1794); 'Thoughts on the Eternal Sonship' (1816); two religious biographies: 'Sermons,' with an autobiography (1830). Consult 'Life' (with the autobiography) by Mrs. Richard Smith (1844).

MOORE, Jacob Bailey, American journalist and author: b. Andover, N. H., 31 Oct. 1797; d. Bellows Falls, Vt., 1 Sept. 1853. He learned the printer's trade on the Concord *Patriot,* became bookseller and publisher, then partner in the above paper. In 1826 he founded the *New Hampshire Statesman* to aid the election of John Quincy Adams as President, and became (1828) member of the State legislature and, in the same year, sheriff of Merrimac County (1828-33). In 1839 he edited the *New Hampshire Journal,* but soon moved to New York to edit the *Daily Whig.* He was government clerk in the Washington post office (1841–45), then librarian of the New York Historical Society (1845–49), when he moved to San Francisco as its postmaster (1849–53). He collaborated in compiling a topographical, historical and biographical work on New Hampshire (Concord 1822–24), and he published 'A Gazetteer of the State of New Hampshire' (1823); and histories of Concord and of Andover, N. H., and 'Memoirs of American Governors' (1846).

MOORE, James, American colonial governor: b. probably in Ireland about 1640; d. Charleston, 1706. He is supposed to have been a son of the Irish rebel, Roger Moore, and to have come to this country about 1665. Settling in South Carolina, he became a leader among those who openly resisted the lords proprietors in their oppressive demands. In 1682 he was made a member of the governor's council, and in 1692 was sent to the Assembly. In the latter year the proprietors named him for exclusion from their pardon. Two years later he was again one of the governor's council; that body in 1700 elected him governor; and he filled the executive office until 1703, when Sir Nathaniel Johnson arrived. Appointed by the Assembly to lead an expedition for the capture of Saint Augustine (1702). Moore took the town without difficulty, but failed to reduce the fort. Under Governor Johnson he served as attorney-general, and was successful in an expedition (1703) against the Apalachee (q.v.). Consult McCrady, 'History of South Carolina Under the Proprietary Government' (1897).

MOORE, James, American colonial officer: b. Charleston, S. C., 1667; d. 17 Feb. 1723. He was a son of the James Moore preceding, in whose expeditions against the Indians he participated. In 1713 Governor Craven appointed him commander of the forces sent to aid the North Carolina colony against the Tuscarora Indians, and two years later served as lieutenant-general of an expedition sent to subdue the Yamasi. In 1719, when Gov. Robert Johnston was deposed, the Convention having made an end of the proprietary government, Moore became governor. He was succeeded in 1721 by Francis Nicholson, who was commissioned by the English crown, afterward becoming speaker of the assembly.

MOORE, James Hobart, American lawyer and promoter: b. Berkshire, N. Y., 14 June 1852; d. 8 July 1916. He was bank clerk (1871–73) at Binghamton, N. Y., went to Chicago (1873) and was admitted to the Illinois bar (1881). In collaboration with his brother, William H. (q.v.), he created the great «Moore group» of four great corporations which

together had a capitalization of $187,000,000, these since being incorporated in the United States Steel Corporation. They were also the promoters of the National Biscuit Company, and other mercantile amalgamations. He was a director of the American Can Company, American Tin Plate Company, and numerous other leading industrial corporations.

MOORE, John, Scottish physician and author: b. Stirling, December 1729; d. Richmond, Surrey, 21 Jan 1802. Having obtained a knowledge of medicine and surgery he went to the Netherlands in 1747, and served as a surgeon's mate in the military hospitals. Returning to Scotland he practised till 1772. In that year he became medical attendant to the ninth Duke of Hamilton, whom he accompanied on a five-year tour on the Continent. In 1779 he published 'A View of Society and Manners in France, Switzerland and Germany,' which passed through numerous editions, and has been translated into several foreign languages. In 1781 appeared his 'View of Society and Manners in Italy'; and in 1786 'Medical Sketches,' followed by 'Zeluco,' a novel (1786); 'A View of the Causes and Progress of the French Revolution' (1795); and two other novels, which were not so successful as his first.

MOORE, Sir John, British soldier, son of the preceding: b. Glasgow, Scotland, 13 Nov. 1761; d. Spain, 16 Jan. 1809. He served in Nova Scotia during the American Revolutionary War; from 1784–90 was member of Parliament for a group of Scottish burghs; served in Cordica, the West Indies (1795), in Ireland during the rebellion of 1798, in Holland in 1799 and in Egypt in 1800–01. He was created Knight of the Bath in 1804 and was in command in the Mediterranean (1806–08). He was appointed commander-in-chief of the British army in Portugal in 1808. His intention was to cut the French communications with Madrid, but struggling against the apathy of the Spaniards and intrigue among his own countrymen, he advanced to Salamanca in spite of the gravest difficulties, but was ultimately forced to make a midwinter march to Coruna, a distance of 250 miles, through a desolate and mountainous country, rendered almost impassable by snow and rain, and constantly harassed by the enemy who outnumbered him by three to one. His troops arrived at Coruna in a distressing condition; Soult was ready to attack him as soon as he began the work of embarkation, and in the battle that followed Moore fell, mortally wounded, in the hour of victory. Wolfe's celebrated poem, 'The Burial of Sir John Moore,' keeps his memory green. Consult Carrick Moore, 'Life of Sir John Moore' (1835), and his 'Diary' (ed. by Maurice 1904).

MOORE, John Bassett, American lawyer, diplomatist and author: b. Smyrna, Del., 3 Dec. 1860. He attended private schools and was graduated at the University of Virginia in 1880. He read law in the office of Edward G. Bradford, now United States district judge at Wilmington, Del., and was admitted to the bar there in 1883. In 1885 he passed the first civil service examination for admission to the Department of State, at Washington, and was appointed a law clerk in that department in July of that year. In August 1886 he was appointed Third Assistant Secretary of State. In the summer of 1887, he acted as secretary to the conference between the Secretary of State and the British and German ministers on the affairs of Samoa; and in the winter of 1887–88 he acted as American Secretary in the conference on the North Atlantic Fisheries. He assisted at the organization of the First International American Conference at Washington, and later made a report to the conference on the subject of extradition. In 1891 he resigned the post of Third Assistant Secretary in order to take the newly-created chair of International Law and Diplomacy at Columbia University, New York, a chair which he has since continued to hold. In April 1898, on the outbreak of the war with Spain, he was without solicitation appointed by President McKinley to the position of Assistant Secretary of State. This position, which he had on three previous occasions declined, he resigned in September of the same year, in order to accompany the American Peace Commission to Paris as Secretary and Counsel, in which capacity he took part in the negotiation of the Treaty of Peace with Spain. In 1904 he acted as agent of the United States before the United States and Dominican Arbitration Tribunal. He was a member of the delegation of the United States in the Fourth International American Conference, at Buenos Aires, in 1910, and afterward served as a special plenipotentiary to the Chilean Centenary. In 1912 he was appointed the delegate of the United States on the International Commission of Jurists, which was organized at Rio de Janeiro in that year, under the Pan-American Treaty of 1906, for the codification of International Law. In March 1913 he became by appointment of President Taft a member of the Permanent Court of Arbitration at The Hague. In the following month he was appointed by President Wilson counselor for the Department of State and was invested with authority to sign as acting Secretary of State. He resigned as counsellor in March 1914. In 1921 he was appointed a member of the Permanent Court of International Justice. Mr. Moore is a member of the Institut de Droit International, of the Institut Colonial International, of the American Philosophical Society, of the American Political Science Association, of which he was president in 1913–14, and of various other learned societies. He is a member and honorary secretary of the Hispanic Society of America; and an honorary member of the College of Lawyers at Costa Rica. He was a member of the Pan-American Financial Congress at Washington in May 1915, acting as chairman of the committee on uniform laws, by which the scheme of work of the Congress was drawn up; and he is vice-chairman of the American section of the International High Commission organized to carry out the plans of the Congress. He was a delegate of Columbia University and of various learned societies in the Second Pan-American Scientific Society at Washington, December 1915–January 1916. He is vice-president of the Pan-American Society of America. He is an incorporator of the American National Red Cross and active on its committees. He was delegate to and president of the International Conference, The Hague, 1922–23, on Rules for Aircraft and Radio in Time of War. His publications include 'Report on Extraterritorial Crime' (Washington 1887); 'Report on Ex-

tradition' (Washington 1890); 'Extradition and Interstate Rendition' (2 vols., Boston 1891); 'American Notes on the Conflict of Laws' (Boston 1896); 'History and Digest of International Arbitrations' (6 vols., Washington 1898); 'American Diplomacy, its Spirit and Achievements' (New York 1905); 'A Digest of International Law' (8 vols., Washington 1906); 'The Works of James Buchanan' (12 vols., Philadelphia 1908); 'Four Phases of American Development: Federalism, Democracy, Imperialism, Expansion' (Baltimore 1912); 'Principles of American Diplomacy' (1918). He is an editor of the *Political Science Quarterly,* of the *Journal du Droit International Privé,* etc.

MOORE, John White, American naval officer: b. Plattsburg, N. Y., 24 May 1832; d. 1913. He was educated at Plattsburg Academy, Williston Seminary and under private tuition at New York City. He was appointed (1853) third assistant engineer, United States navy, promoted (1855) to second assistant engineer, becoming (1894) chief engineer. For valuable service in the Civil War he was created (1906) rear-admiral. He originated chain cable protection on sides of wooden vessels and of "fighting tops," now in general use. After being in action with the West Gulf Blockading squadron and the lower Mississippi River, engaging rebel batteries at head of passes and at defense of Pensacola (1861), passage and capture of forts Jackson and Saint Philip, capture of New Orleans and Port Hudson (1863), etc., he became superintendent of ironclads at New York and Boston (1863–67) and served at various navy yards. He was fleet engineer (1867–68) on staff of Admiral Farragut, European squadron, and fleet engineer of Asiatic station (1872–75). He retired in 1894 with the rank of commodore, serving, however, as inspector of the New York navy yard during the Spanish American War.

MOORE, Maurice, American patriot and jurist: b. Brunswick County, N. C., 1735; d. 1777. Having studied for the bar, he acquired a high reputation as a lawyer, was one of the three colonial judges of North Carolina at the time of the Revolution, was a member of the provincial congresses at Hillsborough in 1775 and Halifax in 1776 and had a prominent part in framing the constitution of North Carolina. He was one of a committee appointed at the commencement of the Revolution to draw up an address to the people of Great Britain on the wrongs of the North American colonies. His letter to Governor Tryon, under the signature of "Atticus," is an incisive piece of work.

MOORE, Raymond Cecil, American geologist: b. Roslyn, Washington, 20 Feb. 1892. He was graduated from Denison University, Granville, Ohio, in 1913, and taught there 1912–13, when he became a member of the United States Geological Survey. He was also an instructor at the University of Chicago in 1916, and thereafter assistant professor of geology. He was in turn an assistant professor, associate professor and, since 1919, a full professor of geology, at the University of Kansas, and head of the geological department. He is also geologist for the State of Kansas; and was editor of the *Bulletin* of the American Association of Petroleum Geologists, 1920–26. Among the works he has published are: 'Oil and Gas Resources of Kansas' (with W. P. Haynes, 1917); 'General Geology of Oil and Gas' (1921); 'Geology of Kansas' (1921).

MOORE, Thomas, Irish poet: b. Dublin, 28 May 1779; d. Bromham, near Devizes, 25 Feb. 1852. He was educated at Trinity College, Dublin, with a view of becoming a lawyer, and in 1800 entered as a student at the Middle Temple. In 1800 he published a translation of 'Anacreon' dedicated to the Prince of Wales (his enemy in after years), and in 1801 'The Poetical Works of the late Thomas Little.' His fine musical talent got him admission to the best society. The office of admiralty registrar at Bermuda was bestowed on him in 1803. The post was given to him as a sinecure, and he quitted it after appointing a deputy to perform his duties. In November 1804 after a tour through the United States and British America, he was back again in England. In 1806 he published 'Odes and Epistles,' which contained some attacks on America, and, castigated by Jeffrey in the *Edinburgh Review,* occasioned the memorable frustrated duel between him and the distinguished critic who had no bullet in his pistol. Moore entered in 1807 into an engagement with Power, the music publisher, to produce a series of adaptations to the national Irish airs, he furnishing the words and Sir John Stevenson the music. This great undertaking, which extended over a number of years, only completed in 1834, is the work on which his reputation will mainly rest. Many of the numbers, such as 'The Last Rose of Summer,' and 'Those Evening Bells,' are generally familiar. His 'National Airs' (1815) included 'Oft in the Stilly Night' and the 'Sacred Songs' (1816); 'Sound the Loud Timbrel.' In 1811 he married Bessie Dyke, an actress. 'The Twopenny Post Boy, by Thomas Brown the Younger,' a series of satires on the proceedings of the prince-regent and his ministers, appeared in 1812, and by their genuine wit attracted much attention and in this kind of composition he afterward excelled. The same year he removed to Mayfield Cottage, near Ashbourne, Derbyshire, and here his 'Lalla Rookh' was elaborated. Its production was the result of an agreement with Messrs. Longman, by which he was to receive 3,000 guineas for a poem to form a quarto volume. It appeared in 1817, and its success fully justified the liberality of Moore's publishers. It was translated into numerous languages, and attained a European fame. Later criticism has deemed it rather a work, as Garnett says, "of prodigious talent," than of the genius ascribed to it in Moore's own day. The same year appeared a satirico-burlesque poem, 'The Fudge Family in Paris' (1818) in the form of a series of amusing letters supposed to be written by the different members of an excursion party to the Continent. 'Rhymes on the Road' and 'Fables of the Holy Alliance' followed in 1819. About this time he became involved in serious embarrassments by the defalcations of his deputy in Bermuda and found himself suddenly called upon to make up a deficiency of £6,000, ultimately reduced to about £1,000. This vast sum he contrived to clear off by his literary earnings In 1822 appeared his 'Loves of the Angels'. The 'Life of Sheridan' was produced in 1825, and the 'Epicurean,' a prose romance of small value, in 1827. Next came the justly praised

'Life of Lord Byron' (1830). (See BYRON). His remaining works include the 'History of Ireland' (1846), written for Lardner's 'Cyclopædia' and a task which he found very severe. For nearly the last 30 years of his life he resided at the cottage of Sloperton, near Devizes. Moore's fame, great in his own day, has suffered diminution, except in so far as his songs are concerned, his more ambitious poems being little read. A biography in eight volumes, edited from his journal and correspondence, was published after his death by his friend, Lord John Russell (1853–56). Consult also Clark, J. C. L., 'Tom Moore in Bermuda' (Boston 1909); Gwynn, 'Thomas Moore' (in the 'English Men of Letters' series, London 1905); Gunning, 'Thomas Moore, Poet and Patriot' (ib. 1900); Vallat, 'Thomas Moore sa vie et ses œuvres' (Paris 1887). See LALLA ROOKH.

MOORE, Tom, Canadian labor leader: b. 1878. By trade a carpenter, he became identified with the trade union movement soon after his coming to Canada in 1906. He was at one time business agent for the carpenters' unions in the Niagara district and was general organizer of the United Brotherhood of Carpenters and Joiners of America from 1911 to 1918. He was president of the Trades and Labor Congress of Canada from 1918 to 1935; member of the Industrial Relations Commission in 1919; labor member of the Canadian National Railway Board of Directors 1923–33; member of the governing body of the International Labor Office, Geneva, Switzerland from 1922. He has been member of the Employment and Social Service Commission since 1935 and of the National Employment Commission since 1936. He has advocated progressively improving employer-employe relations through collective agreements between trade unions and employers. He is considered one of the greatest labor leaders of our time.

MOORE, Willis Luther, American meteorologist: b. Scranton, Pa., 18 Jan. 1856. At eight years of age he joined his father, with Grant's army, at City Point, Va., and sold papers to the troops in the field; was educated in the Binghamton public schools; was student of natural sciences under scientific staff of the Weather Bureau for 15 years and under private tutors six years. He served full apprenticeship as printer and pressman on the Binghamton *Republican*, and worked as union printer in Chicago, Burlington, Iowa and Washington, D. C.; entered Signal Corps (now Weather Bureau) 1876, and rose through successive grades to local forecast official in Milwaukee, 1891–94; won professorship of meteorology in open competitive examination against 23 contestants, 1894, and was assigned to duty as district forecaster at Chicago; was chief United States Weather Bureau, 1895–1913; professor applied meteorology George Washington University 1914. He was lecturer for the Royal Institution (London) in 1912; and was lecturer on the Lyceum and Chautauqua circuits; fellow of the American Association for the Advancement of Science; and honorary member of the Royal Meteorological Society (London), and of the Austrian Meteorological Society; was president of the National Geographic Society, 1905-10; and vice-president Washington Academy of Science, 1900-10. He published 'Descriptive Meteorology' (1904); 'The New Air Mail' (1922); 'Spiritual Gravity of the Cosmist.' Died Pasadena, Calif., 18 Dec. 1927.

MOORE, Zephaniah Swift, American educator, first president of Amherst College: b. Palmer, Mass., 20 Nov. 1770; d. 29 June 1823. He was graduated at Dartmouth College in 1793, entered the Congregationalist ministry, and preached at Leicester, Mass., from 1798 until 1811, when he was appointed professor of languages in Dartmouth College. He was chosen president of Williams College in 1815, but failing in his efforts to procure the removal of the institution to the banks of the Connecticut, he resigned in 1821, and was chosen president of Amherst College.

MOOREA, mō"ō-rā'a, or **EIMEO,** ī'mĕ-ō, one of the Society Islands, in the Pacific Ocean, about 20 miles west-northwest of Tahiti, the principal member of the group; area 51 square miles. It consists of deep valleys and abrupt hills — the former well cultivated, and the latter heavily timbered. Here Christianity was first introduced in Polynesia; and here the South Sea College of the London Missionary Society was established. Most of the natives are Protestants. Pop. 1,837.

MOOREHEAD, Warren King, American archæologist: b. Sienna, Italy, of American parentage, 10 March 1866; d. Boston, Mass., 5 Jan. 1939. He was educated in public schools of Ohio, and devoted himself to the study of Indian archæology and later studied three years in the Smithsonian Institution, and was afterward engaged in investigations of the earthworks and other Indian relics in Ohio for four years. He had charge of the investigations in Ohio, Utah, Colorado and New Mexico for the Chicago exposition and was curator of the museum of the Ohio State University. He was later curator in the department of archæology at Phillips Academy. He was a member of the United States Board of Indian Commissioners; and after 1909 investigated conditions on Indian reservations for the Interior Department; fellow of the American Association for the Advancement of Science. He received the degree of M.A. (honorary) from Dartmouth in 1901, and published 'Primitive Man in Ohio' (1892); 'Stone Age in North America' (1910); 'American Indian in the United States' (1914).

MOORE'S CREEK, a short stream in North Carolina, which flows into Cape Fear River about six miles above Wilmington. Moore's Creek is noted on account of a battle fought on its banks, 27 Feb. 1776, between American and British forces. The British soldiers, nearly all Highland Scotch under Brigadier-General MacDonald, numbered 1,500, and the Americans under Caswell and Lillington numbered 1,000. The charge was made by the British, who tried to cross the stream on the girders of a bridge, the planks had been taken away, but the militia and minute men of the American force routed them. Fully 30 British were killed, many wounded, and about 700 taken prisoners. The victory gained by the Americans was an inspiration to the Carolinas; it had the same effect in the South that the Battle of Lexington had in New England.

MOORESVILLE, mōrz'vĭl, city, North Carolina, in Iredell County, 14 miles south-southeast of Statesville, and 26 miles north of Charlotte. It is served by the Southern Railway and is on federal and state highways. It is a manufacturing town—the chief business enterprises being the manufacture of cotton, flour milling, and ironworks. Founded in 1868, it was incorporated in 1873, and has council-manager government. Pop. (1950) 7,121.

MOORHEAD, Frank Graham, American editor: b. Council Bluffs, Iowa, Aug. 20, 1876. He was educated at Iowa State College and Grinnell College; engaged in newspaper work in various cities; was associate editor of Pierce's *Farm Weeklies* (1910–1920); editor of *The Farm Journal* (1920–1922), editor in chief Pierce's *Farm Weeklies* after 1922. He published *Unknown Facts about Well Known People* (1923); *Jazz History of the United States* (1925).

MOORHEAD, mōr'hĕd, city, Minn., and Clay County seat, altitude 929 feet, on the Red River; 249 miles northwest of Minneapolis, on the Great Northern and the Northern Pacific railroads, and on three federal highways, opposite Fargo, N. Dak. Through the airport at Fargo, it has airline service. Located in a farming region, it handles large volumes of dairy products, and poultry, also wheat and sugar beets. It has sheet-metal works, sugar mills, and makes tents, awnings, and mattresses. It is the seat of a state teachers' college and of Concordia College. The city, named for William G. Moorhead, a director of the Northern Pacific, has aldermanic government. Pop. (1940) 9,491; (1950) 14,870.

MOORISH ART. See ARCHITECTURE—*Islamic;* MOHAMMEDAN ART.

MOORS (Lat. *Mauri;* Sp. *Moros;* Dutch, *Moors*), the people of Morocco. The Arabs who conquered the Roman Province of Mauritania in North Africa in the 7th century converted to Mohammedanism the native population, who in Europe were still called Moors, though in their own language they called themselves Berbers, while by the Arabs they were termed Moghribees, "westerners" or "men of the west." Arabic manners and customs, and in a corrupt form the Arabic language, soon prevailed in the country, the Arab conquerors freely amalgamating with their converts, who far exceeded them in numbers. In 711 an army drawn from this mixed population, under Arab leaders, crossed the straits at Gibraltar, so named from their leader, and began the conquest of the Spanish peninsula. The Spaniards and Portuguese called these invaders Moors because they came from Mauritania, and the term Moors with them soon became synonymous with Mohammedans or Moslems, as the invaders designated themselves. The Spanish writers subsequently applied the term to all the Mohammedans of northern Africa; and when, at the close of the 15th century, the Portuguese made their way around the Cape of Good Hope and encountered the Arabs on the coasts of East Africa and of Asia, they still called them Moors. See also MOROCCO.

MOOSE. The deer family (Cervidae) embraces not only all the round-horned deer, but also the caribou and moose, whose horns are flattened in a manner known as "palmation." Of this family, the American moose (*Alces americanus*) is the most colossal and also the most picturesque member. The moose of Europe and Asia, there called "elk" (q.v.), is a much smaller animal. Even in comparison with the largest American elk, the North American moose is a giant, and it is impossible to appreciate fully the great height and bulk, length of leg and size of antlers of this wonderful creature, without seeing a full-grown bull, either in his native wilds or mounted in a museum.

At nearly every point the species presents a peculiarity. The largest specimens ever shot and measured by naturalists stood from 78 to 84 inches in height at the shoulders. The body is very short in comparison with the great length of the legs, but the depth of the chest is unusually great. The end of the nose is flabby and pendulous, and overhangs the end of the chin by three or four inches. In browsing it is half prehensile, and is of great use in conveying twigs into the mouth. A moose in full winter pelage is covered by a coarse thatch of strawlike hair, from three inches in length on the body to six inches on the neck and shoulders. The color of the hair is purplish-gray, and for an animal which lives so far north, the pelage is exceptionally coarse and open

Alaska moose.

The antlers of the moose are strikingly peculiar. The upper two thirds of the beam is enormously flattened, often to a width of 12 inches or more, and the upper end of this great shovel of solid bone terminates in a row of from 6 to 12 short points. The single browtine is also well palmated, and usually terminates in three or four long points of great strength. The largest antlers known are in the Chicago Natural History Museum, and have a spread of 78 inches, greatest width of palmation 16 inches, thickness of palmation 2⅛ inches, and a total of 34 points. The weight of the antlers and skull is 93¼ pounds.

The moose is a browsing animal, and its favorite food consists of twigs of the willow, birch, hemlock, spruce, alder, aspen and maple. It also feeds upon moss, and in summer is very fond of wading in ponds and eating the stems and leaves of water-lilies. Because of their very unusual feeding-habits, moose are very difficult to rear in captivity to adult age. Moose calves are born either singly or in pairs, in May or June. At birth an average specimen stands about 32 inches in height, and is a most grotesque-looking creature. Its first coat of hair is sandy-red, like that of a buffalo calf. At 15

months, a healthy young animal is about five feet high at the shoulders. The weight of a large adult male moose is between 1,100 and 1,200 pounds, but the maximum weight for the species would probably reach 1,500 pounds.

The range of the moose extends from Nova Scotia and New Brunswick to northern Alaska, a total distance along the axis of distribution of about 4,100 miles.

The valley of the Ottawa River and its tributaries still affords good moose hunting, as does northern Manitoba. The species still exists in small numbers in northern Minnesota, and along the western slope of the Rockies as far south as the head of the Green River, Wyoming. Northward, moose are found in British Columbia, Alberta, Athabasca, Yukon, and in many parts of Alaska. Those found on the Kenai Peninsula and north of Cook Inlet have the most massive and widespreading antlers to be found, and have even been described as an independent species, under the name of *Alces gigas*.

The killing of moose is regulated by law. Open seasons are very short; the number that may be killed by each hunter is limited to one or two males, and the killing of females is forbidden.

WILLIAM T. HORNADAY.

MOOSE, Loyal Order of, a secret fraternal society founded in 1888 at Louisville, Ky. by Dr. J. H. Wilson. The first lodge was organized in Cincinnati, Ohio. Operating in the United States and possessions, Canada, and the British Isles, membership, restricted to the white race, totaled (1954) 1,085,455 in 3,097 units, including women's auxiliaries. The society's purpose is beneficiary; besides paying sick and death benefits to its members, it maintains a home and vocational school for orphan boys and girls at Mooseheart, near Aurora, Ill., and a home for dependent old people at Moosehaven, Orange Park, Fla. The organization publishes *Moose Magazine*.

MOOSE FACTORY, village, Ontario, Canada, on an island at the mouth of the Moose River in James Bay. It is adjacent to Moosonee on Moose River, which is a terminus of the Ontario Northland Railway. Both villages are trading posts. Two French-Canadian explorers, Pierre Esprit Radisson and Médart Chouart, Sieur de Groseilliers, were commissioned by Prince Rupert in 1668 to search for the Northwest Passage. After establishing Charles Fort and returning to England with a cargo of furs, they were sent out by the Hudson's Bay Company in 1671, and founded Moose Factory as a trading post. When war broke out between France and England, the post changed hands several times, and was destroyed at the end of the century. Rebuilt in 1730 by the company near the old site, it has retained operations to the present day. Pop. (1941 est.) 300.

MOOSE JAW, city, Saskatchewan, Canada, situated at the junction of Moose Jaw River and Thunder Creek, 45 miles west of Regina. Divisional headquarters for the Canadian Pacific and the Canadian National railways, and for Prairie Airways Limited, it is on the route of the Trans-Canada Air Lines, and is well served by highways. Moose Jaw is located in a large agricultural area. Its industries include meat packing, milling, oil refining, electrical production, stockyards, creameries, railway terminal shops, and a woolen mill. The city has a collegiate institute and a teachers college.

The district was first settled in 1882; Moose Jaw was incorporated as a town in 1884 and as a city in 1903. The Indians called it "the place where the white man mended his cart with the jaw of a moose." Pop. (1951) 24,355.

MOOSEHEAD, lake, Maine, 50 miles north of Skowhegan, at an elevation of about 1,000 feet. The largest lake in the state, its area is 120 square miles; it is 35 miles long, and 2 to 10 miles in width. The Kennebec River has its source in the lake, and an outlet leads into the Penobscot River. A lake with many islands, Moosehead is a popular resort for fishermen and hunters. Steamer service connects the shore towns, the Canadian Pacific Railroad runs along the southwestern end, and there is an airport at Greenville on the south shore, where guides and canoes are available.

MOOSEWOOD, local name in the Eastern states and Canada for the striped maple (*Acer pensylvanicum*).

MOPSUS, mŏp′sŭs, in Greek mythology, a diviner or two diviners of the same name. (1) A pre-Trojan War Mopsus, son of Ampyx and Chloris, was one of the Lapithae (q.v.) who took part in the battle with the Centaurs, and was the prophet of the Argonauts, whom he accompanied on their voyage. He died in Libya from the bite of a serpent.

(2) A post-Trojan War Mopsus was the son of Rhacius and Manto, daughter of the seer Tiresias. In a contest of divining the number of figs on a tree, he defeated Calchas, who is said to have died from mortification. Mopsus was killed in a combat with Amphilochus.

MOQUEGUA, mō-kā′gwä, department, Peru, bounded on the north by Arequipa, on the south by Tacna, on the west by the Pacific Ocean, and on the east by Puno. Its area is about 4,700 square miles. It is watered by the Tambo and Moquegua rivers, and is crossed by the Cordillera Occidental, which here has several volcanic peaks. The climate is dry—semitropical on the coast, with cooler uplands. Mainly agricultural, its irrigated lands produce wine, olives, cereals, sugarcane, and cotton, and on the mountain slopes cattle are raised.

MOQUEGUA, capital of the department, is on the Moquegua River, 60 miles by rail from the port of Ilo, at an altitude of 4,500 feet. It is also on the Pan American Highway. Earthquakes, the latest occurring in 1868, have caused suffering to the city's industry, but it is now a processing center for olives, wine, cotton, and fruit. Pop. department (1950 est.) 42,647; town (1940) 3,888.

MOQUELUMNAN, mō-kĕl-ŭm′năn, a name applied to a distinct language family of North American Indians, formerly included with the Costanoan in the old Powell classification, but now accorded separate status. It comprises one of the largest groups in California, occupying an area extending from the Cosumnes River south to the Fresno River, and from the Pacific Coast inland to the Sierra Nevada. The Moquelumnan are known tribally as the Miwok, of whom there are

several divisions, each with an individual dialect.

MORACEAE, mô-rā′sē-ē, a family of plants in the order Urticales, composed of trees and shrubs, sometimes vines, and (rarely) herbs, related to the nettle family. The approximately 55 genera and 1,000 species grow mainly in tropical and subtropical climates. Botanical characteristics include deciduous or evergreen trees, alternate or simple leaves, and small unisexual flowers; various species have milky juice and (notably species of *Ficus*) are epiphytes. Moraceae is economically important, and its plants are grown for fruit, shade, and ornament. The most important genera are *Morus* (mulberry), including *M. alba* (white mulberry) and *M. rubra* (red mulberry); and *Ficus* (the fig), which has the most numerous species, including *F. carica* (common fig), *F. benghalensis* (banyan), and *F. elastica* (indiarubber plant). Other genera are *Maclura* (orange osage), *Artocarpus* (breadfruit), *Broussonetia* (paper mulberry), and *Brosimum* (breadnut).

MORADABAD, mŏŏ-räd′ä-bäd, city, India, seat of Moradabad District in north central Uttar Pradesh, on the upper Ganges Plain, situated on the right bank of the Ramganga River, 90 miles east of Delhi. A railway and road junction, the city is a trade center for the wheat, rice, barley, mustard, sugar cane, and cotton which are grown in the area. Its principal industries are cotton milling and the production of lacquered brassware, for which it is noted. Moradabad was founded in 1625 by Rustam Khan, who also built the fort and splendid mosque, Jama Masjid (1631) which are its distinguishing landmarks. It was a Rohilla stronghold in the 18th century, and with its territory became part of British India in 1801. Pop. (1951) 161,854.

MORAES BARROS, mōō-rīs′ bär′rōōs, **Prudente José de,** Brazilian lawyer and political leader: b. Itú, Brazil, 1841; d. Piracicaba, Dec. 3, 1902. An ardent advocate of republicanism, Moraes Barros was a successful lawyer and in 1885 was one of three republicans to sit in the imperial parliament. After the revolution of 1889, which he was active in bringing about, he became governor of São Paulo and president of the Constituent Assembly. In 1894 he was elected president of Brazil (to 1898), the first civilian to hold the office. Although he was personally honest and an able leader, his administration was severely hampered by a series of crises resulting from the disturbed financial and political condition of the new republic.

MORAINE, mô-rān′, the deposit of rock debris, composed of sand, gravel, or clay, made by a glacier. Moraines may be divided into two classes, those that exist on the ice itself and those that are formed at the edge of the ice or under it. Of the first type, the most common are the *lateral moraines.* These are ridges of debris that accumulate on the ice next to the rock wall on either side. They consist in part of material that the glacier has scraped from the valley sides and in part from avalanche debris. When two glaciers unite, two lateral moraines are brought together and form a *medial moraine.* Glaciers that result from many branches uniting may have several such medial moraines. The lower stagnant ends of many large glaciers are wholly covered with debris that was once frozen into the ice, but which has accumulated as the ice melted. Such deposits are known as *ablation moraines.* Forests grow on the ablation moraine of the Malaspina Glacier in Alaska. Moraines of the above three types seldom remain as distinct ridges after the glacier has melted way.

Of the second type, the *frontal* or *terminal moraines* are most important. These are formed at the ice front, when loss by melting just equals ice advance, and all the debris is accumulated in one ridge. In the case of valley glaciers, these form dams across the valleys, often producing lakes. In the case of continental ice sheets, the moraine may stretch across the country, as in the northern United States, at the southern margin of the glaciated region. Sometimes the ice in its retreat pauses several times, building a moraine at each pause, in which case they are called *recessional moraines.* The thin sheet of till (q.v.) that a glacier spreads over the country at large and which results chiefly from material that the ice is forced to drop from the bottom, due to overload, is called *ground moraine.* Drumlins (q.v.) are a special phase of ground moraine. Morainic debris is mostly unstratified and contains many polished and striated boulders. See also GLACIER.

MORALE, mô-räl′, the amount of zest and efficiency with which members of a social group participate in an activity. Morale may be high or low. Each member of a group learns something about the beliefs and attitudes of other members, and, to the extent that he accepts them, his morale is affected. During World War II the Morale Services Division of the United States Army sought to teach each soldier to accept with conviction these basic morale factors: faith in the cause and the future; pride and confidence in the outfit; belief in the mission; confidence in training and equipment; realistic appraisal of the job ahead; satisfaction with the job assignment; and belief in the concern of the army for an individual's welfare. The leader, as exemplar and teacher, is considered to be the principal determiner of the level of morale in any group, whether military or civilian.

American psychologists have devised many ingenious procedures for measuring the level of morale in any group. Attitude scales or personal interviews may be employed to appraise the degree of conviction with which beliefs and attitudes are accepted or rejected.

In business and industry the level of morale may be measured by such factors as absenteeism, employee turnover, accident rate, and quality of output. Many studies have been undertaken in order to maintain a high level of morale. Psychiatric diagnoses and psychological tests have been used in the hope of weeding out potential trouble-makers who might wreck the morale of a business or industrial enterprise. Paternalistic schemes have been used in the vain hope of securing high morale among workers. It seems to be the consensus that a satisfactory level of morale is achieved only when each member of a group enjoys full self-respect. The amount of job dissatisfaction in many a business or industry indicates that much research work remains to be done in the field of worker morale.

PHILIP HARRIMAN.

MORALES, mô-rä′lās, **Luis de** (called EL DIVINO), Spanish devotional painter: b. Badajoz, Spain, about 1509; d. there, May 9, 1586.

Although much of his life was spent in poverty, he was a successful artist, and his paintings were placed in churches throughout Spain. He was called to participate in decorating the Escorial (1563), but his curious style, a mixture of medieval and Renaissance elements, did not please the classically minded Philip II, and his services were not retained. However, in 1581 Philip granted the poverty-stricken artist a pension. Although Morales' style was undoubtedly influenced by foreign sources, notably in his use of North Italian chiaroscuro and in his attention to minute detail, typical of German and Flemish painting, he was purely Spanish in inspiration and feeling. His emaciated figures, elongated and melancholy, and reminiscent of Gothic representation, contain a nervous intensity and a harshness that are symbolic of the exalted mysticism pervading religion in 16th century Spain. The paintings achieved an emotional quality by his use of various mannerisms which became characteristic of his work, such as deep shadows to emphasize a sense of torment and exaltation, and Morales may be considered the founder of the manneristic school of 17th century Spanish devotional painting. In his early work he produced large canvases covered in livid unnatural colors. His color tones gradually softened, and he later painted small canvases filled with a few half-length figures. The popularity of his work created numerous imitators, mostly mediocre. Called El Divino because of his exclusive interest in religious painting, Morales concentrated on a few themes which, with slight variation, he reproduced again and again. Most typical are *Pietà, Virgin and Child, Ecce Homo* (with examples in the Prado and the New York Historical Society gallery), and *Christ Bearing the Cross.*

MORALITY PLAYS or **MORALITIES,** allegorical plays in verse, popular in the late Middle Ages. They differed from the miracle plays (q.v.), whose dramatis personae were taken from the Bible or the hierarchy of saints, while the moralities used allegorical figures personifying abstract qualities of vice and virtue, such as Charity, Wisdom, Sobriety, Folly, and Bad Habits, and generalized types such as Mankind, King, and Bishop. Basically the moralities were dramatized sermons, usually concerned with two principal themes: the struggle between forces of good and evil within man for possession of his soul, and the portrayal of man's journey through life. The latter theme is exemplified in *Everyman* (q.v.), the greatest of the English moralities. However, the moral precept in question was not always religious; it was often secular, as in *La condemnation de banquets* (c. 1507) by Nicolas de La Chesnaye, which condemns gluttony. Although they lacked dramatic action, the plays often contained much humor in the character of the Devil and his various vices, who were played realistically and with gusto. Increasing emphasis was placed on comic elements, and in time the moralities tended to merge into the comic interlude and the farce of the popular theater. Dating from the late 14th century, the morality play reached its highest development in 15th century England and France, and then declined in popularity after 1550. Noted plays include *Castell of Perseverance* (c. 1405) and *Ane Pleasant Satyre of the Thrie Estaitis . . .* (*Three Estates,* c. 1540). See also DRAMA—*Medieval Drama.*

MORAN, mô-răn′, **Edward,** American marine painter: b. Bolton, England, Aug. 19, 1829; d. New York City, June 9, 1901. In 1844 his family emigrated to Maryland, where he worked as a weaver. Moving to Philadelphia, he studied painting with Paul Weber and James Hamilton, and by 1857 he was established there as a professional artist. He studied in England for a time (1862), and in 1872 settled in New York, where he was soon one of the city's most prominent artists. Moran's reputation rested largely on his seascapes, which show the influence of the English landscapist Joseph M. W. Turner; these include *Launching of the Life-Boat* (1865), *Relief Ship Entering Havre* (1872), and *Fishing Boats in the Irish Channel.* His outstanding achievement was a series of 13 marine paintings (completed 1899) which depict notable events in American history, such as the landing of Leif Ericson, Henry Hudson's ship entering New York harbor, and the return of the victorious American fleet after the Spanish-American War. The series was later presented to the Pennsylvania Museum of Art, Philadelphia.

PETER MORAN, his brother (b. Bolton, March 4, 1841; d. Philadelphia, Nov. 9, 1914), was noted as a painter and etcher of animal and landscape subjects. He was taught by his brothers Edward and Thomas Moran (q.v.). His works include *Pasture Land; The Pueblo of Zia, New Mexico; Santa Barbara Mission; The Stable Door; The Return of the Herd* (awarded a medal at the Centennial Exposition of 1876); and *Wolves on the Buffalo Trail.*

MORAN, Patrick Francis, Australian Roman Catholic cardinal: b. Leighlinbridge, Ireland, Sept. 16, 1830; d. Sydney, Australia, Aug. 16, 1911. Educated in Rome, he was ordained priest in 1853, became bishop of the diocese of Ossory (Ireland) in 1872, and in 1884 went to Australia as archbishop of Sydney. He was consecrated cardinal in 1885. In Australia he stirred up much controversy over religious questions, was active in Australian politics, and also supported Irish home rule. He worked energetically for educational reform, and his primacy is noted for the many schools, churches, and hospitals which he built. In addition he was a prominent scholar in Irish church history; the best known of his many writings is *History of the Catholic Archbishops of Dublin* (1864).

MORAN, Thomas, American landscape painter and etcher: b. Bolton, England, Jan. 12, 1837; d. Santa Barbara, Calif., Aug. 26, 1926. His earliest painting instructor was his brother, Edward Moran (q.v.). In 1862 the brothers went to England for further study; there Thomas was deeply influenced by the work of Joseph M. W. Turner, the English landscape painter, and in nearly all his subsequent paintings there is a Turneresque quality. He accompanied the United States Geological Expedition, headed by Ferdinand V. Hayden, to the Yellowstone River country (1871), and in 1873 went on an exploring expedition to the Colorado River. These trips resulted in his most famous landscapes, the *Grand Canyon of the Yellowstone* which was purchased by the government for the Senate Hall in the Capitol, and now on display in the Department of the Interior Building, and *Chasm of the Colorado,* purchased by Congress and placed in the Capitol. Moran went frequently to

Europe and painted many canvasses of Venice. About 1873 he removed to New York and at this time did an enormous amount of drawings on wood for magazine illustration and for schoolbooks. He also did much etching. He was a member of the National Academy of Design, the American Water Color Society and similar societies. Other important works from his hand are *Mountain of the Holy Cross; Shoshone Falls; The Grand Canal, Venice; The Pearl of Venice; The Dream of the Orient,* and *Solitude.* He died Aug. 26, 1926.

MORANT, mô-rănt, Sir **Robert Laurie,** English educator: b. Hampstead, April 7, 1863; d. London, March 13, 1920. He was educated at Winchester, and at New College, Oxford; B.A. 1885. He undertook educational work of several kinds, becoming tutor to the royal family of Siam and organizer of education in that country. He then took up social and educational work in East London, becoming (1895) assistant director of special inquiries and reports in the educational department, Whitehall, which included education reports on England, France and Switzerland. He was appointed permanent secretary, Board of Education, 1903–1911, and was chairman of the Insurance Commission after 1912. He was created knight commander of the bath in 1902.

MORAT, mô-rà' Switzerland, town in the canton Fribourg, located on Lake Morat and on the Palézieux-Lys and the Ins-Fribourg railways. It has a 13th century castle, but is chiefly noted for the brilliant victory of the Swiss and their confederates over Charles the Bold, June 22, 1476. Consult Ochsenbein, *Die Urkunden der Belagerung und Schlacht von Murten* (Basle 1876).

MORATIN, mō'rä-tēn, **Leandro Fernández,** Spanish dramatist: b. Madrid, March 10, 1760; d. Paris, June 21, 1828. He was son of Nicolas (q.v.) and was early instructed in poetic art, and (1786) went to Paris as secretary of Count Cabarrus, where he gained the acquaintance of Carlo Goldoni who strengthened his purpose of reforming the Spanish stage by introducing French rules. Returning (1789) to Spain he was granted a benefice by Minister Florida Blanca which permitted him to follow a literary life. His first comedy, *El Viejo y la Niña* (1790) was successful and it was followed by the satiric play *La Comedia nueva* (1792) which revenged him for the opposition given him by the old adherents to the national taste. Prince Godoy afforded him the means to visit France, England, Germany, Switzerland and Italy, returning in 1796. Next year appeared his *El Barón, La Mogigata,* (1804); *El Sí de las Niñas* (1806), the latter proving an immense success and soon being translated into various languages. Under French occupation he accepted (1811) the post of librarian to King Joseph from which persecution drove him to exile and he settled (1822) in Paris. His plays have their characters drawn true to life, the dialogues are lively and these works show originality. Concerning the history of Spanish drama he wrote *Origines du Théâtre espagnol* (1838), a worthy work. The Spanish Academy published his operas (Madrid 1830–1831). Consult also Ford, *Si de las Niñas* (Boston 1899).

MORATIN, Nicolas Fernandez de, Spanish poet and dramatist: b. Madrid, July 20, 1737; d. there, May 11, 1780. He studied law at Valladolid, devoting time also to fine arts, and received a position in court after finishing his studies. He first turned to the drama, starting with the play *La Petimetra* (1762). Next came *El poeta* and the tragedy *Lucrece* in orthodox style which he held to in his later *Hormesinda* and *Guzman el Bueno.* His last and superlative work was *Canto epico de las Naves de Cortes destruidas* (1765), one of the finest of the Spanish heroics. R. Foulcké-Delbosc published his remaining works under title of *Poesias ineditas* (Madrid 1892).

MORATORIUM, the legal postponement for a given period of the payment of debts usually of an intergovernmental character, as for instance the moratorium of international obligations carried forward by President Herbert Hoover in June 1931 as a remedy for world depression.

MORAVA, Yugoslavia, a river about 250 miles long, formed by the confluence at Staladsh of its head streams, the western Morava rising near the western boundary, and the southern Morava, with its source north of Uskub. It flows into the Danube and is navigable 50 miles from its mouth in the Danube River, 30 miles east of Belgrade.

MORAVA, a river of Czechoslovakia. See March.

MORAVIA, province of Czechoslovakia, formerly a province of the Austro-Hungarian Empire. From March 16, 1939, when Germany completed the dismemberment of Czechoslovakia, until early May 1945, Moravia, with the adjoining province of Bohemia, was ruled as a "protectorate" with savage brutality. National liberation at the close of World War II restored its status. Moravia consists of a large basin surrounded on the north by the Sudeten mountains, on the east by the Carpathians and on the west by a low range of hills extending northward to join the Sudetens and sloping toward a central point at the south. Its climate is milder and more genial than that of most European countries under the same latitude, the mean at Brünn being 48° Fahrenheit. Moravia belongs to the basin of the Danube, all the smaller streams falling into the March or Morava, a tributary of the Danube. About 55 per cent of the land is arable and 27 per cent is occupied by forests. The minerals are of considerable importance and include silver, lead, copper, iron, coal, graphite, etc. The soil is generally fertile and all the ordinary cereal, leguminous and root crops are raised in abundance. Flax of excellent quality is extensively grown in several districts and fruit is so abundant that many parts of the country have the appearance of one great orchard; but the favorite culture is that of the vine, for which both the soil and exposure of the province are admirably adapted. The pastures, in general excellent, occupy a large extent of surface. The rearing of cattle, nevertheless, gets comparatively little attention and is not sufficient to meet the home demand. Sheep, on the other hand, are reared in abandance and are of good

quality. They have been much improved by judicious crossing with the merino and furnish a wool, to the excellence of which the woolen manufactures of the country owe their prosperity. The horses, too, are of a strong, hardy, active breed and were much used in the Austrian service for heavy cavalry. Manufactures have made great progress and in all the great branches of industry—in iron and ironmongery, leather, linen, cotton and woolen tissues, particularly the last—Moravia takes precedence over most of her neighboring provinces. Other manufactures deserving of notice are silk, glass, paper, potash, tobacco and beet-root sugar. The trade in most of these articles is of considerable importance. The waterways are unimportant. Formerly about 71 per cent of the inhabitants were of Slavonian extraction and 28 per cent Germans, though the latter percentage grew after the German invasion. The language chiefly used, known as Moravian, is a Slavic dialect; German, however, is generally understood by all classes. The religion almost universally professed is Roman Catholic (91 per cent) and 3.2 per cent Protestants. Elementary education is generally diffused and numerous gymnasia furnish education of a very superior order. There are theological colleges at Olmütz, and Brünn (Brno) which is the capital of the province (pop. 1930, 264,925). Moravia was anciently inhabited by the Marcomanni and Quádi, afterward by the Rugii, and still later by the Longobardi. It was finally occupied by a colony of Slavs, who took the name of Moravians from the river Morava. In 1029 Moravia was united to the kingdom of Bohemia, with which it had the same constitution, administration and laws. In 1197 it was erected into a margraviate, with a separate court and a separate administration. With Bohemia it passed to the house of Austria in 1527. In 1849 it was separated from Bohemia and erected into a distinct province. Moravia subsequently sent 49 members to the Austrian House of Deputies and the provincial diet was composed of 151 members, the majority elected by nationalities German and Bohemian. On Oct. 28, 1918 Moravia united with Bohemia, Slovakia and Ruthenia to form Czechoslovakia. From 1939 to 1945 Moravia and Bohemia were "autonomous protectorates" of Germany. The area of Moravia is 8,616 square miles. Pop., including Silesia (1930) 3,565,010.

MORAVIAN CHURCH, The, the common name given in England and America to the renewed Unitas Fratrum or Church of the Brethren—for a time styled also in English the Church of the United Brethren—which originally flourished in Bohemia, Moravia and Poland, was disrupted and suppressed in the 17th century, was resuscitated in Saxony in the 18th century and at present exists in its reorganized form in Europe and America with an extensive mission work in many parts of the world. It was a product of the evangelical movement led by the Bohemian reformer, John Hus, who suffered martyrdom at Constance, July 6, 1415. It developed out of an association formed in 1457 near Kunwald in northeastern Bohemia to foster pure Christian teaching and life within the National Church. Its attitude toward the abuses of the time and its rapid growth caused it soon to be put under proscription by the authorities. Drastic measures intended to suppress and disintegrate it had the contrary effect. It formed a more compact union, perfected its organization and gradually became a distinct church with its own ministry, established through the good offices of Waldensian bishops who conveyed the historic episcopate to it in 1467. A system was developed which followed primitive Christianity in its elementary principles. It began with the congregation as the unit, based on Scripture, bound by a Brotherly Agreement and governed by an elected eldership. With the increase of congregation, the Synod was formed, legislating by delegated authority. The Synod committed executive control to the Council which was also elective and representative, for while the episcopacy stood at the head, the presbytery and the laity had a voice in it, with the central principle of conferential government and collegiate administration fixed. This principle, inherited with the ancient episcopate, is cardinal in the modern structure of the Church, adjusting together conceptions of polity commonly regarded as opposites and presenting affinities to widely divergent church types.

Its history during the ancient period is to a great extent one of cruel persecution. Its speedy recuperation after such ordeals and its increase during intervals of peace were phenomenal. When the German Reformation began in 1517, the Bohemian and Moravian Brethren numbered nearly 200,000 with about 400 places of worship. In the baronial castle and in the peasant's cottage loyalty to their Church, which embodied the best ideals of the nation, rendered them amenable to a discipline in which they stood pre-eminent and made them a strong moral power to be coped with by ecclesiastical and political authorities. In their highest ascendency they led the educational and literary activity of the regions in which they were established. Their formulated conceptions of Christian doctrine were a gradual growth. Their last and most mature confession of faith before the overthrow of the Church in its original seats was published in 1573.

The Counter-Reformation inaugurated by Ferdinand II in 1621 brought the organized existence of the Church to an end in Bohemia and Moravia, subjected many of its members to martyrdom and drove thousands into exile. It was excluded from the terms made to other evangelical parties in the Peace of Westphalia which ended the Thirty Years' War in 1648, and the hope of its resuscitation in its home-lands was crushed. The parishes of its Polish province, founded in 1548, maintained an organized existence much longer, but they were gradually absorbed by the Reformed Church of Poland of which ultimately even the clergy in whose persons the episcopate of the Unitas Fratrum was being perpetuated in the hope of its renewal were legally recognized ministers.

The first step in the restoration of the Church occurred in 1722, when a little company of refugees from Moravia were given an asylum by Nicholas Lewis, Count of Zinzendorf, on his estate, Berthelsdorf, in Saxony where, on June 17 of that year, they began a settlement which was called Herrnhut. Many others from Moravia, Bohemia and different parts of Germany joined them during the next few years,

and a gradual process of organization took place in which the plans of the Moravians were merged with those of Zinzendorf who had in view rather an evangelical association harmonizing different confessional affiliations and Church traditions, with the necessary adaptation of the whole to its situation within the pale of the state church. The doctrinal articles of the Augsburg Confession were adopted and concessions from the Saxon and Prussian governments permitted the establishment of Moravian Church order and constitution modified to suit the new conditions.

The Moravian episcopate was transferred to the new organization on 13 March 1735, when David Nitschmann was consecrated a bishop at Berlin by Bishop Daniel Ernst Jablonsky with the written concurrence of Bishop Christian Sitkovius of Lissa, they being the last two surviving bishops of the old line. A notable spiritual experience which marked the year 1727, when the first definite organization took place at Herrnhut, produced an intense zeal for evangelization. The result, during the next few years, was the establishment of other congregations on the continent of Europe, the founding of the Church in England and America and missions to the heathen which have chiefly given the Church its reputation. The first such mission was begun in 1732 on the island of Saint Thomas, West Indies.

The first Moravian evangelist came to Pennsylvania in 1734. The first settlement in America and mission to the Indians was founded at Savannah, Ga., in 1735. Untoward political conditions caused its abandonment in 1740 and the removal of the colonists to Pennsylvania, where a permanent settlement arose in the present Northampton County, with organized activity in Philadelphia and New York and an extensive itinerary among white settlers and Indians. The Moravian pioneers in «the Forks of the Delaware» first located on a tract of land which the evangelist George Whitefield had purchased and named Nazareth, where he proposed to found a village and a negro charity school. This property came into possession of the Moravian Church in 1741. On another tract at the confluence of the Monocacy Creek and the Lehigh River its chief settlement was founded in that year and at Christmas 1741, when Count Zinzendorf was at the place, it received the name Bethlehem. In June 1742, a considerable colony from Europe joined the pioneers and the settlement was regularly organized. The population was divided into an itinerant and a local congregation, the former to engage in gospel work among white settlers and Indians, the latter to develop the settlement and provide support for the missionaries. Thus, from the first, Bethlehem was the centre of the Moravian Church in America and of its various activities.

Until 1762 a co-operative union was maintained at Bethlehem and Nazareth which was called the General Economy. All labored for a common cause and received sustenance from a common stock, but there was no surrender of private property and no obligation which prevented the individual from withdrawing when he chose. Numerous colonies came to America during those years on vessels owned and managed by the Church and under the arrangement which existed results were accomplished which would not otherwise have been possible. The material benefits of the settlement were appreciated by the authorities of Pennsylvania, and the spiritual activities prosecuted by the Moravians, although misunderstood and opposed by some, as was the case also in Europe, were epoch-making in the religious growth of the country.

Two notable lines of effort in colonial times, in addition to the Indian missions, were the propagation of Zinzendorf's idea of evangelical alliance and denominational federation, and religious education of children. Desiring to diminish rather than increase denominational divisions the leaders of the Church generally refrained from organizing distinctly Moravian congregations and in consequence of this policy the Moravian Church remained numerically a small body. The European plan of the Church to concentrate in exclusive settlements to some extent was followed for a full century. Besides Bethlehem and Nazareth, such church-villages, founded prior to the Revolutionary War, were Lititz in Lancaster County, Pa., Hope in Sussex, now Warren County, N. J.,—abandoned in 1808 — and Salem, now a part of Winston-Salem in Forsyth County, N. C., the central settlement on a large tract of land purchased of the earl of Granville and named Wachovia. These places continued long to be conserving centres of all that was distinctive in the religious and social life of the Moravian Church, as fostered under the influence of Zinzendorf's ideas and methods, presenting interesting experiments in municipal government, industrial order and general culture. They are yet the seats of widely known educational institutions, all founded in the 18th century. A few of the town and country congregations organized in colonial times, without the peculiarities of the church settlements, are yet in existence. During the years from 1844 to 1856, the exclusive system was entirely abolished by all of the Moravian villages in America and their unique character rapidly disappeared. At that period active home mission work was revived and since then many congregations have been founded in various parts of the United States. The most fruitful of these efforts have been in several of the Northwestern States.

The Moravian Church has no peculiar doctrines. It is simply and broadly evangelical, in harmony with other Protestant denominations on the cardinal doctrines of Christianity, and bound by no articles on the points of difference. Its only prominent doctrinal feature is the strongly Christ-centred tendency of its teaching which pervades its official statements, its liturgy and its characteristic preaching. The digest («Results») of the General Synod, the catechisms and the Easter Morning Litany sufficiently set forth the doctrinal position of the Church. The Church has an established liturgical system, with a litany used regularly on the Lord's Day, and a variety of offices for different Church seasons, in which special prominence is given to singing; the cultivation of church music having always been a conspicuous feature of the Moravian cultus. The general order of the ancient church year is observed in the services. Of distinctive services retained by some congregations, the love-feast, introduced in 1727 in imitation of the Agapæ of the Apostolic Church, is the most conspicuous. Moravian orders of the ministry are bishops,

presbyters and deacons. A diocesan episcopacy does not exist. The bishops are, as such, everywhere on a parity, representing the entire Unitas Fratrum. They are ex officio members of the General Synod and of the synods of the several provinces in which they reside. Besides having the exclusive function of ordaining men, they are looked to as pre-eminently the guardians of sound doctrine and established order. In governing boards they officiate, not by virtue of episcopal authority, but by election, and those who do not occupy executive positions serve, meanwhile, in pastorates. The Moravian Church in America is divided into a Northern and a Southern province, constituting, with the British and German branches of the Church, an organic unity under the General Synod. The legislative authority of each province is the Provincial Synod which elects an executive board known as the Provincial Elders' Conference and composed usually of a bishop and two presbyters. The Northern province is divided into districts, each organized with its synod and its executive board. The communicant membership of the American Church in 1926 was 26,217 and its total 37,707. The enrolment in the 14 mission provinces of the Church was 110,820 and its grand total in all countries was 236,540, besides 70,000 members of the state churches of Europe, ministered to by Moravian home missionaries.

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MORAVIAN COLLEGE FOR WOMEN, institution of the higher learning at Bethlehem, Pa., founded soon after the Moravian settlement of Bethlehem (1741). It is the second oldest girls' boarding school in the United States, the Ursuline Academy, New Orleans (7 Aug. 1727), being the first. "Colonial Hall," built in 1748, is the oldest structure in the group of buildings owned by the seminary. From the roof of this building it was customary in pre-Revolution days to play the trombone on festal occasions or to announce the death of members. Tradition says that on one occasion during the French and Indian War a band of Indians had planned to attack the settlement, and at sunset as they lay waiting on Calypso Island, for the darkness, they heard a strange melody floating down from the sky. They had never heard anything like it before, and thinking it must be the voice of the Great Spirit warning them, they held a hurried council, and silently stole away in the darkness. In 1776–78, "Colonial Hall" served as a military hospital for the Continental troops. After the battle of Brandywine the place was crowded with wounded. On the slope of the hill, just west of Monocacy Creek, are the graves of over 500 of unknown dead. Many of the distinguished women of the nation have graduated at this institution. A preparatory school, music, art and science departments are connected with the seminary, and several years ago a fully accredited college course leading to A.B. and B.S. degrees was added, and is recognized by the College and University Council of Pennsylvania. Consult Schwarze, 'History of the Moravian College and Theological Seminary' (1909).

MORAVIANS. See Moravian Church.

MORAWETZ, Victor, American lawyer: b. Baltimore, 3 April 1859; d. Charleston, S. C., 18 May 1938. He studied at foreign universities, and received his LL.B. at Harvard (1879); his LL.D. at Williams (1914); admitted to the bar (1880). In his practice of law he acted chiefly in the capacity of counsel for railway and other corporations. He was general counsel, director and chairman of the board of directors of the Atchison, Topeka and Santa Fé Railway Company, and later director and member of the executive committee of the Norfolk and Western Railway Company, as well as director in other corporations. He wrote 'Law of Private Corporations' (1882); 'Banking and Currency Problems in the United States' (1909); Elements of the Law of Contracts' (1927).

MORAY, mŭr'rē, **Earl of.** See Stuart, James, Earl of Murray or Moray. More correctly Stewart: it was Mary Queen of Scots who adopted the latter spelling Stuart.

MORAY FIRTH, Scotland, a large bay on the northeast coast, containing at its widest extent the sea enclosed by a line running from Dunscansby Head in Caithness-shire to Kinnaird Head in Aberdeēnshire. It thus comprises the Dornoch Firth and the inner Moray Firth, to which the name is more strictly applied, the entrance to which lies between Tarbet Ness in Cromarty and Burghead in Elginshire, and which gives off Cromarty Firth and Beauly Firth and Loch. The opening of the outer firth to the North Sea is 80 miles in width. The rivers which enter the firth include the Deveron, Spey, Findhorn, Ness, Beauly, Oykel.

MORAYS, eel-like fishes of the family *Muræniдæ*. These, says Jordan, may be distinguished by the small round gill openings and the absence of pectoral fins. The skin is thick and tough, the narrow jaws are armed with knife-like or else molar teeth, and the lower one is moved by muscles of extraordinary size and power. They are carnivorous and pugnacious fishes, and some of them, which reach a length of five or six feet, may be dangerous to bathers and fishermen. They abound in the tropics, lurking in the crevices of rocks, coral-reefs and similar places, and most of them are colored in striking patterns, as fine marblings of black or lustrous green, or varied spottings.

Several genera and more than 100 species are known, of which a celebrated type is the muræna (*Muræna bellina*) of the Mediterranean Sea, which was extensively cultivated by the Romans, in the classic period, for the sake of its flesh. Two or three species are well known as food-fishes on both coasts of tropical America, and one, usually called "conger," is similarly utilized in southern California.

MORAZAN, Francisco, frän-sēs'kō mō-räsän', Central American soldier and politician: b. Tegucigalpa, Honduras, 1799; d. San José, Costa Rica, 15 Sept. 1842. He early entered political life and in 1824 was secretary-general of Honduras; when Honduras and Salvador revolted against President Arce of Central America, Morazan came rapidly to the front as a military leader, and in 1830, after a series of brilliant military exploits, was elected President of the Central American Confederation. Though a wise ruler, his administration was interrupted by several revolts. At the close of his second term it was found that no provision had been made for electing his successor, and in spite of his efforts the union of the states of Central America was dissolved and he himself compelled to find refuge in Peru. In 1842 he landed in Costa Rica, proclaimed the federation of the states, and after defeating Carillo assumed the Presidency at San Jose. A revolution followed directed against his federal proclivities and he was captured and shot. Consult Bancroft, 'History of Central America' (Vol. III, 1887).

MORDANT, *in dyeing,* a substance which is capable of penetrating the fibres of the substance that is to be colored, or of forming an insoluble deposit upon them, and which also forms an insoluble compound with the dye that is to be used. Mordants vary greatly in character, according to the nature of the dye and of the fabric. They may be classified, however, as "acid" and "basic"; an acid mordant being required to fix a basic dye and a basic mordant to fix an acid dye. Tannic acid is a typical example of an acid mordant. Cotton may be mordanted with this substance by soaking it in a solution of tannic acid and then passing the fabric through a solution of a salt of antimony, tin or some other suitable base, by which the tannic acid is fixed upon the fibre in the form of an insoluble tannate, with which the dye subsequently combines. The acetates and sulphates of aluminum and of iron may be cited as examples of basic mordants. Wool may be mordanted, for example, by boiling it in a dilute solution of such a salt (usually with the addition of certain other substances, such as cream of tartar or oxalic acid), the wool causing the mordant to partially dissociate, so that a more basic compound is deposited upon and within its fibres, while a more acid one remains in solution. Wool, when treated in this way, will fix dyes (such as alizarin) that are of a phenolic character. See DYEING.

MORDECAI, môr'dĕ-kī, **Alfred,** American engineer: b. Warrenton, N. C., 3 Jan. 1804; d. Philadelphia, 23 Oct. 1887. Graduating at the head of his class from West Point in 1819, he became 2d lieutenant of engineers, and after work as instructor at West Point and assistant engineer was appointed captain of ordnance corps 30 May 1832. He was assistant to the chief of ordnance at Washington (1838–42) and member of the ordnance board (1839–60). Brevetted major (1848) for meritorious conduct in the Mexican War, he was sent to the Crimea (1855–57), his observations on military organization and ordnance being published by order of Congress in 1860. He resigned from the service in 1861, settling in Philadelphia, where, after acting as assistant engineer of the Mexican and Pacific Railroad (1863–66), he became (1867–87) treasurer and secretary of canal and coal companies controlled by the Pennsylvania Railroad. Among his works are 'Digest on Military Laws' (1833); 'Reports of Experiments on Gunpowder' (1845–49); 'Artillery for the United States Land Service,' as devised and arranged by the Ordnance Board with plates (1849); 'Ordnance Manual for the Use of Officers of the United States Army' (1841 and 1850).

MORDECAI, Alfred, American engineer, son of the preceding: b. Philadelphia, 30 June 1840; d. 20 Jan. 1920; graduated, West Point (1859); and brevetted 2d lieutenant, topographical engineers. After service on the field (June–August 1861) he taught at West Point for nearly a year and then was promoted until he became chief of ordnance, Department of the South (1863–64). From May to September 1864 he was chief of ordnance, Army of the James, later holding similar office in the Army of Ohio, Army of the Cumberland, and military division of the Tennessee. Brevetted lieutenant-colonel for services in the war (13 March 1865), he was instructor of ordnance and gunnery at West Point 1865–70, and again 1874–81. He was commander, with rank of colonel, of the Benicia (Cal.) arsenal, 1899–1902; promoted brigadier-general and retired in January 1904.

MORDENITE, a native hydrous silicate of aluminum, potassium, sodium and calcium, occurring in small monoclinic crystals, or in small hemispherical concretions with a fibrous structure. It is white, or nearly so, with a vitreous lustre. Mordenite occurs at Morden, N. S., and in western Wyoming.

MORDVINS, môrd'vĭnz, a race of people scattered over the Volga provinces of European Russia and to the south and east of these, and belonging to the Ural-Altaic family. There are two distinct groups, the Ersh or northern and the Moksha or southern, with differences in feature, and the latter of darker hue. They are a well-built, hardy race, and superior to the Russians by whom they are surrounded. Their chief sources of livelihood are cattle-rearing, hunting, fishing and bee-keeping, and they are famous as carpenters and woodworkers. They are nominally Christians, the work of conversion beginning at the time of the Empress Anna; but their Christian beliefs have been superimposed on remains of the old pagan worship. Pop. about 1,000,000.

MORE, mōr, **Hannah,** English moralist: b. Stapleton, near Bristol, 2 Feb. 1745; d. Clifton, near Bristol, 7 Sept. 1833. She was educated in the seminary in Bristol kept by her elder sisters, and her talents early made her acquainted with Johnson, Burke, Garrick and other literary men of the period. Her first

success was as a dramatic writer. 'The Inflexible Captive'; 'Percy'; and 'The Fatal Captive' were successfully brought out through the patronage of Garrick and her other friends. After the production of the last in 1779 she gave up playwriting from religious motives, and devoted herself to writing works of a moral and religious tendency, the diffusion of tracts and other philanthropic labors. In this new course her talents commanded an extraordinary measure of success. A series of tracts called the 'Cheap Repository,' commenced at Bath in 1795, is said during the first year to have had a circulation between 1,000,000 and 2,000,000 copies, and led to the foundation of the Religious Tract Society. Her most popular fiction, 'Cœlebs in Search of a Wife' (1809), ran through eight editions in the course of a year, and passed through 30 editions in America. Sydney Smith's hostile review of this work in the *Edinburgh* is highly diverting. Her works include 'Strictures on the Modern System of Female Education' appeared in 1799, followed by 'Hints Towards Forming the Character of a Young Princess' (1805); 'Practical Piety' (1811); 'Christian Morals' (1813); 'Character and Writings of Saint Paul' (1815); 'Moral Sketches, with Reflections on Prayer' (1817). Consult Roberts, 'Life of Hannah More' (1838); Thompson, 'Life of Hannah More' (1838); 'Correspondence of Hannah More with Zachary Macaulay' (ed. by Roberts, 1860); Yonge, C. M., 'Hannah More' (1888); Harland, Marion, 'Literary Hearthstones: Hannah More' (1900).

MORE, Louis Trenchard, American educator: b. Saint Louis, 9 April 1870. He studied at Johns Hopkins taking (1895) the degree Ph.D. He was instructor of physics (1896) at Worcester Polytechnic Institute and was appointed instructor and adjunct professor of physics at the University of Nebraska (1896–1900), becoming professor of physics (1900) and dean (1910–13). He was dean of the Graduate School (1916) at the University of Cincinnati. He has written 'The Limitations of Science' and 'The Dogma of Evolution'; also technical articles on such subjects as light, electricity, magnetism, ionization and sound.

MORE, Nicholas, English colonist: b. England: d. Philadelphia, Pa., 1689. He was a physician and left a promising career in England to come with William Penn to America in 1682. He was from the first prominent in the affairs of the colony, was president of the first assembly in 1682 and in that year presiding judge of the courts of Philadelphia. In 1683 he was clerk of the provincial council and the next year was speaker of the assembly. He was appointed first chief justice of the Supreme Court of the province in 1684, and in this position incurred the disapproval of the colony and was impeached for having wielded "an unlimited and arbitrary power." He retained the confidence of Penn, however, who appointed him in 1686 one of the five commissioners in control of the government.

MORE, Paul Elmer, American author: b. Saint Louis, Mo., 12 Dec. 1864. He was graduated at Washington University in his native city in 1887, studied later at Harvard and was instructor in Sanskrit there for a year and subsequently at Bryn Mawr for two years. He was literary editor of *The Independent,* 1901–03; of the New York *Evening Post,* 1903-09; editor of *The Nation,* 1909–14. He was elected a member of the American Academy of Arts and Letters in 1915. His fine scholarship and effectiveness of method placed him in the front rank of American literary critics. His published volumes include: 'The Great Refusal'; 'Life of Benjamin Franklin' (1900); 'Shelburne Essays' (11 vols. 1904); 'Platonism' (Lectures, 1917); 'The Religion of Plato' (1921); 'Hellenistic Philosophies' (1923); 'The Christ of the New Testament' (1924). He translated 'Judgment of Socrates'; 'Prometheus Bound.' Died 9 March 1937.

MORE, Sir Thomas, English statesman and author: b. London, 7 Feb. 1478; d. there, 6 July 1535. In 1492–94 he studied at Canterbury Hall, now Christ Church, Oxford, and in 1494 was a student in Lincoln's Inn. At 21 he obtained a seat in Parliament, and distinguished himself with spirit in opposition to a subsidy demanded by Henry VII. After being admitted to the bar he enjoyed great reputation as a pleader. In 1516 he accompanied the commissioners sent to renew the alliance between Henry VIII and Charles, then Archduke of Austria, and showed much ability. In 1516 he published his celebrated political romance 'Utopia.' Cardinal Wolsey pressed him to receive a pension, which he refused as inconsistent with his official duties; but he was induced to accept the place of master of requests. He was shortly after knighted, and taken into the Privy Council. In 1521 he was appointed treasurer of the exchequer, and in 1523, at the instance of Wolsey, was elected speaker of the House of Commons. He was joined with Wolsey in a mission to France in 1527 and on his return made Chancellor of the Duchy of Lancaster. In 1529 he succeeded the cardinal as Lord High Chancellor, which office he filled for three years with scrupulous integrity, but he was severe in his punishments for heretical opinions. Unable to acquiesce in the king's wishes respecting his divorce from Catherine of Aragon, he obtained permission to resign the seals. The affront rankled in the mind of Henry, and was further inflamed by his refusal to attend the coronation of Anne Boleyn. An attempt made to implicate him in the practices of Elizabeth Barton altogether failed; and he also perfectly cleared himself of the charge of inducing the king to publish the book against Luther, in which the Pope's authority was held forth — a doctrine now found inconsistent with the intended attack on the Roman See. The king was declared supreme head of the Church in 1534; but More steadily refused to recognize any other head than the Pope, declined to take the oath of supremacy and was consequently committed to the Tower and indicted for treason. After an imprisonment of 12 months, he was brought to trial, and despite his eloquent defense condemned and sentenced to be hanged and quartered. The king altered the sentence from hanging and quartering to beheading, and this act of grace More received with his usual vein of humor. While in prison he wrote a 'Dialogue of Comfort against Tribulation' and a treatise on Christ's passion. At his execution he comported himself with dignity and with a

great degree of good humor. The news of his death startled Catholic Europe, and British ambassadors were instructed to explain that all was done by due legal process. More's learning was varied and extensive, his wit abundant and his elocution ready and agreeable. He wrote elegant Latin prose and verse, and a terse and simple English. His 'Utopia' is a classic of literature, and he, one of the brightest spirits of the Renaissance. In 1886 beatification was conferred on More by the Roman Catholic Church and he was canonized by Pope Pius XI in 1935. His English works were published collectively, in 1557, and his Latin in 1567. (See UTOPIA). Consult the 'Life' by Roper (1626, reprinted 1716), and Stapleton's 'Tres Thomae' (1588), the principal sources; and the biographies or studies by Bremond (Eng. trans. with bibliography, London 1904); Bridgett (ib. 1891); Campbell's 'Lives of the Chancellors' (ib. 1845–48); Sir Sidney Lee's 'Great Englishmen of the 16th Century' (ib. 1904); Manning's 'Household of Sir Thomas More' (ib. 1851) and 'The Book of Sir Thomas More' in 'Malone Society Reprints' (ib. 1911).

MOREA. See PELOPONNESUS.

MOREAS, mō'rā'a', **Jean,** French poet and author: b. Athens, 15 April 1856; d. 1910. His real name was Jean Papadiamantopulos. He was sent to Paris to study law but, from 1882, devoted himself entirely to poetry. His poems, 'Les Sytres' (1884) and 'Les Cantilènes' (1886), made him one of the most prominent representatives of symbolism. In the novel, 'Le Thè chez Miranda' (1886), so hard to understand, he tries to bring prose under the same new tendency. His poem, 'Le Pélerin passionné' (1891), shows a happy leaning toward Ronsard. The six books of 'Stances' (1905) contain most of his more perfect works. He wrote a version of Euripides' 'Iphigenia in Aulis' (1903) in semi-archaic language, which was produced at the Odéon, Paris, with success. Consult Gourmont, J. de, 'Jean Moréas' (Paris 1905).

MOREAU, mō-rō, **Gustave,** French painter: b. Paris, 1826; d. there, April 1898. He began his career under the influence of Delacroix, but on going to Rome he chose as his especial subjects of study the fantastic architectural effects of Mantegna and the dramatic composition and sometimes violent poses of Luca Signorelli. His works show the characteristics of these masters and are eminently original both in design and coloring, though little known until the latter days of his life, as he seldom exhibited until he was past 40, or offered his works for sale. On his death he left upward of 800 canvases to the municipality of Paris to form the Musée Moreau. In 1892 he was appointed professor in the Ecole des Beaux-Arts and held the position till his death. He was made an officer of the Legion of Honor in 1883. His most notable pictures are 'Death and the Young Man' (1865); 'Orpheus' (1867) in the Luxembourg; 'Prometheus' (1869); 'Hesiod and the Muses' and 'The Apparition,' the last two in the Luxembourg also. Consult Ary Renan, 'Moreau' (Paris 1900); Flat, 'Le Musée Gustave Moreau' (ib. 1905); Muther, 'History of Modern Painting' (London 1896).

MOREAU, Hégésippe, French poet: b. Paris, 9 April 1810; d. there, 20 Dec. 1838. Of illegitimate descent, losing both parents early, he died young, in poverty and need, in a hospital. He set up type for a book-printer, first in Provins, then at Paris, but found no favor or success in his writings. Tenderness and nobility of character appear in his earlier poems with excellent effect but his more mature works show the ills of fashion and the world's sorrows. His finest poems are the elegies, 'La Voulzie,' etc. Among his novels are 'La Fermière,' 'Contes de ma sœur' and the shy prose novelles, 'Le gui de chêne,' etc. His works are published under the title 'Myosotis' (1838) and his correspondence in 'Œuvres complètes' (1890–91). Consult Moret, J., 'Hégésippe Moreau' (Provins 1871).

MOREAU, Jean Victor, French general: b. Morlaix Finistère, 11 Aug. 1763; d. Laun, Bohemia, 2 Sept. 1813. His father was a lawyer and the son, apparently against his will, studied law and held a post in the justiciary at Rennes. But at the beginning of the Revolution he entered politics, formed a company of the National Guard and in 1791 was elected lieutenant-colonel of a volunteer battalion which joined Dumouriez in the field. He rose rapidly, replaced Pichegru in 1795 as commander of the Army of the North, and in 1796 was put at the head of the Army of the Rhine and the Moselle. His retreat before a superior force after Jourdin's defeat at Würsburg, and his swift movement to the attack again before the truce of Leoben proved him a masterly strategist. Momentarily retired for failure to reveal Pichegru's Royalist plot, he was recalled in 1799; served under Scherer in Italy and largely recouped his superior officer's losses; succeeded Joubert after that general's death; was Bonaparte's confidant in the *coup d'état* of 18th Brumaire; passed the Danube and the Rhine; defeated the Austrians in a series of brilliant engagements culminating in Hohenlinden (1800); and then with the backing of the Royalists attempted to oust Bonaparte. He was found guilty of plotting against Napoleon and was exiled from France for two years, which he spent on a farm in Pennsylvania. Although Republican in his sympathies, in his last campaign he took arms with the Allies, served against France in 1813 and was killed at the battle of Dresden. Consult Jochmus, 'General Moreau' (Berlin 1814); Ary Renan, 'Moreau' (Paris 1900).

MOREAU RIVER. One of the larger branches of the Missouri River draining a wide area in northwestern South Dakota. Its length is about 180 miles. The name is a French one, signifying a dark horse or nosebags. On some maps the name Owl River is improperly given to this stream.

MORECAMBE, mōr'kăm, England, a Lancashire seaside resort on Morecambe Bay, four miles by rail northwest of Lancaster. Its principal features are the promenade pier, three miles long, observation tower, winter garden, etc., and the fine beach of Morecambe Bay, this inlet of the Irish Sea being about 18 miles long and 10 miles broad. Pop. 19,000.

MOREEN. See MOIRE.

MOREHEAD CITY, mōr'hĕd, town, North Carolina, in Carteret County, 33 miles southeast of New Bern. It is situated on the west shore of Beaufort Harbor at the north end of Bogue Sound, and is connected with the Atlantic Ocean by means of a four-mile channel through Beaufort Inlet. Its 1,000-foot pier is operated by the Morehead City Port Commission, and was constructed between 1935 and 1937. A new ocean terminal of the North Carolina State Ports Authority was being built in 1950, to supplement the existing shipping facilities, which, upon completion, will provide an additional 1,200-foot wharf, a transit shed, and two storage sheds.

Morehead City was founded in 1857, and incorporated three years later. Pop. (1950) 5,144.

MOREL. See FUNGI.

MOREL-LADEUIL, mô-rĕl' lá-dû'y', **Léonard,** French sculptor and goldsmith: b. Clermont-Ferrand, France, 1824; d. Boulogne-sur-Mer, France, March 15, 1888. He studied art in Paris, and made his debut as an exhibitor at the Salon with his *Courage terrassant l'hydre de l'anarchie* in 1853. Six years later he went to Birmingham, England, where he was employed by the Messrs. Elkington, a firm of goldsmiths. Here he became known for his very beautiful *repoussé* work, and at the time of the Prince of Wales' marriage, the city of Birmingham purchased Morel-Ladeuil's plaque called *Dreams* for a wedding gift to the royal couple. Still another of his well known pieces presented to royalty, was his famous *Helicon* vase given to Queen Victoria on the occasion of her first jubilee.

MORELIA, mô-rā'lyä, city, Mexico, and capital of Michoacán state, is situated 130 miles west-northwest of Mexico City, on a fertile plateau, altitude 6,187 feet. It was founded in 1541 by the first viceroy of New Spain, Antonio de Mendoza, and was originally called Valladolid after the city of his birth in Spain. The city was renamed Morelia in 1828 in honor of José Morelos y Pavón (q.v.), priest and one of the early martyrs in Mexico's struggle for freedom from Spanish rule, who was born here. His enemy Augustín Iturbide (q.v.) was also a native.

Its chief products are corn, beans, sugar cane, fruit, and cattle. Among its industries are coffee processing, sugar refining, the extracting of vegetable oil, and the manufacture of shawls, hats, cotton goods, tobacco products, sweets, beer, chemicals, and resins.

The city is equipped with an airport, and modern radio stations. There are many fine old buildings. Pop. (1940) 44,304.

MORELL, George Webb, American soldier: b. Cooperstown, N. Y., Jan. 8, 1815; d. Scarborough, N. Y., Feb. 11, 1883. He was graduated from the West Point Military Academy in 1835, but resigned from the army two years later to become a civil engineer. He worked for three years in Michigan and in various Southern states on railroad construction, but in 1840 he settled in New York to study law. Admitted to the bar in 1842, he practiced law until 1861. During this period he served as commissioner of the United States Circuit Court for the Southern District of New York, from 1854 until the Civil War broke out, when he was made inspector general on the staff of the 1st Division, New York State Militia, and accompanied it to Washington.

He was colonel on Gen. Robert Patterson's staff during the Shenandoah campaign, and was promoted to brigadier general, then to major general, commanding the 2d Brigade, 2d Division, Army Corps, to be given next command of a division. He commanded the supports of the celebrated battery of 100 guns at Malvern Hill, and was engaged at Hanover Court House, Mechanicsville, and Gaines' Mills.

During the Chickahominy campaign, he contracted a disease that was later to prove fatal. After being mustered out of the army on Dec. 15, 1864, he retired to his farm at Scarborough, and lived there until his death.

MORELLA, mô-rā'lyä, city, Spain, is situated in the Province of Castellón de la Plāna, and is the principal town in the mountainous district of Maestrazgo. Originally founded by the Romans, the city became, in the Middle Ages, the stronghold of the kingdom of Valencia, and later played a prominent part in the Carlist wars.

In 1839, it was stormed by the Carlist general, Ramon Cabrera, who received for this victory the title of count of Morella. The city remained in Carlist hands until it was captured by Gen. Baldomero Espartero in 1840. Its modern industries consist of cotton textile factories, dyeing establishments, tanning, flour milling, and lumbering. It also raises cereals, almonds, and livestock. Pop. (1940) 2,466.

MORELLET, mô-rĕ-lĕ', **Andre,** French philosopher and writer: b. Lyon, France, March 7, 1727; d. Paris, France, Jan. 12, 1819. He studied under the Jesuits in Lyon, and then at the Sorbonne in Paris, after which he acted as tutor to a youth being sent by his family to Italy.

Morellet's growing interest in political economy was evidenced in his writings at this period in his life. They were eloquent, and possessed a keen and bitter wit rather than outstanding originality of thought. He was a personal friend of Voltaire, and a contributor to the famous *Encyclopédie* of Denis Diderot the French philosopher. He was elected to the French Academy in 1785, and seven years later, when the Academy was dissolved during the French Revolution, he managed to save its archives and the manuscript of the *Dictionaire de l'Académie français* from the revolutionaries. He kept the valuable documents hidden until 1803 when the Academy was reorganized. It is interesting to note that 32 years afterward, Morellet was made one of the directors of this same *Dictionaire* he had been instrumental in preserving.

MORELLI, mô-rĕ'lĕ, **Domenico,** Italian painter: b. Naples, Aug. 4, 1826; d. there, Aug. 13, 1901. He studied at Rome under Camillo Guerra and later was associated with the Realist leader, Felippo Palizzi.

His finest early works were *The Sicilian Vesper* and *Refugees from Aquileja.* He turned to religious subjects in 1867, of which his *Christ Walking on the Sea* and *The Descent from the Cross* are particularly well known. He painted the *Ascension of the Virgin* for the royal palace at Naples, and the results of a journey he took to the Orient were the paintings, *Street in Constantinople* and *Mohammed Before the Battle.* He was made a senator of the kingdom of Italy, and

became a director of the Institute of Fine Arts and the Museum of Applied Art in Naples.

MORELLI, Giovanni (pseudonym IVAN LERMOLIEV, lyĕr-môl′yĕf), Italian art critic: b. Verona, Feb. 25, 1816; d. Milan, Feb. 28, 1891. He gained his education at Bergamo, and afterward at Aarau, Switzerland. He went next to Germany to study natural science in Munich, and while at the university there became interested in art. Returning to his native country in 1840, he associated himself whole-heartedly with the patriots who were trying to liberate Italy from Austrian domination. He took part in both the insurrection of Milan in 1848, and in that of Bergamo in 1866. He was elected deputy of the latter city (1860–1870), and in 1873 became a senator. While in this post he introduced the bill, bearing his name, which forbids the sale of works of art from public and religious institutions.

His treatises on art identification, which he usually signed with his pseudonym, were based on what were at that time new principles. He showed how paintings can be attributed to certain artists by observing the treatment of such details as hair, ears, fingers, etc. To this theory many experts—among them his main adversary, Friedrich Bode—opposed the objection that pupils of the old masters often employed the characteristics and mannerisms of their teachers. Of course, modern methods which use X-ray in examining paintings, have rendered Morelli's theories obsolete, replacing conjecture with scientific tests.

Morelli's major books are *Die Werke italienischer Meister in den Galerien von München, Dresden, und Berlin,* 3 vols. (1880), and *Kunstkritische Studien,* 3 vols. (1890–1893). The latter work was translated into English by Charles John Ffoulkes under the title *Italian Painters* (1892).

MORELOS, mô-rā′lôs, state, Mexico, lying to the south of the Federal District and the State of México. Its capital is Cuernavaca (q.v.), and it covers an area of 1,917 square miles. Situated on the south slopes of a large plateau with Popocatepetl to the northeast, the state is drained by small tributaries of the Rio de las Balsas. It is an agricultural region, producing corn, rice, sugar cane, wheat, coffee, tropical fruits and cattle. The climate ranges from semitropical to temperate. Pop. (1950) 268,863.

MORELOS Y PAVON, mô-rā′lôs ē pä-vôn′, **José María,** Mexican patriot and priest: b. Morelia (then Valladolid), Michoacán, Mexico, Sept. 30, 1765; d. near Mexico City, Mexico, Dec. 22, 1815. He had some Indian ancestry, and he worked for many years as a muleteer. At the age of 30, he entered the college of Valladolid (Morelia, q.v.) and was ordained to the priesthood three years later. From 1801 to 1810 he was in charge of the parishes of Carácuaro and Nucupétaro.

He joined, in 1810, the rebellion launched by Miguel Hidalgo y Costilla, who had been rector of the college of Valladolid during Morelos' student days.

After Hidalgo's death, he kept the cause alive in the north. His few followers soon became an army, and having defeated the Spaniards in several battles, he advanced upon Mexico City. He held Cuautla for 62 days against the famous siege by the viceroy, finally effecting a skillful withdrawal of his forces. Later he captured Oaxaca (October 1812) and Acapulco (August 1813).

He was made captain general in November 1813 by the Congress convened at Chilipancingo. On Nov. 6, 1813, he proclaimed the independence of Mexico from Spain; after which he drafted a republican constitution for the newly freed country. In attempting to capture Valladolid, he was defeated by Augustín de Iturbide, and taken prisoner. He was shot as a traitor at San Cristóbal Ecatepec, and his remains now lie in the cathedral in Mexico City. The state of Morelos was so named in his honor.

MORENO, mô-rā′nō, **Alfredo Baquerizo,** bä-kâ-rē′sō, Ecuadorian president and diplomat: b. Guayaquil, Ecuador, Sept. 29, 1859; d. New York, N. Y., March 29, 1951. He was graduated in law from the University of Quito, and began to practice his profession in 1884. From 1897 to 1901 he was a member of the Superior Court of Guayaquil.

He became minister of foreign relations in 1901–1902; and a year later was elected vice president of Ecuador. He was minister to the United States during President Theodore Roosevelt's administration, and was elected president of Ecuador in 1916, serving a four-year term. Again he occupied the presidency, from 1931–1932, being deposed from office during the latter year.

He was author of *Poetas* (1882); and the novels *Titania* (1892); *El Señor Peneo* (1892); *Una Sonata en Prosa* (1894); *Evangelina* (1895); and *Luz* (1901).

MORESNET, mô-rĕz-nĕ′, former neutral territory on the Belgian-German border, about 5 miles southwest of Aachen. The territory was under the protection of the signatories of the Vienna Congress (1815), and the citizens had a choice of military service with either the Belgian or the Prussian Army. Many of the inhabitants were French and Dutch, others Flemish and German.

Under the Treaty of Versailles, promulgated June 28, 1919, Belgium was awarded full sovereignty over the contested territory of Moresnet and over part of Prussian Moresnet. Pop. (1940) 6,385.

MORET, mô-rĕ′, **Alexandre,** French Egyptologist: b. Aix-les-Bains, Province of Savoie, France, Sept. 19, 1868; d. Paris, France, Feb. 2, 1938. After passing the examination for the academic title of Agrégé in history and geography in 1893, he obtained his doctorate in 1903, and became director of Egyptological studies at the *École des Hautes Etudes* at the University of Paris, where he also lectured on Oriental history. Between 1906 and 1923 he was a director of the *Musée Guimet* in Paris, and professor of Egyptology at the *Collège de France.*

MORETO Y CAVANA, mô-rā′tō e kä-vä′-nyä, **Augustín,** Spanish dramatist: b. Madrid, Spain, April 8, 1618; d. Toledo, Spain, Oct. 27, 1669. He graduated in law from the University of Alcala, and upon his return home changed his profession and began writing plays. In Madrid he found a friend and patron in Pedro Calderon de la Barca. He was very prolific, turning out drama after drama until he finally passed the 100 mark before he had reached middle age.

His popularity was immense and he was rated as the equal, if not the superior, of Lope de Vega, by his admirers, among whom were the best critics of the day. Posterity, however, while recognizing the genius of Moreto and his valuable contributions to the Spanish drama, has not sustained this high verdict of his contemporaries. One reason is that Moreto was not original in the sense that Lope de Vega was. His dramas or *Comedias de capa y espada* (cloak and sword plays), while clever in themselves and instinct with the dramatic spirit, have more than an echo of Vega and Calderón, whom he frequently borrowed from and sometimes improved upon, as in *El Desdén con el Desdén,* which is generally considered to be his masterpiece. In addition to dramas of intrigue he also produced historical dramas and wrote considerable lyrical poetry and *autos sacramentales* (religious plays).

Moreto's incursion into the field of historical drama was probably occasioned by the decree of the Royal Council and Chamber of Castile which, in 1644, ordered that, in the future, the dramatists should turn their attention to historical drama and plays based on the lives of the saints. He found a new field in recasting old plays and making them conform to the requirements of the censor, who was, in reality, controlled by the church authorities who had dictated the new move for restricting the activities of the drama and the stage. Like Shakespeare, Moreto put so much of himself into this work of reconstruction that many of the new-made dramas were more deservedly his than the work of their first creators. He excelled in depicting human passions and feelings, among them all the shades of love, including undying passion, disdain, the suffering of unrequited love, jealousy, friendship, faithfulness, unfaithfulness, intrigue in love and in the ordinary affairs of life. In this field he led the way for that true and colorful character drawing in which the Spanish drama and novel have since shown such power and realism combined with idealism.

Moreto painted people of more refined feelings and higher position in life than did Lope de Vega, probably because he was better acquainted with upper-class society than was the older dramatist. The complicated complexion of Spanish court life with its intrigues, ambitions, plots, and insincerity is well pictured in his dramas. While he lacks invention and made use, without conscience, of his predecessors, he gave the Spanish drama characterization and artistic development that it had not previously possessed, and he polished his work as no Spanish dramatist had done before his day. He thus pointed the way to the successes that have, since his time, been achieved by dramatists and novelists in Spain. What he lacked in originality of invention he made up in his knowledge of the stage and in his ability to reconstruct the scenes and thoughts of others. His plots move along with rapidity, satisfactory development and wonderful management of dialogue which is ever fluid and graceful. He presents with great skill realistic pictures of the extravagances, customs, and vices of the life of his day, and he remains the greatest of the Spanish writers of character drama. In this field he shows his deep and wide knowledge of the world and his power to analyze characters and motives, passions and prejudices. Yet, on the whole, his plays are in better taste and superior in morality to those of his contemporaries. In 1659 he entered a monastery. Among his more notable plays, besides *El Desdén con el Desdén,* are *El lindo don Diego, El valiente justiciero y ricohombre de Alcalá, El parecido en la Corte, Trampa adelante,* and *Primero es la honra.*

Consult volumes 39 and 58 of *Biblioteca de autores españoles* for articles on Moreto and the *autos sacramentales;* also Ticknor, George, *History of Spanish Literature* (New York 1849); Carrara, E., *Studio sul teatro ispano-veneto di Carlo Gozzi* (Cagliari 1901).

MORETON BAY, mōr't'n, Australia, southeast coast of Queensland, an inlet of the Pacific Ocean, 65 miles long, 20 miles wide. Moreton and Stradbroke islands form its eastern shore, and the mainland its western shore. Brisbane River flows into it.

MORETON BAY CHESTNUT, or bean tree, *Castanospermum australe,* family Leguminosae, native to Australia. It grows 40 to 60 feet high, has very long pinnate leaves, bright yellow blossoms in long clusters, and bears large brown pods each having four or five chestnut-like seeds which are edible when roasted. The timber, called black bean wood, resembles walnut but is not durable.

MORETTO, Il, ēl mō-rāt'tô (real name, Alessandro Bonvicino, or Buonvicino), Italian painter: b. Brescia, Italy, about 1498; d. there, 1554. He was a pupil of Floriano Feramola, took Titian as his model, and was also influenced by the work of Il Romanino (Girolamo Romani) and Gian Girolamo Savoldo. His pictures are distinguished for the beauty and nobility of their human figures, the serenity and balance of composition, and their color harmony, especially a silvery gray tone. The Church of St. John the Evangelist at Brescia is a veritable gallery of his pictures. Others hang in leading European galleries, and the Metropolitan Museum, New York City, has his *Christ in the Desert* and *The Entombment of Christ.*

MOREY, Samuel, American inventor: b. Hebron, Conn., Oct. 23, 1762; d. Fairlee, Vt., April 17, 1843. Before he was four years old, his family moved to Orford, N. H., and he attended public school there. He entered the lumbering business, but also developed his considerable talent for mechanics and engineering, and was engineer in charge of building the Connecticut River locks at Bellows Falls, Vt. He began experiments with steamboats about 1790. In 1793 he patented a steam-operated spit, and in the same year constructed a small craft propelled by a steam engine mounted on the bow, which he demonstrated on the Connecticut River at Orford. On March 25, 1795, he received a patent for a rotary steam engine. He also patented a windmill, a water wheel, and a steam pump.

In 1797, seeking capital for further experiments with steam engines, Morey went to Bordentown, N. J., where he built a side-wheel steamboat and demonstrated it successfully on the Delaware River. Failure of his financial backers, however, prevented further experiment at that time. He tried unsuccessfully to persuade Robert Fulton to adopt a model of his steamboat, and always believed that Fulton had appropriated his ideas. In 1805 and 1815 he obtained patents for steam engine improvements, and in 1820 constructed and operated on Fairlee Pond

(now Lake Morey) at Fairlee, Vt., a steamboat which he called *Aunt Sally*. On April 1, 1826, he obtained one of the first American patents for an internal combustion engnie. He contributed articles on his work to *The American Journal of Science and Arts* edited by Prof. Benjamin Silliman of Yale.

MOREY, William Carey, American educator: b. North Attleboro, Mass., May 23, 1843; d. Rochester, N. Y., Jan. 21, 1925. At the outbreak of the Civil War, he left his studies at the University of Rochester to enter the Union Army as a volunteer, becoming brevet major and lieutenant colonel. Returning to the university after the war, he graduated in 1868, and in 1869 entered Rochester Theological Seminary. He was professor of history, English, and Latin at Kalamazoo College from 1870 to 1883, when he became professor of political science at the University of Rochester. He was organizer, trustee, and director of Reynolds Library there, 1884–1904. Among his many books on history and government were *Outlines of Ancient History* (1906), *The Study of Roman Law in Liberal Education* (1911), and *Ancient Peoples* (1915). He also wrote *Reminiscences of the "Pundit" Club* (1923), and numerous articles for magazines and reviews.

MOREY LETTER, The, in American political history, a forged letter used in the presidential campaign of 1880 to discredit the Republican candidate James A. Garfield. Published in the New York weekly *Truth* on Oct. 20, 1880, it purported to be a letter from Garfield to an H. L. Morey of Lynn, Mass., favoring free entry of cheap Oriental labor for work in American factories. Though instantly denounced as fraudulent, it caused Garfield the loss of five of the six electoral votes of California where the exclusion of Chinese and other Oriental labor was an issue.

MORF, môrf, **Heinrich,** Swiss philologist: b. Münchenbuchsee, Switzerland, Oct. 23, 1854; d. Thun, Jan. 23, 1921. He studied at the universities of Zurich and Strasbourg, and under Gaston Paris at the Collège de France in Paris, and at 25 was professor of Romance linguistics at Bern. He subsequently taught at Zurich (1889), Frankfort-am-Main (1901), and Berlin (1910–1921). His works include *Geschichte der französischen Literatur im Zeitalter der Renaissance* (1898), considered a masterwork; *Aus Dichtung und Sprache der Romanen* (1903–1911); *Zur sprachlichen Gliederung Frankreichs* (1913).

MORFILL, môr'fĭl, **William Richard,** English Slavonic scholar: b. Maidstone, Kent, England, Nov. 17, 1834; d. Oxford, Nov. 9, 1909. He was educated at Oriel College, Oxford, where he later became university reader in Russian and, in 1900, professor of Russian and Slavonic. He wrote extensively on Slavic languages, literature, and history, and was the author of Polish, Serbian, Bulgarian, Russian, and Czech grammars.

MORFORD, môr'fĕrd, **Henry,** American writer: b. New Monmouth, N. J., March 10, 1823; d. Aug. 4, 1881. In 1852 he founded the weekly New Jersey *Standard* at Middletown Point (now Matawan), and four years later went to New York, where he worked as a court clerk for a time and then on the editorial staff of the New York *Atlas*. He made several trips abroad, and became known for his travel books and short-trip guidebooks to Europe and America. He also published several volumes of verse and three Civil War novels, and in January 1880 founded the *Brooklyn New Monthly Magazine* which he edited and published until March 1881.

MORGAGNI, môr-gä'nyē, **Giovanni Battista** or **Giambattista,** Italian anatomist: b. Forlì, Italy, May 25, 1682; d. Padua, Dec. 5, 1771. After graduating at the age of 14 from the academy in his native town, he spent 16 years in Bologna as the student, friend, and colleague of Antonio Maria Valsalva (illustrious pupil of Marcello Malpighi), lecturer in anatomy at the university. There he took degrees in philosophy and medicine at the age of 19. In 1710 he became professor of medicine at the University of Padua, and in 1715 professor of anatomy. His famous *Adversaria Anatomica* was published in 1706, and an enlarged version, *Adversaria Omnia*, in 1741. His greatest work, published in 1761, was *De Sedibus et Causis Morborum per Anatomen Indigatis* (*The Seats and Causes of Diseases Investigated by Anatomy*), which established pathological anatomy as a science and changed the course of medical diagnosis.

MORGAN, môr'găn, **Arthur Ernest,** American civil engineer: b. Cincinnati, Ohio, June 20, 1878. He attended high school in St. Cloud, Minn., and while working for his father as a surveyor, studied engineering at night. In 1902 he went into business for himself, specializing in flood control, and in 1907–1909 was supervising engineer for the United States Government Drainage Investigations. He was president of Antioch College, 1920–1936, and was the recipient of numerous honorary degrees from other colleges and universities. In 1933–1938 he was chairman of the Tennessee Valley Authority, but was dismissed by President Franklin D. Roosevelt for refusing to provide evidence to support his charges against other members of the commission. His numerous books include *My World* (1927), *The Long Road* (1936), *Nowhere Was Somewhere* (1946), *Industries for Small Communities* (1953).

MORGAN, Charles Hill, American inventor: b. Rochester, N. Y., Jan. 8, 1831; d. Worcester, Mass., Jan. 10, 1911. He left school at the age of 12 to go to work, and at 15 became an apprentice machinist in Clinton, Mass. He attended night school, and at 21 was an expert machinist and draftsman. From 1855 to 1860 he was draftsman for Erastus B. Bigelow, carpet manufacturer, and in 1860, in partnership with his brother, he opened a paper bag factory in Philadelphia, Pa. Here he invented an automatic bag-making machine. The business was sold profitably in 1864, and Morgan joined the Washburn & Moen Company, wire makers, in Worcester, Mass. While there, he perfected a power reel (with Fred H. Daniels), a continuous rolling mill, and automatic pouring and laying reels. He established the Morgan Spring Company, Worcester, in 1881, and in 1891 organized the Morgan Construction Company to produce rolling mill machinery. From 1887 until his death he was consulting engineer for the American Steel & Wire Company, and was a trustee of Worcester Polytechnic Institute from its founding.

MORGAN, Conwy Lloyd, British zoologist: b. London, 6 Feb. 1852. He was educated at the Royal Grammar School, Guildford, and Royal College of Science. From 1878–83 he was lecturer in English and physical science at the Diocesan College, Rondesbosch, Capetown, then (1884) professor of zoology and geology at University College, Bristol, becoming principal (1887–1909). He was appointed vice-chancellor of the University of Bristol, but resigned after three months. He has written 'Animal biology' (1887); 'Animal Life and Intelligence' (1890); 'Introduction to Comparative Psychology' (1895); 'Spencer's Philosophy of Science' (1913); 'Emergent Evolution' (1923); 'Life, Mind and Spirit' (1926).

MORGAN, Daniel, American soldier: b. Hunterdon County, N. J., 1736; d. Winchester, Va., 6 July 1802. His early life was passed in obscurity and in 1753 he removed to Virginia where in 1755 he served under Braddock as a teamster. He was afterward engaged in Indian warfare and served in Pontiac's War and in Lord Dunmore's War. In 1775 he entered the army of the colonists and commanded a company of riflemen under Washington. He accompanied Arnold at Quebec in 1775 and rendered gallant service there but was captured by the British and not exchanged until nearly a year afterward. He was then given command of a Virginia regiment with the rank of colonel, and in the campaign against Burgoyne took a prominent part; but his services not being recognized by Congress, he resigned. In 1780 he returned to the service as brigadier-general under Gates, and under General Greene who succeeded Gates. Morgan won a brilliant victory over Tarleton at Cowpens, which was recognized by a gold medal from Congress. His subsequent movements were of serious annoyance to Cornwallis, but in 1781 he resigned from the army owing to ill health. In 1794 he returned to it as major-general and helped to crush the Whisky Insurrection, and from 1795–99 was a member of Congress. Consult Graham, 'Life of General Daniel Morgan of the Virginia Line' (1856); McConkey, 'The Hero of Cowpens' (2d ed., 1885).

MORGAN, Edwin Dennison, American politician: b. Washington, Mass., 8 Feb. 1811; d. New York, 14 Feb. 1883. He was educated in the public schools, at 17 entered the store of his uncle in Hartford, Conn., and three years later was made a partner in the business. In 1836 he removed to New York and engaged in the grocery business. During the cholera visitation of 1849 he rendered devoted service. Elected to the State senate in 1850, he continued in that office until 1858, when he was elected governor of the State and served until 1862. his administration during those trying times being marked by great sagacity and patriotism. About 223,000 troops were raised for the Federals; New York's firm attitude during the war being in large measure due to Governor Morgan's influence. In 1862 he was elected to the United States Senate; in 1865 he declined the secretaryship of the treasury offered him by President Lincoln, and again refused it under Arthur. He served in the Senate until 1869, and though still taking an active interest in politics held no further political office excepting that of chairman of the Republican committee which conducted the presidential campaign of General Grant in 1872. He was connected with numerous great financial enterprises during the last years of his life and was a generous benefactor to education, notably to the New York Theological Seminary and Williams College.

MORGAN, Edwin Vernon, American diplomatist: b. Aurora, N. Y., 22 Feb. 1865. He graduated (1890) at Harvard University and studied (1891–92, 1894–95) at the Berlin University. He was appointed assistant in history (1892–94) at Harvard and instructor in history (1895–98) at Adelbert College, Cleveland. In 1899 he was appointed secretary to the Samoan Commission, and (1900) secretary of legation at Seoul, Korea. He served as second secretary of the embassy, Saint Petersburg (1901) and as consul at Dalny, Manchuria (1904), Minister Plenipotentiary to Korea (1905), filling the same diplomatic position at Cuba (1905–10), then Uruguay, Paraguay (1910–11), and Portugal (1911–12). He was made Ambassador Extraordinary and Plenipotentiary at Brazil 1912. Died Brazil, 16 Apr. 1934.

MORGAN, George Campbell, Anglo-American clergyman: b. Tetbury, Gloucestershire, 9 Dec. 1863. He was educated at the Cheltenham Douglas School, became master in the Jewish Collegiate School, Birmingham (1883–86); then mission preacher (1886–88), to be ordained (1889) to the Congregational ministry. He served as pastor at Stone, Staffordshire (1889–91); Rugely (1891–93); Westminster Road, Birmingham (1893–97); New Court Chapel, London (1897–1901); Westminster Chapel (1904–17); Tabernacle Presbyterian, Philadelphia (1929–); lecturer in the United States since 1919. He wrote 'The Analyzed Bible' (10 vols. 1910); 'Evangelism'; 'The Life of the Christian' (1904); 'God, Humanity and War' (1914); 'The Ministry of the World' (1919); 'Acts of the Apostles' (1924). He edited the Westminster *Bible Record,* Westminster *Pulpit.*

MORGAN, Sir George Osborne, English politician: b. Gothenburg, Sweden, 8 May 1826; d. 1897. He was graduated at Oxford in 1848 and was admitted to the bar in 1853. In 1868 he became a member of the House of Commons and was a staunch supporter of various reform movements, particularly those concerning the English land laws, Welsh disestablishment and education. He was appointed judge-advocate-general in Gladstone's ministry in 1880 and carried through legislation abolishing flogging in the army; and in 1886 was Under-Secretary for the Colonies. He was created a baronet in 1892 and was leader of the Welsh party in the House of Commons until his death. He was the author of a work on 'Chancery Acts and Orders' (1858).

MORGAN, George Washbourne, American organist: b. Gloucester, England, 9 April 1822; d. Tacoma, Wash., 10 July 1892. When he was eight he played the entire service at Saint Nicholas' Church in Gloucester, and at 12 became assistant organist at the cathedral there. He removed in 1853 to New York where he was organist in several leading churches, and gave recitals in different cities of the United States with marked success. He conducted an annual Lenten service in Chicker-

ing Hall, New York, after 1880, and was the author of an Episcopal service, and numerous compositions.

MORGAN, George Washington, American soldier: b. Washington County, Pa., 20 Sept. 1820; d. Old Point Comfort, Va., 26 July 1893. He left college in 1836 to enlist in the Texas army and fought for the independence of that country as lieutenant and then as captain when he resigned and in 1841 entered West Point. In 1843 he left the academy to study law and established a law practice at Mount Vernon, Ohio, in 1845. When the Mexican War broke out he became colonel and served under General Scott with distinction, becoming brevet brigadier-general. He returned to his law practice and in 1856 was sent as United States consul to Marseilles; in 1858 he went from there to Portugal Minister where he remained until 1861. He entered the army immediately upon his return to the United States and as brigadier-general was given a command under General Buell. In 1862 he took command of a division of the Army of Ohio, later was with Sherman at Vicksburg and held the command at the capture of Fort Hindman, Ark. He resigned in 1863 on account of failing health. He was a member of Congress from 1869 to 1873.

MORGAN, Sir **Henry John,** Welsh buccaneer, lieutenant-governor of Jamaica: b. Llanrhynny, Glamorganshire, about 1635; d. Jamaica, 1688. While a boy he was kidnapped at Bristold and sold at Barbados. Just when he joined the Jamaica buccaneers is uncertain, as there were several Morgans in the marine at Jamaica at the time, but he may have commanded his own ship as early as 1663; a Captain Morgan who sailed from Jamaica in that year taking part in the sack of Vildemos, Truxillo and Granada (1665–66). In 1666 Morgan sailed under Mansfield to capture Curaçao, and was chosen admiral after Mansfield's death at the hands of the Spaniards. In 1668 he captured Puerto Principe in order to get information of Spanish plans for an attack on Jamaica; then took Porto Bello, Panama, after a sharp siege during which the buccaneers planted scaling ladders under the cover of captured priests and nuns, sacked the city and tortured and maltreated its inhabitants; and in the end of the summer again ravaged Cuba. The next year, 1669, saw Morgan's attack on Maracaibo, followed by fresh outrages. The arrival of three Spanish warships did not check Morgan's success, for he set fire to one ship, captured another and forced the Spaniards to beach and burn the third; he killed almost all his prisoners, recovered 15,000 pieces of eight from the sunken ship, got a ransom for the city from the Spanish forces in the fort and by a clever manœuvre made his escape. Returning to Jamaica he was first reproved for exceeding his powers and then made commander-in-chief of the entire naval force of Jamaica, so that in 1671, with a stronger force under him than before, he approached the city of Panama, which he captured after a thrilling battle, in which the Spanish cavalry was broken by riding into a swamp, and further execution was done by a herd of cattle which the Spaniards intended should break the English ranks but which stampeded the Spanish. This attack and the capture of Panama occurred some time later than the signature of peace between England and Spain, and in consequence Morgan was ordered to England for trial in 1672. Nothing serious came of this, however, possibly because Morgan made free use of his wealth in England. In November 1674 he held a commission as lieutenant-governor of Jamaica. He can hardly be called a pirate; his cruel, brutal methods were those of his enemies and England's enemies. The primary source for Morgan's life is Exquemeling, 'Buccaneers of America' (1684), the work of one of Morgan's followers and reprinted in the 'Adventure Series' (London 1891). Professor J. K. Laughton in the 'Dictionary of National Biography' (Vol. XXXIX, 1894), first set straight the chronology of Morgan's life. Popular accounts are Hutcheson, 'Sir Henry Morgan' (1890); Pyle, 'Buccaneers of America' (1891); Stockton, 'Buccaneers and Pirates of Our Coast' (1898); and Brady, 'Sir Henry Morgan,' a romance (1902).

MORGAN, James Appleton, American lawyer and author: b. Portland, Me., 2 Oct. 1850. He was graduated at Racine College, Wisconsin, in 1867, and at the Columbia Law School in 1869, and in 1871 began the practice of law in New York City, becoming professionally associated with railroad interests. In 1885 he founded the Shakespeare Society of New York, of which until 1910 he was president. His view of the First Folio of 1623 is that the plays as therein printed are not monographs almost solely attributable to Shakespeare, but «growths» embodying «improvements,» alterations and expressions by many hands; and the society's publication, the 'Bankside Edition of Shakespeare' (22 vols., 1888–1906), edited by him, contains the earliest players' rendering printed in parallel columns with the First Folio. His writings include 'Macaronic Poetry' (1870); 'The Law of Literature' (1874); 'Legal Maxims' (1877); 'The Shakspearean Myth' (1880); 'Shakespeare in Fact and Criticism' (1884); 'Some Shakespearean Commentators' (1885); 'Digest Shakespeareana' (1887); 'The People and the Railways' (1888); and 'The Society and the Fad' (1890); 'Bankside Restoration Shakespeare' (5 vols., 1905-08). Died New York, 15 Aug. 1928

MORGAN, John, American physician: b. Philadelphia, 10 June 1735; d. Philadelphia, 15 Oct. 1789. He was graduated (1751) at th College of Philadelphia (now known as the University of Pennsylvania) and served an apprenticeship in medicine under Dr. John Redman. He entered the provincial army as surgeon and lieutenant, resigning his commission to continue (1760) his medical studies in London and Edinburgh, receiving the degree of M.D. 1763. During a visit to Paris he was made member of the Academy of Surgery for clever anatomical preparation of a kidney. In Italy he was made member of the Society of Belles-Lettres, Rome, and on his return to London was elected Fellow of the Royal Society and licentiate of the Colleges of Physicians of both London and Edinburgh. Returning (1765) to Philadelphia he laid the plan for establishing a medical school in that city, which he had formulated, at the request of the trustees of the College of Philadelphia. The plan

adopted, he was elected professor of the theory and practice of medicine, and, three years later, five young men received medical degrees — the first conferred in America. In 1775 he was appointed by Congress director-general and physician-in-chief to the general hospital of the American army, and reorganized the hospitals of the army. But lack of supplies for the sick and wounded made his energetic efforts largely ineffective and complaints to Washington caused Congress (1777) to dismiss him without reason. A committee of that body, however, after an investigation, honorably acquitted him of blame, while Washington wrote him: «No fault could be found with the economy of the hospitals during your directorship.» He wrote 'A Discourse on the Introduction of Medical Schools in America' (1765), and his dissertation 'The Reciprocal Advantages of a Perpetual Union between Great Britain and her American Colonies' (1766) won him a gold medal from England.

MORGAN, John Hartman, British publicist and educator: b. 20 March 1876. He was educated at Caterham School, studied at University College of South Wales, Balliol College, Oxford, and University of Berlin. From 1901–03 he was on the literary staff of the *Daily Chronicle,* became editorial writer on the *Manchester Guardian* (1904–05), and London University Extension lecturer. He has been professor of constitutional law at London University College since 1908. He was Home Office Commissioner with the British Expeditionary Forces and Staff Captain on the Adjutant General's staff (1914–15); and Deputy Adjutant General on the Inter-Allied Military Commission of Control in Germany (1919–23). He wrote 'The House of Lords and the Constitution' (1910); 'The New Irish Constitution' (1912); 'The German War Book' (1915); 'German Atrocities: An Official Investigation' (1916); 'The Present State of Germany' (1924); 'Remedies Against the Crown' (1925).

MORGAN, John Hunt, Confederate general: b. Huntsville, Ala., 1 June 1826; d. New Greenville, Tenn., 4 Sept. 1864. His boyhood was spent in Lexington, Ky., where he was later a manufacturer of bagging. He served through the Mexican War as lieutenant of cavalry. At the outbreak of the Civil War he, with 200 men of the local militia, made for the Confederate lines, and he was appointed a captain of volunteers. Soon discovering that he could best serve the Confederacy by adopting guerrilla methods of warfare he began the series of raids which so annoyed the Union commander. Moving with great celerity, and accompanied by his own telegraph operator, he kept himself acquainted with the plans of the enemy while he misled them regarding his own position. As the result, bridges which they expected to cross were burned, much-needed supply trains were captured and railroad tracks were destroyed. In 1862 he was rewarded by appointment as major-general. In 1863 he projected an extended raid through Kentucky, Ohio and Indiana, but was captured and, with many companions, imprisoned in the Ohio Penitentiary. Escaping, he again attempted a raid but, while sleeping at a farmhouse near Greenville, Tenn., he was surrounded by National troops under Gen. Alvin C. Gillem, and upon attempting to escape was killed. See MORGAN'S RAID INTO INDIANA AND OHIO.

MORGAN, John Livingston Rutgers, American chemist: b. New Brunswick, N. J., 27 June 1872. He was graduated (1892) at Rutgers College, received Ph.D. diploma at University of Leipzig (1895) and was appointed assistant in chemistry at Stevens Institute (1895–96). He became instructor of quantitative analysis at Brooklyn Polytechnic Institute (1896–97). He served at Columbia University as tutor of chemical physics and chemical philosophy (1897–1901), professor of physical chemistry (1901–05) and as professor after 1905. He wrote 'The Principles of Mathematical Chemistry' from Helms' German work (1897); 'The Theory of Solution and its results' (1897); 'Elements of Physical Chemistry' (5th ed. 1914); 'Physical Chemistry for Electrical Engineers' (2d ed., 1909). He died, New York City, 13 Apr. 1935.

MORGAN, J(ohn) Pierpont, American financier: b. Hartford, Conn., 17 April 1837; d. Rome, Italy, 31 March 1913. He was the son of J. S. Morgan (q.v.). He was educated at the English High School in Boston and at the University of Göttingen, Germany. He began his business career in the banking house of Duncan, Sherman & Co., New York City; in 1860 he became agent and attorney in the United States for George Peabody & Co. of London; in 1864 junior member of the banking firm of Dabney, Morgan & Co., and later member of the firm of Drexel, Morgan & Co., of which his father was also a partner. By the death of the older members of the firm he became the head of the latter house and the firm name was changed to J. P. Morgan & Co. He also controlled the firm of J. S. Morgan & Co. of London and had partnership interest in Drexel & Co. of Philadelphia. For many years his chief interest lay in railroad negotiations and combinations, and he gradually gained control of the New York Central system, the New York, New Haven and Hartford, the Reading, the Erie, the Lehigh Valley, the Southern, the Northern Pacific, the Big Four and the Chesapeake and Ohio. Shortly after this great railroad consolidation was completed (1901), he succeeded in organizing the «United States Steel Company,» uniting the Carnegie Steel Works and other large concerns with a capitalization of $1,100,000,000, and dominating the steel industry of the United States. In the same year he bought up a large English shipping line with the evident design of organizing a trust for the control of transatlantic shipping, but did not succeed in completing the consolidation. He was the head of both the anthracite and the soft coal trusts, and was several times prominent in the settlement of miners' strikes. In 1895 he organized the syndicate which floated the United States bond issue of $62,000,000, for the increase of the gold reserve; and in 1901 secured American subscriptions of $50,000,000 to the British war loan. In 1912 he testified before the Pujo Banking Committee in Washington, appointed by the House of Representatives to investigate the alleged «Money Trust.» Probably no other American capitalist was so well known and so thoroughly

trusted in Europe as Mr. Morgan; particularly was this true as regards England, and a large majority of English investments in American securities were made through his house; everywhere he was recognized, not merely as a man of vast wealth, but also as a man of unusual organizing and constructive ability. He gave largely to many charities and institutions, particularly to hospitals, churches and the Trade School in New York, and to Harvard University. He was an enthusiastic yachtsman, was for two years commodore of the New York Yacht Club and built the yacht *Columbia,* which defeated Sir Thomas Lipton's *Shamrock* in the international yacht races. Mr. Morgan was the greatest art collector of his time, his collections being among the most varied and important ever owned by an individual. The historic and romantic aspects of art appealed more strongly to him than the purely aesthetic. He built a beautiful library adjoining his home, wherein he housed a collection of important manuscripts and rare and handsomely-bound books. The Metropolitan Museum of Art in 1913 exhibited most of his collections. Thirteen galleries were needed to house the many rare specimens of Byzantine and Gothic enamels and ivories, bronzes and marbles of the Renaissance, metal work, crystals, Flemish tapestries, a great collection of miniatures and paintings by artists of the first rank. His collection of porcelains, French furniture and objects of decorative art and the paintings of the celebrated Fragonard room were sold by his son in 1915. Mr. Morgan published elaborate catalogs of nearly all of his collections. Consult the catalogs published by the New York Museum of Art (1914), and for much valuable material on Mr. Morgan's career as financier, art collector and philanthropist, consult the New York *Evening Post* of 31 March 1913.

MORGAN, J(ohn) Pierpont, American financier, son of John Pierpont Morgan (1837–1913): b. Irvington, N. Y., 7 Sept. 1867; d. Boca Grande, Fla., 13 March 1943. He was graduated from Harvard University in 1889; was made a partner in J. P. Morgan & Co. in 1891; and soon afterward entered its London branch. He returned to the United States in 1901, and succeeded his father as head of J. P. Morgan & Co., upon the latter's death in 1913. He inherited the greater portion of his father's fortune, valued at $78,000,000, and succeeded to the directorates of many corporations in which the house of Morgan held large financial interests, including that of the United States Steel Corporation, of which he was chairman of the board until 1932, and a director until his death. In January 1915, following the outbreak of the First World War, the house of Morgan was appointed commercial agent for the British Government in the United States, and subsequently purchased all munitions and supplies for the Entente in this country, totaling in cost several billions of dollars. On 1 July 1915 at Glen Cove, L. I., Mr. Morgan was shot by a fanatic, but escaped with minor injuries. The banking act of 1933 restricted bank dealings in securities, and forced Morgan & Co. to choose between surrendering its security business, the largest in the world, and its private deposit banking business. It gave up the security business, turning it over to the new firm of Stanley Morgan & Co., Inc., of which Mr. Morgan's son, Henry S. Morgan, became treasurer. On 1 April 1940, the name of the banking house was changed to J. P. Morgan & Co., Inc., and Mr. Morgan became chairman of the board. At that time the bank had deposits of over $600,000,000. As head of J. P. Morgan & Co., Mr. Morgan surrounded himself with many of the ablest financiers in the country. Throughout his career Mr. Morgan shunned publicity. He was nevertheless very human towards his friends, and a liberal contributor to charitable causes. He had been decorated by many foreign governments, and was a trustee of the Metropolitan Museum of Art, New York Public Library, Cooper Union, and a member of the joint administrative board of the New York Hospital and Cornell Medical College.

MORGAN, John Tyler, American lawyer and politician: b. Athens, Tenn., 20 June 1824; d. Washington, D. C., 11 June 1907. He went to Alabama when nine years old, received his education there, was admitted to the bar in 1845 and commenced practice. He rapidly gained a high reputation as a lawyer and speaker; was presidential elector in 1860, voting for Breckenridge, and in 1861 was a delegate to the Alabama convention which declared for secession. He enlisted in the Confederate army as a private in 1861; in 1862 raised a regiment in his state, of which he was made colonel; and in 1863 was commissioned brigadier-general and commanded a division under General Johnston. After the war he resumed the practice of law at Selma, Ala.; was presidential elector on the Democratic ticket in 1876, and sat in the United States Senate from 1877 until his death. He was long recognized as one of the ablest leaders of the Democrats in the Senate, was a member of the Senate Committee on Foreign Relations and for some years its chairman; in his last term he was chairman of the Committee on Interoceanic Canals and, favoring in that capacity the Nicaragua Canal route instead of the Panama, was removed from his post in November 1903. He was an earnest and able advocate of recognition of Cuban independence, and won popularity in all parts of the country by his eloquent speeches in behalf of Cuba. In 1892 he was a member of the board of arbitration on the Bering Sea Fisheries, and in 1898 was one of the commission appointed to prepare a system of laws and organize the government for the Hawaiian Islands.

MORGAN, Junius Spencer, American financier: b. West Springfield (now Holyoke), Mass., 14 April 1813; d. Monte Carlo, Monaco, 8 April 1890. He entered a dry-goods store when a boy and remained there until he came of age, when he was engaged for 18 months in banking in New York. He returned to the dry-goods business in Hartford, Conn., where he was junior partner in a leading firm and rapidly advanced until he formed a partnership under the name of J. M. Beebe, Morgan & Co., which became one of the largest dry-goods establishments in the United States. In 1854 he became a member of the banking house of George Peabody & Co., in London, which subsequently became J. S. Morgan & Co., and was ranked among the world's greatest banking

houses. He was a generous benefactor of various public and private institutions, among them being Trinity College, Hartford, and the Hartford Orphan Asylum. He established a public library in Hartford and made valuable donations to the Metropolitan Museum of Art, Yale College and other institutions.

MORGAN, Lewis Henry, American archæologist and anthropologist: b. Aurora, N. Y., 21 Nov. 1818; d. Rochester, N. Y., 17 Dec. 1881. He was graduated at Union College in 1840, practised law at Rochester in 1844–64 and served in the State assembly (1861) and senate (1868–69). His enduring fame rests on his researches in the history and customs of the American Indians. In his labors he received the aid of the Smithsonian Institution and the United States government. He spent much of his time among the tribes and was regularly admitted into the Senecas. His earliest work, 'The League of the Iroquois' (1851; new ed., 1904), was the first scientific account of the organization and government of an Indian tribe; but even more valuable are his 'Systems of Consanguinity and Affinity of the Human Family' (1869) and his treatise on 'Ancient Society' (1877), each based on the same material, the former being a collection of facts, the latter a philosophical treatise. He also published 'The American Beaver' (1868) and 'Houses and House-life of the American Aborigines' (1881). In 1875 he was elected to the National Academy of Sciences and 1879 was president of the American Association for the Advancement of Science. He bequeathed $80,000 to found a woman's college at the University of Rochester.

MORGAN, Matthew Somerville, American artist: b. London, 27 April 1839; d. New York, 2 June 1890. He studied scene painting, but soon abandoned it to become correspondent and illustrator for the London *News,* afterward studying in Paris, Italy and Spain, and in 1858 penetrated the interior of Africa on a sketching tour. Returning to London he became joint editor and proprietor of the *Tomahawk,* and his cartoons, which audaciously attacked the aristocracy and royalty, brought him into disfavor. He assisted in the establishment of the London *Fun,* and in 1870 removed to the United States, where he was engaged with Frank Leslie. He managed several theatres in New York, managed the Strobridge-Lithograph Company of Cincinnati in 1878–85, and founded in that city the Matt Morgan Pottery Company and the Art Students' League.

MORGAN, Morris Hickey, American classical scholar: b. Providence, R. I., 8 Feb. 1859; d. 1910. He was graduated (1881) at Harvard, receiving (1887) the degree Ph.D. He held the chair of classical philosophy at Harvard. He wrote 'De Ignis Eliciendi Modis apud Antiquos' (1890); 'Dictionary to Xenophon's Anabasis' (1892); 'A School Latin Grammar' (1899); 'The Minor Works of Tacitus' (1904); 'The Language of Vitruvius' (1906). Among his published translations are 'Xenophon's Art of Horsemanship' (1893); 'Bibliography of Persius' (1893); 'The Phormio of Terence' (1895); 'Eight Orations of Lysias' (1895). Numerous essays and reviews from his pen have been published in the contemporary philological periodicals.

MORGAN, Sydney Owenson, Lady, Irish novelist: b. Dublin, Ireland, about 1783; d. London, 14 April 1859. Her father was an actor on the Dublin stage, of the name of Mac Owen, afterward changed to Owenson. She was a governess for a time. Her first literary effort was a volume of poems (1801), followed by a collection of Irish songs and two novels, 'Saint Clair' and the 'Novice of Saint Dominick' (1804). In 1806 appeared her 'Wild Irish Girl,' a novel which, avowedly nationalist in sympathy and containing good descriptive passages, established her reputation, became immediately popular and secured for her a high position in fashionable and literary life. She had by this time removed from Dublin to London, and in 1812 was married to Sir Charles Morgan, an eminent physician. She also contributed English words to be set to Irish airs. In 1837 she received a civil list pension of £300 a year, the first woman author to be so rewarded. Her style was inflated and gushing; her vanity was inordinate; but she drew many vivid characterizations of Irish character. Among her other works are novels 'O'Donnell'; 'Florence McCarthy'; and 'The O'Briens and The O'Flahertys'; the 'Life and Times of Salvator Rosa'; 'Woman and her Master'; and 'Passages from my Autobiography.' Consult Fitzpatrick, W. J., 'Lady Morgan' (London 1860).

MORGAN, Tali Esen, American choral conductor: b. Llangynwyd, Wales, 28 Oct. 1858. He studied music and came (1876) to Scranton, Pa., where he published the *Cambro-American* in 1897. For 17 years he conducted the summer music festivals at Ocean Grove, N. J., later becoming director of the New York Festival Chorus. He was founder and president of the International Correspondence School of Music. He also founded the National Association of Organists and the Musicians Club of New York, and published a course of music instruction for teachers. D. 30 June 1941.

MORGAN, Thomas Hunt, American zoologist: b. Lexington, Ky., 25 Sept. 1866. He was graduated (1886) at the State College of Kentucky, took the degree Ph.D. (1890) at Johns Hopkins and became professor of biology at Bryn Mawr (1891–1904). He was professor of experimental zoology at Columbia University (1904–28), and biological authority at the California Institute of Technology after 1928. In 1939 he was awarded the Copley Medal for his development of the study of genetics, by the Royal Society of London. He received many honorary degrees. His publications include: 'Development of the Frog's Egg' (1897); 'Regeneration' (1901); 'Evolution and Adaptation' (1903); 'Heredity and Sex' (1913); 'Critique of the Theory of Evolution' (1916); 'Physical Basis of Heredity' (1919); 'Theory of the Gene' (1926); 'Embryology and Genetics' (1933). He died at Pasadena, Calif., 4 Dec. 1945.

MORGAN, William, American Freemason, whose death was the immediate cause of the formation of the Anti-Masonic party: b. Culpeper County, Va., about 1775; d. possibly near Niagara in 1826. He fought in the defense of New Orleans in 1815; removed to York, Canada, in 1821, where he became a brewer, and whence soon after he moved to Batavia, N. Y.; and in August 1826 disappeared soon after a

rumor had been spread that he was to reveal in a book the secrets of the Masonic Order. He was supposed to have been abducted by fellow-Masons and drowned in Lake Ontario, but his death was never proved. A corpse found near the mouth of Niagara River was stated to be his, and as such was claimed by his family, but disinterred and believed to be some one else. Much political capital was made of the alleged abduction and drowning and it was averred that Thurlow Weed, a leader in the antimasonic movement (see ANTIMASONRY), cynically said that it was "a good enough Morgan till after election," a remark that has become proverbial for campaign deceit.

Morgan's book *Illustrations of Freemasonry, by One of the Fraternity Who Has Devoted Thirty Years to the Subject* (1826) roused much less excitement than the story of his death. This book under the title *Free Masonry Exposed and Explained* was reprinted in 1912.

MORGAN, Fort. See FORT GAINES AND FORT MORGAN.

MORGAN CITY, city, Louisiana, in St. Mary Parish, at an altitude of six feet, situated on Berwick Bay on the navigable Atchafalaya River, 53 miles south of Baton Rouge, and served by the Southern Pacific Railway. One of the busier ports of southern Louisiana, it has water connections with the Mississippi and westward in to Texas via the Intracoastal Canal, which here joins the Plaquemine-Morgan City Waterway leading to the Gulf of Mexico. The port handles petroleum, chemicals, steel and iron products, oystershells, sulphur, and lumber. The packing of sea food provides employment for a large number of workers. Sugar cane, corn, rice, and cotton are grown in the surrounding region and are traded through the city. There is extensive fur trapping nearby, mainly of muskrat, mink, and otter, and the surrounding area is also a paradise for hunters and fishermen. The city maintains a modern library, good schools, churches, and a hospital.

History.—Settled in 1850, the city was incorporated as Brashear City in 1860, but the name was changed in 1876 in honor of Charles Morgan (1795–1878), a steamship-line owner. In 1863 the city, held by Union forces, was taken by the Confederates, but was soon abandoned by them and reoccupied by the Federals. Pop. (1950) 9,759.

MORGANATIC MARRIAGE, a marriage between a prince or noble and a woman of inferior rank in cases where a perfect marriage is not legal except with a woman of equal rank. The distinctive feature of the morganatic marriage is that the wife does not acquire the rank of the husband, and the children, legitimate though they are, do not inherit it; in some states they do not inherit either entailed estates or personalty.

In Great Britain under the Royal Marriages Act (1772) such a marriage is invalid in public law. A morganatic marriage and a regular marriage cannot exist at the same time, so that the Roman Catholic Church regards the morganatic marriage as a perfect one. The custom originated in ancient German law, is prevalent among the princes and high nobility of that country and is also in force among the royal families of Europe.

MORGANFIELD, môr'găn-fēld, city, Kentucky, seat of Union County, at an altitude of 439 feet, 22 miles west-southwest of Henderson, and served by the Illinois Central Railroad. In an agricultural and coal mining region, there is also extensive livestock raising. The town is a railroad shipping point for tobacco, corn, wheat, and clover, and has flour mills, a seed-cleaning plant, and manufactures of furniture and metal products. There are also large oil fields nearby. St. Vincent's Academy (1820) for girls and Camp Breckinridge, an army camp active during World War II, are nearby. The waterworks are city owned and operated. Pop. (1950) 3,257.

MORGAN'S RAIDS INTO INDIANA AND OHIO. In the middle of June 1863 Gen. Braxton Bragg ordered Gen. John H. Morgan, with 2,000 picked mounted infantry and four guns to move from Tennessee into Kentucky, break up the railroad upon which Gen. William S. Rosecrans depended for supplies, capture Louisville, destroy the public works and return to Tennessee as quickly as possible. Morgan determined to exceed his orders and make a raid north of the Ohio. On July 2, with 2,460 men and four guns, he set out from Burkesville, crossed the Kentucky River in the face of Union troops guarding it, and marched northward, followed by all the Union detachments within immediate call. He passed through Columbia, after a sharp skirmish with about 300 Wolford's Kentucky cavalry, in which he lost about 40 in killed and wounded, and on the 4th reached Green River at Tebb's Bend, and demanded the surrender of Col. O. H. Moore, who, with about 300 men of the 25th Michigan, was guarding the bridge at that point. Moore replied that the Fourth of July was not a good day to surrender, and was instantly attacked with artillery and musketry. After a hard fight of three hours, in which Moore had six killed and 23 wounded, Morgan was repulsed, with a loss of 36 killed and 46 wounded, and drew off, crossing the river below the bridge. On the 5th he defeated and captured the small garrison of Lebanon and marched by Bardstown to Brandenburg, on the Ohio, where he arrived on the morning of the 8th, and seizing two steamboats began crossing his command. His passage was disputed by a gunboat and by militia with a field-piece on the Indiana shore, but by the morning of the 9th his whole command was in Indiana. Twenty-four hours later Gen. Edward H. Hobson, with 2,500 cavalry and mounted infantry and four guns, crossed the river in pursuit, and for 17 days hung upon Morgan's heels. Indiana and Ohio were aroused and turned out their militia by thousands.

After crossing the Ohio, Morgan rode north through Corydon, where he was resisted by militia, who were soon overpowered. He then pushed on to Salem, where he captured nearly 400 militia, then through Lexington and Paris to Vernon, near which place on the evening of the 11th he encountered a stiff resistance from about 1,200 militia under Colonel Love. Under cover of darkness he withdrew from Love's front, and pressing on through Dupont and Sumansville, crossed the Indiana line on the 13th to Harrison, Ohio, and concentrated his command preparatory to making his way across the Ohio into Kentucky, detaching parties to burn bridges and confuse the pursuit, and impressing fresh horses. Under cover of a feint on Hamilton he

marched by night a few miles north of Cincinnati, moving directly east, closely pursued next day by Hobson, who was marching 40 miles a day, and threatened from all directions by the militia. Turning toward Berlin, where the government had a large number of animals, he was confronted by a small body of militia under Colonel Runkle, lost much precious time in threatening an attack, drew off closely followed by Runkle, and after dark of the 18th reached the banks of the Ohio, a short distance above Pomeroy, near Buffington Bar and Blennerhasset's Island, where from the first he had planned to escape. His pursuers were closing in on him from every direction. On the west Hobson was hanging on his rear; General Judah, who had been withdrawn from Kentucky, had landed his division at Portsmouth, and was marching up from the southwest; regiments were coming down the river from Parkersburg; and gunboats patroled the river and watched the fords. Early in the morning of the 19th Morgan endeavored to cross the river, but was speedily checked. He was attacked in rear by the head of Hobson's column, Judah's cavalry struck him in flank and two gunboats opened upon his front. A severe engagement cost him about 120 killed and wounded, and more than 700 of his officers and men surrendered. Morgan with the remainder escaped up the river, where he attempted to cross to Belleville by swimming his horses.

Three hundred men, under Col. B. R. Johnson, had crossed when a gunboat stopped the remainder of the column, Morgan himself returning to the Ohio shore and with about 800 men retreating inland. He had lost all his artillery and trains. He pressed on northeast through Athens and Washington, marching 35 miles a day, burning bridges behind him, with General Shackelford and 500 men close upon his rear and skirmishing with it. Near Salineville on the 26th Shackelford's advance captured 250 men, and later in the day he was intercepted near New Lisbon and Beaver Creek, and surrendered with 364 officers and men. The Union loss in the campaign July 2-26 was 19 killed, 47 wounded and 8 missing.

E. A. Carman.

MORGANTE MAGGIORE, Il, by Luigi Pulci (1432–1484), begun in 1460 and completed in 1483, is the first of the great Italian humoresque poems dealing with the material of the Old French epic, with the adventures and adventurers of the court of Charlemagne, with chivalry and deeds of valor, with Saracens, witches, and magic, with all that distinguishes men from cowards and loyalty from treachery in a world of strong arms and generous appetites, good humor and simple passions. It is a reworking of an earlier popular poem called the *Orlando,* with a few elements borrowed from another poem of the same cycle called the *Spagna.* Pulci thus obtained the traditional schematic plot of the Italian chivalric tale: the struggle between the house of Clermont and the treacherous descendants of Ganelon, resulting in the slander of Orlando, his flight to the Orient, his adventurous battles with the Saracens, his return to Paris to raise the inevitable siege by the Saracens, his reconciliation with Charlemagne, and his ultimate vengeance on his enemies at court. Pulci is more faithful to the spirit and the substance of the Carolinian tale than either of his great successors, Matteo Maria Boiardo or Ludovico Ariosto, who utilized the more fantastic and sentimental legends of the Round Table to such an extent as wholly to transform the character of chivalric romance. The earnestness of the popular legend passed over directly into the *Morgante,* to constitute the solid base for its pervasive humorism, on which the author then erects an original comic structure of his own, with not a few deliberately satiric elements. Neither Petrarchism nor classical models were strong enough in their influence on Pulci to alter or to vitiate this humorous attitude toward his subject. The reader willingly remembers three salient figures from *Il Morgante Maggiore:* that of the giant Morgante himself, whose size and corresponding appetite for food have a jolly time getting along in this world made for smaller people; that of the half-giant Margutte, liar, thief, glutton, blasphemer, and all-around rascal of perennial goodnature, the most popular personage in the rambling story; and finally that of the devil Astaroth, who treats learnedly on orthodox theology, and among whose many feats of magic the most famous and startling remains his discovery of a new Western world some years before the voyage of Columbus. Save in its best episodes, the *Morgante* is no longer much read. There is an English translation by William Roscoe.

Arthur Livingston.

MORGANTON, môr'găn-tŭn, town, North Carolina, seat of Burke County, at an altitude of 1,181 feet, 15 miles south-southwest of Lenoir, near the Catawba River, and served by the Southern Railway. The trade center for an agricultural and timber region, it manufactures leather goods, furniture, hosiery, textiles, and electrical equipment. A state school for the handicapped and a state hospital for the insane are located here.

Morganton was incorporated as a village in 1784 and as a town in 1885, and is governed by a mayor, council, and city manager. The water, power, and light systems are municipally owned. Pop. (1950) 8,311.

MORGANTOWN, môr'găn-toun, city, West Virginia, seat of Monongalia County, situated on the navigable Monongahela River, at an altitude of 960 feet, 15 miles northeast of Fairmont and 103 miles south of Pittsburgh, Pa., and served by the Baltimore and Ohio and the Monongahela railroads, state and federal highways, and an airport with scheduled air service. It is located in the midst of an area rich in oil and gas fields, bituminous coal fields, limestone quarries, and deposits of glass sand. Its principal industries are the mining and shipping of the coal and the turning of the sand into industrial and commercial glass. Rolled, plate, and pressed glasses, cut glass, wireglass, window glass, and watch crystals are made, while other industries manufacture coke, concrete blocks, and plumbing equipment. A United States ordnance works here produces chemicals from the coal and gas. The city is also the trading center for a district including a dozen small towns.

Morgantown has public and parochial schools, a city and a county hospital, over 20 churches, and is the seat of West Virginia University (q.v.). Nearby points of interest include Cooper's Rock State Forest, the largest in the state, Cheat River Canyon, Cheat Lake, and Dorsey's Knob.

History.—Although there had been earlier settlers on the site, the town was named for the brothers Zackquill and David Morgan who, in 1766, made the first successful settlement here. Morgantown was incorporated in 1785, and is governed by an elected city council and an appointed city manager. The water supply system is municipally owned. Pop (1950) 25,525.

MORGARTEN, môr'gär-tĕn, mountain slope, Switzerland, with an altitude of 4,084 feet, five miles north of Schwyz, on the border of Schwyz and Zug cantons, just southeast of the Lake of Aegeri. It is memorable as the scene of the battle of Nov. 15, 1315, in which a small body of Swiss mountaineers from Schwyz, Uri, and Unterwalden, ill-armed and undisciplined, totally vanquished an Austrian army of 20,000 under Duke Leopold I, sent by Frederick the Fair to avenge the seizure of the abbey of Einsiedeln the previous year. This was the first victory achieved by the Swiss in their struggle for freedom.

MORGAT, môr-gä', seaside resort, France, in Finistère Department, on Crozon Peninsula, 11 miles south of Brest. The chief occupation of the inhabitants is sardine fishing in Douarnenez Bay.

MORGENSTERN, môr'gĕn-schtĕrn, **Lina (nee Bauer),** German writer and reformer: b. Breslau, Nov. 25, 1830; d. Berlin, Germany, Dec. 16, 1909. She did much social work in Berlin after her marriage (1854) to Dr. Theodor Morgenstern. She was leader of the woman's Verein (1860–1866) in their furthering the cause of the Froebel Kindergärten, and (1866) she founded the Verein Berliner Volksküchen (public kitchens). In 1868 she started the Kinderschützverein, for the protection of children; in 1869 she founded an institute for the training of young women in the useful arts. In 1880 she established a woman's society for the rescue of immoral girls, placing them in schools to teach them housework and farming.

She wrote *Das Paradies der Kindheit* (1861); *Der Häusliche Beruf* (1875); *Die Volksküchen* (1882); *Der Beruf des Weibes* (1869); *Die Frauen des 19 Jahrhunderts* (1888–1891); *Hilfsbuch zur Gründung, Leitung und Kontrolle von Volksküchen* (1892), besides several works on the systems of economical cooking.

MORGENTHAU, môr'gĕn-tou, **Henry,** American lawyer, merchant, and ambassador: b. Mannheim, Germany, April 26, 1856; d. New York, N. Y., Nov. 25, 1946. Coming to the United States in 1865, he attended the New York public schools, the College of the City of New York, and received his LL.B. degree from the Columbia Law School. He became a partner in the law firm of Lachman, Morgenthau and Goldsmith, New York (1879–1899), was president of the Central Realty Bond and Trust Company (1899–1905), and of the Henry Morgenthau Company (1905–1913), dealers in realty. He was ambassador to Turkey (1913–1916) and at the outbreak of World War I took charge of the interests in Turkey of Great Britain, France, Italy, Russia, Belgium, Switzerland, Montenegro, and Serbia, rendering invaluable assistance to these nations. He was vice chairman of the Near East Relief, and chairman of the commission created by the League of Nations in 1923 for the settlement of the Greek refugees. In 1933 he was a delegate to the Geneva Wheat Conference—his last public service in official capacity.

He wrote *Ambassador Morgenthau's Story* (1918); and *All in a Lifetime* (1922); *My Trip Around the World* (1928); *I Was Sent to Athens* (1929).

MORGENTHAU, Henry, Jr., American public official: b. New York City, New York, May 11, 1891. He studied two years at Cornell University, and from 1922 to 1933 was publisher of the *American Agriculturist.* Under Gov. Franklin D. Roosevelt, Mr. Morgenthau served as conservation commissioner of the State of New York, also as chairman of the governor's agricultural advisory committee and member of the Taconic State Park Commission. A close friend and neighbor of the governor, the latter, after election to the presidency, appointed Mr. Morgenthau first, chairman of the Federal Farm Board, then governor of the Farm Credit Administration, and on Nov. 17, 1933, made him acting and under secretary of the treasury. He was appointed secretary of the treasury Jan. 1, 1934. Soon after the president's death, Mr. Morgenthau resigned his post (July 5, 1945) to become effective after President Truman's return from the "Big Three" conference at Berlin, being the sixth Roosevelt Cabinet appointee to resign after Mr. Truman took office. During his 11 years as head of the Treasury Department Mr. Morgenthau raised for government operations, for furtherance of the New Deal program and for war purposes, through taxation and loans $450,000,000,000, far more than all his 50 predecessors from 1789 to 1934.

MORGHEN, môr'gân, **Raffaello,** Italian engraver: b. Florence, Italy, June 19, 1758; d. there, April 8, 1833. He received his early instruction in his art from his father, Filippo, and his uncle, Giovanni Elia, and was afterward placed as a pupil under the celebrated Volpato, whom he assisted in engraving the pictures of Raphael in the Vatican. He settled in Florence about 1793 as professor of copper-plate engraving in the Academy of Art. In 1803 he was chosen an associate of the French Institute; and in 1812 was invited to Paris by Napoleon, who treated him with flattering kindness.

Among the most remarkable of the other numerous works of Morghen may be noted *The Transfiguration* from Raphael; a *Magdalen* from Murillo; a *Head of the Savior* from Da Vinci; the *Hours* from Poussin; the *Prize of Diana* from Domenichino; the *Monument of Clement XIII* from Canova.

MORGIANA, môr-gĭ-ä'nä, a female slave figuring in "Ali Baba and the Forty Thieves," a story in the *Arabian Nights* (q.v.).

MORGUE, môrg (Old French, to look at solemnly), a place or building in large cities where the bodies of unknown persons who have perished by accident, murder or suicide are exposed, that they may be recognized by their friends. If not claimed within a certain period they are either buried or given over to medical institutions for dissection purposes. The name arose from the building in Paris, dating from the 5th century, devoted to this purpose.

MORI, Arinori, mō′rē ä-rē-nō′rē, Japanese statesman: b. Satsuma, 1848; d. 11 Feb. 1889. He was educated in England; as chargé-d'affaires in Washington arranged the postal convention between Japan and the United States; served as plenipotentiary in Peking and in London; and was Minister of Education from 1885 to his death. He was an extremely cultured man, with progressive educational ideas. On the day of the proclamation of the Japanese Constitution he was assassinated by a Shinto fanatic for violating a shrine at Ise by lifting the curtain with his walking stick.

MORIAH, mō-rī′ą, Palestine, the hill on which the temple of Jerusalem was built (2 Chron. iii, 1), and by many authorities believed to be the mount on which Abraham was commanded to sacrifice his son Isaac (Gen. xxii, 2).

MORICE, Adrian Gabriel, Canadian clergyman, ethnologist and author: b. Saint Mars-sur-Colmont, Mayenne, France, 27 Aug. 1859. He was educated at Oisseau, Sion and Autun, France, joined the Oblate Order in 1877 and three years later was sent to British Columbia. In 1882 he was ordained to the priesthood, and for the following three years labored as missionary to the Chilcotin Indians at William's Lake. From 1882 to 1906 he was stationed at Stuart's Lake, B. C., was then transferred successively to Kamloops 1906, Saint Boniface 1908, Winnipeg 1909, Duck Lake, Sask., 1910, and Winnipeg 1911. Since 1911 he has been lecturer in anthropology at the University of Saskatchewan. During his missionary career he mastered a number of Indian languages and compiled dictionaries and grammars of Chilcotin, Sekanais and Nahanais. He invented the Déné Syllabary and printed books in that language. He made maps during his wanderings up and down British Columbia. For one of these the Geographical Society of Paris awarded him a silver medal and another map was published by the provincial government. He was a member of the American Anthropological Association, the Historical Society of Saint Boniface, the Ethnological Committee of the British Association for the Advancement of Science, corresponding member of the Canadian Institute, the Geographical Society of Quebec and of many others in Canada and abroad. He was the author of 'Au pays de l'ours noir' (1897); 'History of the Northern Interior of British Columbia' (1904 et seq.); 'Aux sources de l'histoire manitobaine' (1907); 'Dictionnaire historique des Canadiens et des Métis français de l'Ouest' (1908); 'History of the Catholic Church in Western Canada' (2 vols., 1910). He collaborated in 'Encyclopædia of Religion and Ethics' and in 'The Catholic Encyclopedia.' D. 1939.

MORICHI, a palm. See Murichi

MORIER, mō′rĭ-ēr, **James Justinian,** English diplomatist, traveler and novelist: b. Smyrna, about 1780; d. Brighton, March 1849. He was educated at Harrow, England, and entered (1807) the Persian diplomatic service and returned (1809) to England via Turkey, making a journey that became celebrated and a description of which he published under the title of 'A Journey through Persia, Armenia and Asia Minor to Constantinople in the years 1808 and 1809' (1812). Returning (1810) to Teheran as secretary of legation he made his journey (1815) back to Europe through Asia Minor and published another book entitled 'A Second Journey through Persia' (1818). After a trip to Mexico he settled in England and devoted himself to a literary life. Among his works are the Oriental novels 'Hajji Baba of Ispahan' (1824; new ed., 1914), perhaps his best work; 'The Mirza' (1842); 'Zohrab the Hostage' (1832); 'Ayesha, the Maid of Kars' (1834).

MORIER, Sir **Robert Burnett David,** English diplomatist: b. Paris, 1826; d. Montreux, 16 Nov. 1893. He was graduated (1849) at Balliol College, Oxford, entered (1851) the diplomatic service and served as attaché at the embassies of Vienna and Berlin. In 1865 he was appointed secretary of the embassy at Athens, then at Frankfort, becoming (1871) chargé-d'affaires at Stuttgart, and (1872) at Munich. In 1876 he was made English Minister at Lisbon, and at Madrid 1881–84, was appointed Ambassador at Saint Petersburg, 1884–93. In 1888 he was in a bitter conflict with Count Herbert Bismarck, who accused him of furnishing Marshal Bazaine with information as to the German advance over the Moselle at the outbreak of the Franco-Prussian War. Later it was proven that spies of the French government had obtained the information from other sources and that Bismarck's dislike was really caused through his knowledge of the diplomat's brilliant work. He was created K.C.B. (1882), privy councillor (1885), G.C.B. (1887), D.C.L. Oxford (1889).

MÖRIKE, mė′rĭ-kē, **Eduard,** German lyric poet and short-story writer: b. Ludwigsburg, Württemberg, 8 Sept. 1804; d. Stuttgart, 4 June 1875. His father was Kreis Medical Councillor Karl Friedrich Mörike, d. 1817; his mother Charlotte, née Bayer. He attended the Latin school at Ludwigsburg, the seminary at Urach (1818), where he made the acquaintance of Wilhelm Hartlaub and Wilhelm Waiblinger; and the divinity school at Tübingen where he came into contact with Ludwig Bauer, David Friedrich Strauss and F. T. Vischer. After completing his studies at these theological institutions, he spent the greater part of his life as a country pastor in various parts of Württemberg. His longest incumbency was at Cleversulzbach (1834–43), where he associated with Justinus Kerner, Hermann Kurz, Uhland and Karl Mayer. From 1851 to 1866 he taught literature at the Stuttgart Katharinenstift, receiving the title of professor in 1856. His first literary work was the short novel of artist life, 'Maler Nolten,' which passed through many revisions and was printed in its final form after his death (1877). His shorter stories are more finished artistically, especially 'Mozart auf der Reise nach Prag' (Stuttgart 1856). As a lyricist, no other Suabian poet attains his simple yet perfect form. His observations of life and of nature are realistic, and his depth of feeling sometimes approaches Goethe's. Some of his poems have even become favorites among the people, especially the ballad 'Schön Rotraut,' opening with the line: 'Wie heisst König Ringangs Töchterlein?'

Jacob Wittmer Hartmann.

MORILLO, mō-rēl'yō, **Pablo,** Spanish general: b. Fuente de Malva, Spain, 1777; d. Madrid, Spain, 27 July 1838. He enlisted in the navy in 1797 and was engaged at Trafalgar in 1805; but when the French invaded Spain he left the navy to enter the army and rose to the rank of major-general in 1814. In 1815 he was sent to South America to subdue the revolution in Venezuela and Colombia, and after varying fortunes, during which he made for himself a name as a cruel and tyrannous general, perceiving defeat to be inevitable, he asked to be relieved but was compelled to sign a truce with the victorious Bolívar before sailing for Spain. He was appointed to command the garrison at Madrid, and in 1822 became captain-general of Galicia, which he surrendered to the French. He retired in disgrace to Rochefort, France, but returned to Spain in 1832 and led an army against the Carlists. During his exile in France he published his 'Mémoires' (1826).

MORIN, mō-răn, **Arthur Jules,** French mathematician and engineer: b. Paris, 19 Oct. 1795; d. there, 7 Dec. 1880. He was educated at the Ecole Polytechnique in Paris and at the Ecole d'Application at Metz, and was for a time professor of mechanics in the latter institution. In 1819 he became lieutenant in a battalion of engineers and later accepted a professorship at the Conservatoire des Arts et Métiers in Paris of which he became director in 1847. He held the rank of general in the army and was a member of various military boards, and his researches and inventions were of great scientific value. He published 'Aide-mémoire de mécamique pratique' (1838); 'Salubrité des habitations' (1868), etc.

MORIOKA, mō-rē-ō'kä, Japan, a town in the island of Hondo, 40 miles from the coast, and 339 miles by rail from Tokio. It is the capital of the prefecture of Iwate, in the northerly province of Rikuchu, has manufactures of silk, copper and other ware, and is celebrated for it fine fruits and vegetables (many of these of American origin) and preserves. Mount Iwate (6,800 feet) is in the vicinity. Pop. 50,030.

MORISCOS, mō-rē'skōs, Spanish term applied to those Moors who accepted Christianity. After the fall of Granada (1492) many of the Moors returned to Africa. But most remained in Spain, permitted under pretense of conversion to Christianity and lived, under the name of Moriscos, as industrious, peaceful inhabitants, till they were driven to revolt by the cruel persecutions under Philip II (1568–70) and over 100,000 of them were exiled; the few remaining being now found in the mountains of Granada after Philip III (1609) deported another 500,000. Consult Rochau, 'Die Moriscos in Spanien' (Leipzig 1853); Boronaty y Barrachina, 'Los moriscos españoles y su expulsion' (Valencia 1901); Lea, 'The Moriscos of Spain' (Philadelphia 1901).

MORISON, Samuel Eliot, American historian: b. Boston, Mass., 9 July, 1887. He was educated at Harvard and at Oxford, and studied in Paris. He became instructor in history in the University of California, 1914, and then served as instructor, lecturer, and is now professor of history at Harvard University. From 1922–25 he was Harold Vyvyan Harmsworth professor of American History at Oxford University, England. He was an American delegate to the Peace Conference (1919), and earlier was on the Am. Commission to Negotiate Peace. His publications include 'Sources and Documents of the Am. Revolution' (1923); 'Oxford History of the United States' (1927), etc.

MORISON, James Augustus Cotter, English biographer and essayist: b. London, 1832; d. 26 Feb. 1888. He was graduated at Oxford in 1859, was a Positivist in philosophy, was one of the most brilliant contributors to the *Saturday Review* and one of the founders of the *Fortnightly Review.* He wrote 'Life and Times of Saint Bernard' (3d ed., 1877); brief biographies of Gibbon, Macaulay and Madame de Maintenon; 'The Service of Man: An Essay toward the Religion of the Future' (2d ed., 1887), which he regarded as his best work. His knowledge of French literature and history was profound.

MORISON, Robert, Scottish botanist: b. Aberdeen, Scotland, 1620; d. London, 10 Nov. 1683. He was graduated from the University of Aberdeen in 1638 but having borne arms as a Royalist in the Civil War, was obliged to take refuge in France when the cause of Parliament triumphed, and took the degree of doctor at Angers in 1648. From 1650 to 1660 he was superintendent of the garden formed at Blois by Gaston, Duke of Orleans. After the Restoration he was appointed by Charles II one of his physicians and botanist royal, and in 1669 became professor of botany at Oxford. His strong point as a botanist was in classification. His chief work is 'Oxford University History of Plants' (1680). Consult Pulteney, 'Sketches of the Progress of Botany' (1790); Sachs, 'History of Botany' (1906); Tournefort, 'Eléments de Botanique' (1797).

MORISONIANS. See EVANGELICAL UNION.

MORISOT, mō'rē-sō, **Berthe** (MADAME EUGÈNE MANET), French painter: b. 1840; d. 1895. As great-granddaughter of Fragonard she inherited from this great French painter his gracefulness, his spirited elegance and other fascinating qualities. Her natural talents she placed under the influence of Corot, Renoir, Dégas and Manet. Having married Eugène Manet, brother of the great painter, she exhibited with the "Impressionists," but always signed her pictures Berthe Morisot, delicately respecting Manet's great name. She acquired her own reputation by distinguished and beautiful coloring and dash. She was as much admired for her beauty as for her talent. A French critic sums up her qualities as follows: "All her work is bathed in brightness, in azure, in sunlight; it is a woman's work, but it has a strength, a freedom of touch and an originality, which one would hardly have expected. Her water-colors, particularly, belong to a superior art: some notes of color suffice to indicate sky, sea or a forest background and everything shows a sure and masterly fancy, for which our time can furnish no analogy. A series of Berthe Morisot's pictures looks like a veritable bouquet, whose brilliancy is less due to the color-schemes which are comparatively soft (gray and blue) than to the absolute correctness of the values. A hundred canvases

and perhaps 300 water-colors attest this talent of high mark. Normandy coasts, scenes with pearly skies and turquoise horizons, radiant gardens of Nice, fruit-laden orchards, girls in white dresses, with big hats wreathed in flowers, young women in ball-dresses and flowers are the favorite themes of this artist.»

MORITZ, mō'rĭts, **Karl Philipp,** German author: b. Hameln, 15 Sept. 1756; d. Berlin, 26 July 1793. He was born of poor parents and became one of the most extraordinary figures in the Sturm und Drang (Storm and Stress) period. After distressful attempts to gain a living he caught the attention of a patron in Hanover and entered the gymnasium to reach quick promotion, but soon accepted an engagement as actor under Ekhof at Gotha, failing in which he returned to study (1776) at Erfurt; but tiring again he joined the Herrnhuter (Moravians) at Barby, and studied theology at Wittenberg (1777); then taught philanthropy at the Potsdam military orphanage, soon again to take to wandering. Teaching in Berlin, he made a reputation as writer, preacher and poet, and went to England; then became professor at the Kölnisches Gymnasium; next tried editing the *Vossische Zeitung* to make it proletarian, but failed. Later, he traveled to Italy (1786) where he met Goethe, who made a favorable influence on his mind, and on his return to Germany he took up residence as Goethe's guest at Weimar. Duke Karl August aided him to a membership in the Berlin Academy of Sciences and he became (1789) professor of antiquities at the Berlin Academy of Art. He wrote much of his life's vicissitudes into his works, notably, 'Anton Reiser' (Berlin 1785–90), an autobiographical novel; 'Andreas Hartkopf' (ib. 1786), also contains other elements from his life. Other important works are 'Versuch einer deutschen Prosodie' (Berlin 1786; later ed., 1815); 'Ueber die bildende Nachahmung des Schönen' (Brunswick 1788; Heilbronn 1888) 'Götterlehre' (Berlin 1791 10th ed., 1851); 'Reisen eines Deutschen in England' (ib. 1783); 'Reisen eines Deutschen in Italien' (ib. 1792–93). Consult Dessoir, 'Karl Philipp Moritz als Aesthetiker' (Berlin 1889); Eibisch, Hugo, 'Anton Reisers kritische Autobiographie' (Leipzig 1909).

MORLAIX, môr-lā, France, capital of an arrondissement in the department of Finistère, picturesquely situated on two hills on the river Dossen, rendered navigable to the town. It is on the government railroad, L'Ouest, and has two churches dating from the 15th and the 16th centuries, besides ancient wooden houses, a commercial court of justice, chambers of commerce and of agriculture, a college, theatre, museum, hydrographic school, etc. Its industries consist of a tobacco factory, hardware, leather and candle factories, besides import trade in coffee, lumber, stearic acid, fertilizers, wine, brandy, petroleum. It has also an export trade in butter, grain, cattle, eggs, vegetables, fish, etc. Its population is about 12,000. It is the birthplace of the generals Moreau and Souvestres.

MORLAND, môr'land, **George,** English painter: b. London, 26 June 1763; d. there, 29 Oct. 1804. His father, himself a painter, gave the boy a severe early training in art, and his proficiency was such that his productions found ready purchasers, while at 10 he exhibited in the Royal Academy and became famous as a copyist of Dutch interiors. Soon after he rebelled against the strict discipline of his father's house, and entered upon a career of dissipation, in the company of stable-boys, money lenders, pimps and pugilists, supporting himself, meanwhile, by the pictures which he painted with amazing facility. So great was his productivity, that he was able to paint one or two pictures daily, and on one occasion completed a large landscape containing six figures, in six hours. The demand for his work was so great that dealers would take them before the oils had dried. In 1786 he took up his residence at Kensal Green, where he changed his mode of life and married the sister of James Ward, the animal painter, and William Ward, the engraver. Here he worked hard, and the moral subjects, after the manner of Hogarth, which he favored at this period, were engraved and became very popular. Soon again, however, he drifted back into his old habits, and, as his pictures were eagerly sought by the dealers, he was able for some time to carry on his reckless career. He had to make many changes of residence to avoid his creditors; and at length, in 1799, he was arrested for debt, but «obtained the rules of the Bench,» took a house within the bounds and continued to practise his art up to his release in 1802. In his later days he suffered from a palsied hand. Under arrest for debt, he died in a sponging-house. His epitaph for himself was, «Here lies a drunken dog.» The art of Morland is characterized by a picturesque representation of rural life in its homelier aspects, his rustic story being always happily conceived and skilfully told. He is one of the first genre and animal painters of the English school, and his reputation has increased of recent years. He painted about 4,000 pictures, 192 of which were engraved during his lifetime. Six of his best paintings are in the Kensington Museum, and the 'Farmhouse Stable' in the National Gallery is sometimes considered his masterpiece. The New York Historical Society possesses his 'Old English Sportsman' and 'Dogs Fighting'; the Metropolitan Museum the 'Mid-day Meal' and 'Weary Wayfarers' and the Corcoran Gallery, Washington, 'The Farmhouse.' Consult Collins, W., 'Memoirs for Picture' (1803); and memoirs or biographies by Dawe (1807); Gilbert and Cuming (1907); Richardson, Ralph (1895); Williamson, G. C. (1904) and Wilson, D. H. (1907).

MORLAND, Sir **Samuel,** English inventor and diplomat: b. Sulhampstead-Bannister, Berks, 1625; d. Hammersmith, 30 Dec. 1695. He studied at Winchester School and at Magdalen College, Cambridge; was a tutor at Cambridge in Pepys' day; and about 1650 devoted himself to diplomacy. Cromwell sent him to Sweden in 1653; and in 1655 to the Duke of Savoy, to protest against the persecution of the Waldensians, in whose history he became deeply but none too intelligently interested, his 'History of the Evangelical Churches of the Valley of Piedmont' (1658), relying as it did to some extent on documents that were forgeries, being absolutely misinformed and unreliable. He was

alienated from the Commonwealth when he learned of Sir Richard Willis' plot against Charles II, and thereafter favored the Restoration. The king rewarded his support with a baronetcy. Subsequently, he withdrew from public life, devoted his time to mechanical experiments, and became one of the first to demonstrate the utility of steam power for propulsive purposes.

MORLEY, Christopher Darlington, American author: b. Haverford, Pa., May 5, 1890. He was graduated from Haverford College in 1910, was appointed a Rhodes scholar, and studied at New College, Oxford University, from 1910 to 1913. He then joined the editorial staff of Doubleday, Page & Company. From 1917 to 1920 he was successively with the *Ladies' Home Journal* and the Philadelphia *Public Ledger,* and from 1920 to 1924 he served on the staff of the New York *Evening Post.* He was a contributing editor of the *Saturday Review of Literature* from 1924 to 1940, and subsequently served as one of the judges of the Book-of-the-Month Club. In 1937, he edited, with Louella D. Everett, the revised edition of Bartlett's *Familiar Quotations.* His published works include essays, fiction, plays, and poetry. Among them are *Parnassus on Wheels* (1917); *Shandygaff* (1918); *The Haunted Book Shop* (1919); *Three's a Crowd,* with Earl Derr Biggers (1920); *Tales from a Rolltop Desk* (1921); *Where the Blue Begins* (1922); *The Powder of Sympathy* (1923); *Pandora Lifts the Lid,* with Don Marquis (1924); *One Act Plays* (1924); *Thunder on the Left* (1925); *The Romany Stain* (1926); *Off the Deep End* (1928); *Seacoast of Bohemia* (1929); *John Mistletoe* (1931); *Human Being* (1932); *Mandarin in Manhattan* (1933); *The Trojan Horse* (1937); *Kitty Foyle* (1939); *Thorofare* (1942); *The Middle Kingdom* (1944); *Spirit Level* (1946); *The Old Mandarin* (1947).

MORLEY, Felix Muskett, American author and educator: b. Haverford, Pa., Jan. 6, 1894. He was graduated from Haverford College in 1915, was appointed a Rhodes scholar, and from 1919 to 1921 studied at New College, Oxford University. In 1921–1922, he was a research fellow at the London School of Economics, and in 1928–1929 a Guggenheim fellow in political science. He received a Ph.D. degree from the Brookings Institution in 1936. From 1922 to 1929 he was a member of the staff of the Baltimore *Sun,* serving as correspondent in the Far East (1925–1926) and at Geneva (1928–1929). He was director of the Geneva office of the League of Nations Association from 1929–1931, and became a member of the staff of the Brookings Institution in 1931. From 1933 to 1940 he was editor of the Washington *Post,* and from 1940 to 1945 president of Haverford College. In addition to numerous articles, he wrote *Unemployment Relief in Great Britain* (1924); *Our Far Eastern Assignment* (1926); *and The Society of Nations* (1932). In 1936, he received the Pulitzer Prize for editorial writing.

MORLEY, Frank, American mathematician: b. Woodbridge, Suffolk, England, Sept. 9, 1860; d. Baltimore, Md., Oct. 17, 1937. He studied at King's College, Cambridge University, receiving the degrees of A.B. (1883), A.M. (1886), and ScD. (1898). From 1884 to 1887 he was a master of Bath College, England. He then went to the United States, becoming (1887–1888) instructor, then (1888–1900) professor, of pure mathematics at Haverford College. From 1900 to 1928 he was professor of mathematics at Johns Hopkins University. From 1900 to 1930 he was editor of the *American Journal of Mathematics.* His works include *Elementary Treatise on the Theory of Functions,* with James Harkness (1893); *Introduction to the Theory of Analytic Functions* (1898); *Inversive Geometry,* with his son, Frank V. Morley (1933). He was also the father of Christopher Morley and Felix Morley (qq.v.).

MORLEY, Henry, English author: b. Hatton Garden, London, Sept. 15, 1822; d. Carisbrooke, Isle of Wight, May 14, 1894. Educated at King's College, London, he practiced medicine in Somerset and Shropshire; taught at Manchester and Liverpool; and was connected editorially with Charles Dickens' periodicals, *Household Words* and *All the Year Round.* From 1859 to 1865, he served as editor of the *Examiner,* and from 1865 to 1889 as professor of English literature, University College, London. In 1878, he occupied a similar post at Queen's College, London, and from 1882 to 1890 was principal of University Hall. He edited Morley's Universal Library (1883–88), Cassell's National Library (1886–90), and the Carisbrooke Library (1889–91). Among his works are several biographies—*Palissy the Potter* (1852), *Jerome Cardan* (1854), *Cornelius Agrippa* (1856), and *Clément Marot* (1870); and a history of English literature, *English Writers,* 10 vols. (1864–94). Morley devoted his life to the popularizing of good literature and often lectured on literary subjects.

MORLEY, John, Viscount Morley of Blackburn, English author and statesman: b. Blackburn, Lancashire, England, Dec. 24, 1838; d. London, Sept. 23, 1923. The son of a surgeon, he was educated at University College School, London, Cheltenham College, and Lincoln College, Oxford University, receiving the degree of A.B. in 1859. While at Oxford, he was influenced by the positivist teachings of Auguste Comte and the economic theories of John Stuart Mill. After 1860 he was a journalist in London, in 1863 joining the staff of the *Saturday Review.* From 1867 to 1882 he served as editor of the *Fortnightly Review.* During his editorship this magazine became known for its high literary standards and liberal views and attracted many eminent contributors. Beginning in 1878, he edited the *English Men of Letters* series, and from 1880 to 1883 was editor of the *Pall Mall Gazette.* It was at this time that he first became associated with the cause of Irish home rule, opposing the policy of coercion in Ireland which then found favor with leaders of the Liberal Party. He was elected to Parliament from Newcastle as a Liberal in 1883. After the conversion of his party to home rule, he accepted the post of chief secretary for Ireland in the short-lived Gladstone Cabinet of 1886. This appointment was acceptable to Irish nationalists because, unlike Gladstone and the majority of his colleagues, he had no previous record of political action on the subject of Ireland. He became the trusted intermediary in the difficult and delicate negotiations between the Irish members of Parliament and the Cabinet leading to the introduction of the first two home rule bills. After the defeat

of the measure of 1886, he made many speeches in England and Ireland in favor of home rule. From 1892 to 1895 he was again secretary of state for Ireland. Defeated at Newcastle in the general election of 1895—largely because he had refused to vote for an eight-hour law—he was elected in the following year for the Montrose Burghs, a seat he held until his elevation to the peerage in 1908. As secretary of state for India (1905–1910), he worked with the viceroy, the 4th earl of Minto, to achieve notable legislative reforms. He then became lord president of the council but, because of his well-known pacifist views, resigned this office at the outbreak of World War I in 1914.

Morley was considered the epitome of late Victorian liberalism. He had a distingusihed career in public affairs, but it was as a writer and editor that he made his most notable contribution. The most eminent biographer of his time, he published *Voltaire* (1872); *Rousseau* (1873); *Diderot and the Encyclopaedists* (1878); *Burke* (1879); *Life of Richard Cobden* (1881); *Walpole* (1889); and the monumental *Life of Gladstone* (3 vols., 1903). Among his other works are several editions of *Critical Miscellanies; On Compromise* (1874); *Studies in Literature* (1891); and *Recollections* (2 vols., 1917).

Consult Hirst, Francis F., *Early Life and Letters of John Morley,* 2 vols. (New York 1927); Staebler, Warren I., *The Liberal Mind of John Morley* (Princeton 1943).

MORLEY, Sylvanus Griswold, American archaeologist: b. Chester, Pa., June 7, 1883; d. Santa Fe, N. Mex., Sept. 2, 1948. He was educated at Harvard (B.A., 1907; M.A., 1908), and from 1909 to 1914 did field work in Mexico and Central America for the School of American Archaeology. From 1915 to 1940 he was associated with the Carnegie Institution of Washington, directing its project at Chichén Itzá (q.v.) from 1924. Morley became a leading authority on the ancient Maya. His published works include *An Introduction to the Study of Maya Hieroglyphs* (1915); *The Inscriptions at Copán* (1920); *Guide Book to the Ruins of Quirigua* (1935); *The Inscriptions of Petén* (5 vols., 1938); and *The Ancient Maya* (1946).

MORLEY, Thomas, English composer: b. 1557; d. London, England, ?1603. He was a pupil of William Byrd. After receiving the degree of bachelor of music at Oxford in 1588, he probably became organist of St. Giles, Cripplegate. About 1591 he became organist of St. Paul's, and in the following year was appointed gentleman of the Chapel Royal (because of ill health he resigned this position in 1602). In 1598 he was given an exclusive, 21-year license to print music books and sell ruled music paper. Between 1593 and 1600 he published six books of canzonets, madrigals, and ballets; *The First Booke of Aires* (1600) contains the page's song which he composed for *As You Like It.* He also edited collections of works by others, including *The Triumphs of Oriana* (1601) in honor of Elizabeth I, and he wrote *A Plaine and Easie Introduction to Practicall Musicke* (1597).

MORLEY, municipal borough, England, situated in the West Riding of Yorkshire, 4 miles southwest of Leeds. It has establishments producing woolens and worsteds, textile machinery, glass, pharmaceuticals, and leather, and there are coal mines and stone quarries nearby. Morley was the site of a Royalist siege during the Civil War. Pop. (1951) 39,783.

MORMON CRICKET, the common name of a large, black, wingless grasshopper (*Anabrus simplex*) of the Rocky Mountain states. Its periodic migrations have caused great crop destruction, and the United States Department of Agriculture pursues an active program of control.

MORMONS. The term "Mormons," which is derived from the *Book of Mormon,* is a nickname applied to members of the Church of Jesus Christ of Latter-day Saints, whose headquarters are in Salt Lake City, Utah.

HISTORY

Joseph Smith (q.v.), the founder of the church, was born on Dec. 23, 1805, in Sharon, Vt. In 1816 he accompanied his family to upstate New York. The Smiths were honest, God-fearing people who loved their country, read the Bible, and prayed, but belonged to no church. Joseph relates that, when he was between 14 and 15 years of age, a religious revival in which the ministers of all the various denominations joined was held in his neighborhood. His mother and three of his brothers and sisters joined the Presbyterian Church. Joseph had a strong desire to join a church himself, but did not know which one to choose. While pondering this question, he read (James 1:5): "If any of you lack wisdom, let him ask of God, that giveth to all men liberally, and upbraideth not; and it shall be given him." Acting on this admonition, he retired to a grove near his home in the vicinity of Palmyra. Here, he relates that, in answer to his prayer, he received a glorious vision in which the Father and the Son appeared to him: "I saw two personages whose brightness and glory defied all description standing above me in the air. One of them spake to me, calling me by name, and said, pointing to the other, 'This is My Beloved Son. Hear Him.'" The Son thereupon declared to the young man the great mission which he was to be called to perform.

Smith further relates that on the night of Sept. 21, 1823, while he prayed for divine guidance, there appeared in his room a glorious light in the midst of which stood a person clothed in white with a countenance of radiant purity. The visitor announced himself as Moroni, a messenger sent from the presence of God, and said that there was a book deposited in a hill written on plates of gold giving an account of the former inhabitants of the North American continent and the source from which they sprang. The following day, Smith tells us, he went to the hill which he had seen in the vision and with some labor laid bare the stone box containing the plates and other things spoken of by the messenger. The angel again stood beside him and forbade him to move the contents of the box, explaining that four years were to elapse before the plates could be committed to his care, and that it would be his duty to visit the spot at yearly intervals. The bringing forth of the plates from their resting place of centuries and their translation were eventually completed, and the book was published in Palmyra, N. Y., in 1830. This first edition of the *Book of Mormon* consisted of 5,000 copies. Since then many editions have been published, millions of copies have been distributed, and the work has been translated into many different languages.

The Organization of the Church.—Lying at

the center of Mormonism is the question of divine authority. Joseph Smith affirms that his authority was conferred on him by direct administration of heavenly beings, each of whom had once exercised the same power on earth. He relates that on May 15, 1829, the Aaronic or lesser priesthood was conferred on him and on Oliver Cowdery by John the Baptist. In delivering his message, John stated that he was acting under the direction of the Apostles Peter, James, and John, in whose hands reposed the keys of the Melchizedek or higher priesthood, which in time would be given. This promise, affirmed Smith, was fulfilled later that year when the three apostles visited him and Cowdery, ordaining them to the apostleship, which comprises all the offices of the higher order of priesthood and carries authority to administer in all of the established ordinances of the Gospel.

The organization of the church as a body corporate was effected on April 6, 1830, in Fayette, N. Y., with six members, the minimum required by state law. The first gathering place of the infant church was in Kirtland, Ohio. Here the first stake of Zion was organized, the first temple was built, the School of the Prophets was established, and the church was more completely organized.

The Church in Missouri.—In the summer of 1831 the first group of Mormons arrived in western Missouri, settling in Jackson County on lands secured from the federal government and dedicated as a site for the center stake of Zion. Things did not work out as anticipated. The Mormons differed socially and religiously from the old settlers. Most of them were from the Northern and Eastern states and were in sympathy with the abolitionists, while Missouri was linked with the South and was a proslavery state. Intolerance, jealousy, and hatred were soon manifest toward the gathering Mormons. As a consequence, 15,000 members of the church were forced to flee from their Missouri homes. Through the winter of 1838–1839 they painfully made their way eastward toward Illinois, and many died from exposure or illness. A number of the leaders of the church were imprisoned, and Brigham Young (q.v.) directed this sorrowful migration.

Nauvoo.—The people of Quincy, Ill., received the refugees with kindness, provided for their necessities, and sought employment for their men. In the spring of 1839 land was purchased at Commerce, 45 miles north of Quincy, and a settlement was established there. Commerce was then a mosquito-infested bog. The Mormons drained the swamps, planned a city with streets intersecting at right angles, and built homes. With very little else than their bare hands they transformed the bog into a beautiful city called Nauvoo, which in six years had a population of about 20,000. Here they erected a temple regarded as one of the finest structures west of the Allegheny Mountains.

The time came when the Mormons, who usually voted as a unit, held the balance of power in Illinois elections. This aroused the animosity of their opponents to a murderous degree and was a contributing factor in the martyrdom of Joseph Smith and his brother Hyrum at the hands of a mob of 200 men in Carthage, Ill., on June 27, 1844. Brigham Young, president of the Quorum (Council) of the Twelve Apostles, succeeded Smith as leader of the church. Persecution reached a point where it became evident that the Mormons must leave Illinois. On Feb. 4, 1846, the first of them left Nauvoo and crossed the Mississippi.

The Migration to Utah.—During the year 1846 thousands of Mormons made their way across Iowa and reached Council Bluffs, on the east side of the Missouri River. Crossing to the west bank, they established what is known in Mormon history as Winter Quarters (the site is in modern Omaha, Nebr.). From here, in April 1847, the first company of pioneers began their historic trek across the Great Plains, arriving in Salt Lake Valley on July 21-24, 1847. From then until the completion of the railroad in 1869, more than 80,000 Mormons crossed the plains with ox teams and handcarts. Of those who started, 6,000 were unable to finish and were buried in nameless graves by the roadside.

In 1849 the State of Deseret was formed, with Young as governor (see DESERET, STATE OF). Two years later, when Utah was given a territorial government, he was appointed its first governor.

Mormon Expedition.—False and inflammatory charges were made by corrupt officials, appointees of the federal government, against Governor Young and the Mormon people. These charges were accepted at face value by President James Buchanan, who determined in 1857 to change the governor and the judges and directed that an army commanded by Col. Albert S. Johnston accompany the new appointees to sustain them and to suppress a falsely reported rebellion among the Mormon people, which in fact did not exist. (Johnston's force is known in history as the Mormon Expedition.) The people of Utah resented the coming of this army and prepared to burn their homes, lay waste their fields, and move. Many did move temporarily to the southern settlements. Alfred Cumming, the newly appointed governor, came to Salt Lake City without guards and was received with honor in 1858. After his arrival, and on his recommendation, a commission was appointed to investigate matters, and the critical situation was cleared up.

Polygamy.—The controversy over polygamy was a very bitter one. This doctrine, which was announced by Joseph Smith in Nauvoo in 1843, was not publicly taught until 1852. The practice was limited—not more than 3 per cent of the marriages among the Mormon people were polygamous. Moreover, it was kept on a high spiritual level, and only those deemed worthy of the ceremony and ordinance were permited to enter into it. It was the kind of thing, however, which the enemies of the church could easily capitalize on to make trouble.

In 1862, Congress passed an antipolygamy law. This law was considered unconstitutional by many people in the nation and generally by the Mormons as infringing on their religious liberty, and few persons were prosecuted under it. The Edmunds Act of 1882 made polygamy punishable by fine or imprisonment. No man who had more than one wife could act as a juror in a Utah court, and in Idaho members of the church were disfranchised. The Edmunds-Tucker Act of 1887 gave added power to judges to try polygamy cases. This act also disincorporated the church, ordered the executive to take appropriate action to wind up its affairs, and required that its property be escheated to the nation. The law was administered with harshness. Numerous Mormons were disfranchised, many men were imprisoned because they had plural families, and homes were broken. The election machinery was taken from the hands of the people. As a result of a Supreme Court decision sustaining the law, Mormon Presi-

dent Wilford Woodruff, on Oct. 6, 1890, issued what is known in church history as the Manifesto. It declared an end to the practice of plural marriage, and since that time the church has not practiced or sanctioned such marriages.

Statehood and Subsequent Developments.—On Jan. 4, 1896, Utah, under a proclamation issued by President Grover Cleveland, entered the Union as a state, and on March 28 of that year what was left of the escheated property was returned to the church by act of Congress.

Brigham Young, who had presided over the church for 30 years, was succeeded in 1877 as president by John Taylor (he was acting president until 1880). It was during Taylor's presidency that the crusade against polygamy was at its height. After Taylor's death the following served as president: Wilford Woodruff (1889–1898), Lorenzo Snow (1898–1901), Joseph Fielding Smith (1901–1918), Heber Jedediah Grant (1918–1945), George Albert Smith (1945–1951), and, since 1951, David O. McKay.

ORGANIZATION, BELIEFS, AND WORK

Mormons believe that two major responsibilities rest on the church: (1) to proclaim the truth to all the world, and (2) to perfect the lives of those who accept it. The organization is suited to the promotion of these objectives.

Government and Organization.—The government and organization of the Mormon Church center in the priesthood, which Mormons define as the power of God delegated to man by which he is authorized to act in the name of and by the authority of God. The Aaronic priesthood has to do mainly with the temporal affairs of the church: the collection of offerings, distribution of charities, and care of properties belonging to the church; the administration of the outward ordinances of the Gospel, such as baptism, administration of the sacrament; and the supervision of ward teaching. The offices in this lesser priesthood are priest, teacher, and deacon. There is a general presidency of the Aaronic priesthood, called the Presiding Bishopric, which consists of three high priests, one of whom is bishop and the two others counselors. These high priests are designated and ordained by the First Presidency, and sustained by the vote of the people of the church.

The Melchizedek priesthood has to do with spiritual affairs: the proclamation of the truth to the world, bearing witness to it, and directing the general activities of the church, including the supervision of temporal affairs. From members of this priesthood are drawn the administrative officers of the church. The offices are apostles, high priests, seventies, and elders. There is in addition the office of patriarch, which corresponds to evangelist.

At the head of the entire church is the presiding high priest with his two counselors, who are known as the First Presidency. The whole government of the church, temporal and spiritual, is lodged in these three men.

In the Mormon Church there is no clergy class. All men who desire to hold the priesthood and are worthy to do so may receive it. It can be conferred only by one who holds it and who is authorized to confer it. Services in the church are widely distributed and gratuitous.

Geographically, the church is divided into stakes, wards, branches, and missions. A ward is a local unit, corresponding roughly to a parish, that is presided over by a bishop and two counselors, who are assisted by a large corps of officers. Each individual has a definite responsibility. Directly under the bishopric are persons called to work as ward teachers who visit each home at least once a month. Stakes, which are composed of an average of eight wards, are presided over by a stake president with two counselors. These men are assisted by a council of 12, who constitute the high council of the stake. A branch is a smaller division than a ward and is presided over by a branch president.

All of the territory lying outside the boundaries of the stakes is divided into missions presided over by mission presidents. It is each mission president's responsibility to look after the welfare of all the branches and members of the church within his mission and to direct all missionary labors in his field.

In addition to the regular church organization there are five auxiliary organizations: the Sunday schools, the Relief Society for women, the Young Men's Mutual Improvement Association, the Young Women's Mutual Improvement Association, and the Primary Association for children.

As of April 1955, there were 1,993 wards, 219 stakes, and 42 missions. The total membership of the church was approximately 1,302,240 with 180,000 men holding the Melchizedek priesthood and 136,000 boys and men belonging to the Aaronic priesthood.

Beliefs.—Four books are accepted by the church as containing the revealed words of God and as being the written authoritative guides in faith and doctrine. They are the Bible, the *Book of Mormon,* the *Doctrine and Covenants,* and *The Pearl of Great Price.* One of the cardinal principles of the church is the doctrine of continuous revelation—that is, that God continues to reveal His mind and will to His children, supplementing the revelations of the past. The *Book of Mormon, Doctrine and Covenants,* and *The Pearl of Great Price* have been added to the Bible as scriptures pursuant to this principle. The people stand ready to accept further revelation when it shall come through the proper source.

The church has no formulated creed. Its cardinal doctrines are concisely stated in the *Articles of Faith,* which were written by Joseph Smith in 1842:

1. We believe in God, the Eternal Father, and in His Son, Jesus Christ, and in the Holy Ghost.
2. We believe that men will be punished for their own sins, and not for Adam's transgression.
3. We believe that through the Atonement of Christ, all mankind may be saved, by obedience to the laws and ordinances of the Gospel.
4. We believe that the first principles and ordinances of the Gospel are: first, Faith in the Lord Jesus Christ; second, Repentance; third, Baptism by immersion for the remission of sins; fourth, Laying on of hands for the gift of the Holy Ghost.
5. We believe that a man must be called of God, by prophecy, and by the laying on of hands, by those who are in authority to preach the Gospel and administer in the ordinances thereof.
6. We believe in the same organization that existed in the Primitive Church, viz., apostles, prophets, pastors, teachers, evangelists, etc.
7. We believe in the gift of tongues, prophecy, revelation, visions, healing, interpretation of tongues, etc.
8. We believe the Bible to be the word of God as far as it is translated correctly; we also believe the Book of Mormon to be the word of God.
9. We believe all that God has revealed, all that He does now reveal, and we believe that He will yet reveal many great and important things pertaining to the Kingdom of God.
10. We believe in the literal gathering of Israel and in the restoration of the Ten Tribes; that Zion will be built upon this (the American) continent; that Christ will reign personally upon the earth; and, that the earth will be renewed and receive its paradisiacal glory.

11. We claim the privilege of worshiping Almighty God according to the dictates of our own conscience, and allow all men the same privilege, let them worship how, where, or what they may.
12. We believe in being subject to kings, presidents, rulers, and magistrates, in obeying, honoring, and sustaining the law.
13. We believe in being honest, true, chaste, benevolent, virtuous, and in doing good to all men; indeed, we may say that we follow the admonition of Paul—We believe all things, we hope all things, we have endured many things, and hope to be able to endure all things. If there is anything virtuous, lovely, or of good report or praiseworthy, we seek after these things.—Joseph Smith.

These articles are not to be regarded as a complete exposition of faith, for, as stated in Article 9, ". . . we believe that He will yet reveal many great and important things pertaining to the Kingdom of God."

Missionary Work.—Since its organization the church has carried on missionary work in most of the civilized countries of the world. Missionaries are volunteers who give their time, pay their own expenses, and serve for about two years. They travel in pairs and labor under the direction of their mission president.

Education.—"It is impossible for a man to be saved in ignorance" (*Doctrine and Covenants* 131:6) is a Mormon aphorism. Education with the Mormons is a matter of religious significance. This has resulted in the development of a carefully coordinated plan for the secular and religious training of church members. The church maintains 155 seminaries adjacent to high schools, where religious instruction is given to Latter-day Saint children attending these schools; and 15 institutes adjacent to universities, where religious instruction is given to Latter-day Saint students attending these institutions. It also maintains Ricks College in Rexburg, Idaho, and Brigham Young University in Provo, Utah.

Word of Wisdom.—In 1838, Joseph Smith received a revelation known as the Word of Wisdom. This is regarded by Mormons as a divine law of health and enjoins on members of the church total abstinence from the use of tea, coffee, tobacco, wine, and strong drinks, and counsels moderation in all things.

Temples.—Latter-day Saints believe in vicarious work for the dead. They believe that the Gospel is preached in the spirit world so that all people may have the opportunity of accepting it. They also believe that all ordinances necessary for the salvation of the dead who accept the Gospel must be performed here on earth. For this purpose temples are erected. Mormons believe that marriages solemnized in these temples, by one authorized to perform them, are for time and eternity.

To do this work for the dead it is necessary to have each individual's genealogical record. The church therefore organized its own genealogical society and established in Salt Lake City one of the best genealogical libraries in the United States.

Tithing.—Tithing is the revenue law of the church. One tenth of a member's annual income is given to the church through the bishop for general church purposes. The money is used for the building and maintenance of temples, meetinghouses, and other buildings; the support of education and the missionary system; and the care of the sick. Payment is voluntary, and those without income are exempt.

Church Welfare Program.—The church has a unique plan for caring for its poor, the Church Welfare Program, organized in 1936. Its aim is to help the people to help themselves. The program has a twofold objective: (1) to put to work every employable person for whose temporal welfare the church assumes a responsibility, and (2) to obtain and administer for the needy life's necessities.

To obtain these necessities the bishops have two sources of income: (1) cash received from fast offerings, and (2) commodities received from welfare projects. Members of the church are asked to abstain from eating two meals on the first Sunday of the month and to give the equivalent of what they have saved from fasting to the support of the needy. This puts in the hands of the bishop a sizable sum with which to meet the cash requirements of the needy of his ward. Throughout the church stakes and wards are encouraged to develop projects through voluntary contributions of church members. These provide opportunities for welfare recipients to labor for what they receive. Such projects produce grain and grain products, meat, dairy, and poultry products, fruit and vegetables, fuel, furniture, bedding, and other commodities.

See also SALT LAKE CITY; UTAH—*History*.

JOSEPH ANDERSON,
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EDITOR'S NOTE.—The Reorganized Church of Jesus Christ of Latter Day Saints, whose members do not call themselves Mormons, is treated in a separate article.

MORMYRIDAE, mô-mĭr'ĭ-dē (from Gr. *mormyros,* sea fish), a family of fishes from the Nile River and all fresh waters of tropical Africa except those of Kenya, Tanganyika, and Uganda. There are some 11 genera. The mouth is small, and the jaws are often set at the end of a tubular snout; the vertical fins are far back on a body whose greatest depth is back of the mid-line. The eyes are small and covered by a membrane. The skull structure is highly specialized, and the brain is larger in proportion to the body size than in any other fish.

Though easily recognized as members of the family, some species are fairly normal looking, but others—for example, some species of *Gnathonemus*—have elephantlike trunks from the tip of which hang fleshy filaments. Some species reach five feet in length, but most are much smaller. Their rather flat bodies weigh little for their length. They vary in color from brown, purplish, or greenish to silvery and sometimes have chalk-white bellies. Some species, perhaps all, are equipped with weak electric organs, apparently for nonvisual perception of their surroundings.

The mormyrids are mud grubbers, living in muddy streams and lakes and eating larval insects and worms. Anglers sometimes hook them. Some natives eat them, but Hugh Copley tried this and thought he was being poisoned.

Consult Boulenger, George A., *Catalogue of the Fresh-Water Fishes of Africa,* vol. 1 (London 1909); Copley, Hugh, *The Game Fishes of Africa* (London 1952).

CHRISTOPHER W. COATES,
The Aquarium, New York Zoological Society.

MORNAY, môr-nā', Philippe de, SEIGNEUR DU PLESSIS-MARLY (commonly known as DU-

PLESSIS-MORNAY), French Huguenot leader: b. Buhy, Normandy, France, Nov. 5, 1549; d. La Forêt-sur-Sèvre, Nov. 11, 1623. He was converted to Protestantism by his mother and, after studying at Heidelberg and Pavia, entered the service of Admiral Gaspard de Coligny. In 1572, at the time of the Massacre of St. Bartholomew, he escaped to England. Returning to France in 1573, he took up arms for the Huguenot cause. In 1576 he became an adviser of Henry of Navarre, who employed him on diplomatic missions and appointed him governor of Saumur. His influence grew steadily, and he became known as the Huguenot pope. In 1593, after Henry became a Roman Catholic, Mornay retired to Saumur, where he founded a Protestant university and devoted himself to writing. He remained at Saumur until 1620, when he was forced to resign his post. His principal published work is *De l'institution, usage et doctrine du sainct sacrement de l'eucharistie en l'église ancienne* (1598). His *Mémoires* were published posthumously in 1624–1651, and in a 12-volume edition in 1824.

MORNING-GLORY, the name of a very popular twining herb, the common morning-glory (*Ipomoea purpurea*), naturalized from tropical America and widely cultivated in many named varieties, with flowers ranging from purple, red, and bluish to white and variegated forms. The name is also applied to the entire genus *Ipomoea* of the morning-glory family, Convolvulaceae (q.v.), found in all warm parts of the world. Broadly defined, *Ipomoea* includes about 400 species of (1) annual twiners like *I. hederacea,* whose seeds yield the medicinally useful resin pharbitisin, and *I. purpurea;* (2) perennial twiners like man-of-the-earth or wild potato vine (*I. pandurata*), with long, heavy tuberous roots and white flowers, found in the southern United States, and the Mexican true jalap (*I. purga* or *Exogonium purga*), with tuberous roots weighing 40 to 50 pounds (source of the drug jalap) and purplish rose flowers; and (3) evergreen twiners, often seen in greenhouses, like the West Indian *I. Horsfalliae,* with deep rose flowers, and the blue dawn flower (*I. Learii*), with bright blue flowers that turn magenta with age. See also JALAP.

THEODOR JUST.

MORNINGSIDE COLLEGE, a coeducational institution of higher learning in Sioux City, Iowa. It is affiliated with the Methodist Church. Chartered as the University of the Northwest in 1889, it was reincorporated under its present name in 1894. The curriculum is divided into divisions of fine arts, humanities, natural science, and social studies. In 1953 the grounds, buildings, and equipment were valued at $1,690,338, and the endowment totaled $922,093. In the 1954–1955 academic year there were 35 full-time faculty members and 1,243 students.

MORNY, môr-nē′, DUC **Charles Auguste Louis Joseph de,** French politician: b. Paris, Oct. 23, 1811; d. there, March 10, 1865. The illegitimate son of Comte Auguste Charles Joseph de Falhaut de la Billarderie and Hortense de Beauharnais (qq.v.), wife of Louis Bonaparte, he was known as the comte de Morny until 1862, when he was created a duke by his half brother, Napoleon III. From 1830 to 1838 he served with some distinction in the French Army, part of the time in Algeria, after which he combined commercial speculation with politics. Becoming a deputy in 1842, he played a major role in the coup d'état of Dec. 2, 1851, and as minister of the interior (1851–1852) and president of the Corps Législatif (1854–1865) exerted much influence in the Second Empire. His usually successful and probably unscrupulous commercial speculation included mining interests in Sonora, Mexico, and one of Maximilian's secretaries asserted that Morny was the chief buttress in France of the Mexican Empire. While serving (1856–1857) as envoy at the coronation of Alexander II of Russia, he married Princess Sophie Trubetzkoi.

MOROCCO, mô-rŏk′ō (Fr. MAROC; Sp. MARRUECOS; Arab. EL MAGHREB EL AQSA, literally "the Far West"), a territory of northwestern Africa, sometimes referred to as the Sherifian Empire (from "sherif," a descendant of Mohammed) and consisting of three zones: the French, the Spanish, and the international zone of Tangier. Morocco is located between latitudes 35° N. and 28° N. and longitudes 10° W. and 1° W., and is bounded on the north by the Mediterranean Sea, on the west by the Atlantic Ocean, on the east and southeast by Algeria, and on the southwest by Río de Oro (Spanish Sahara). The border with Algeria is only partially defined.

The total area of 165,651 square miles is divided among the protectorates of France (147,888 square miles) and Spain (10,039 square miles), and the international zone of Tangier (135 square miles). Ifni is a small Spanish enclave on the southwestern coast of French Morocco. Rabat and Tetuán are the administrative capitals of the French and Spanish protectorates, respectively; Fez (Fès) and Marrakech have been historically considered as northern and southern capitals, respectively, with residences of the sultan in each.

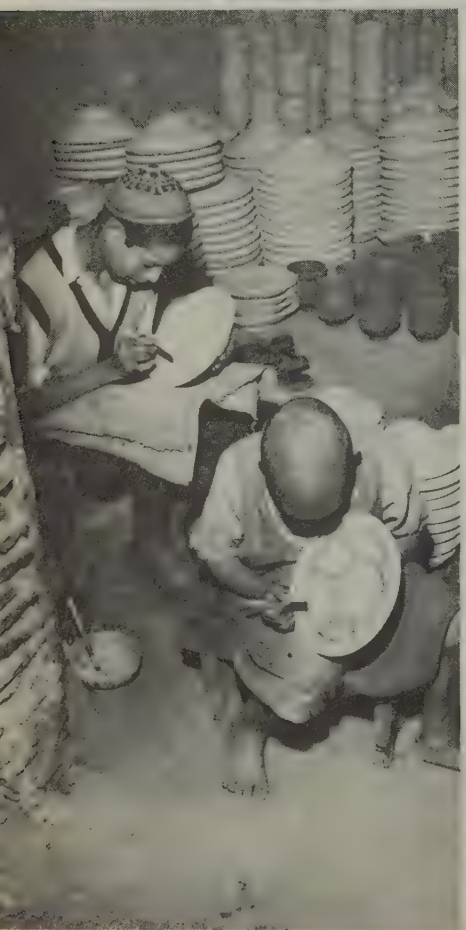
The Land.—Morocco may be divided roughly into three areas, according to marked differences in terrain: (1) the northern coastal massif, along the Mediterranean, comprising a chain of lesser mountains known as Er Rif, part of the Maritime Atlas, and varying in elevation up to about 8,000 feet; (2) the great mountain system of the Atlas, occupying most of the French zone and extending in three parallel ranges from the Atlantic coast in the southwest to Algeria and the Mediterranean in the northeast; and (3) the wide plateaus and lowlands lying between the mountain systems and extending westward from the foothills of the Atlas to the Atlantic. Both the mountain ranges and the Atlantic tend to moderate the tropical heat of Africa, and to provide a relatively equable temperature of between 40° and 90°F. in the northwesterly regions where the largest centers of population are located. Maximum annual rainfall of about 30 to 40 inches occurs in the northwest.

The Grand Atlas (or High Atlas) Mountains, with an average elevation of 11,000 feet, extend from the southwestern coast between Mogador and Agadir northeastward to Algeria, and contain several of the highest peaks of North Africa, among them Mount Toubkal (13,665 feet). South of the Grand Atlas are the Anti-Atlas Mountains, with volcanic Mount Siroua (about 10,900 feet); while extending northeastward from the Grand Atlas chain are the Middle Atlas Mountains, with Bou Naceur (10,794 feet). Between the Atlas

(Top) Wide World Photos; (bottom) Charles Phelps Cushing

MOROCCO: *Top:* Street in Marrakech, one of the traditional capitals of the sultanate and French Morocco's largest city. Reed awnings protect buyers and merchants from midday glare. The sooks, or booths, characteristic of the Muslim East, open directly on the street. *Bottom:* Moorish gate in Fez, one of Islam's sacred cities.

Above: At Fès el Bali, founded 808 A.D., and oldest of three towns encompassed by modern Fez, age-old handicrafts are practiced with techniques unchanged in a millennium. The two in the foreground spin wool thread, their father and brother weave it into blankets.



Left: In this potter's workshop in Old Fez (Fès el Bali) boys paint designs in typical Moroccan oranges and blues on dishes fresh from the kiln.

Wide World Photos

Below: A craftsman in brass and copper, wearing traditional form of felt cap, the fez, working at his trade in Old Fez.

ranges and the northern coastal mountains is the Taza corridor, providing the principal rail and motor route to Algeria.

The rivers flow generally northwestward to the Atlantic, or southeastward toward the Sahara; an exception is the Moulouya (Muluya) which flows northeastward from the Grand Atlas on a 350-mile course to the Mediterranean. Principal rivers with outlets in the Atlantic are the Oum er Rebia, Sebou (Sebu), Bou Regreg, Tensift, and Sous (Sus). The Wad Dra (Oued Dra) flows eastward from the Atlas, turns southwestward on the Algerian border, and completes its course in the Atlantic at the southern border with Río de Oro. Other southward-flowing rivers, notably the Ziz (Zis) and Ghéris (Ghir), periodically diminish or disappear entirely in the Sahara. The Atlantic coast offers few natural harbors, but efficient port facilities have been built at Casablanca, which handles most of Morocco's external trade, and at Safi, which is linked by rail with the mining center of Louis Gentil and with Marrakech. Port Lyautey is an important center on the lower Sebou.

The People.—The total population of Morocco in mid-1953 was estimated by United Nations sources at 9,439,000, including 8,220,000 in the French zone (as compared with 8,617,387 at the 1947 census); 1,035,000 in the Spanish zone (1,082,009 at the 1945 census); and 184,000 in Tangier. The large nonindigenous population included 362,814 Europeans (chiefly French) and 199,156 native Jews in the French zone in 1951; and 72,184 Europeans and 14,196 native Jews in the Spanish zone in 1945. The largest concentration of Europeans is in Casablanca (134,690 in 1951). Spaniards are numerous in the coastal towns.

Principal cities in the French zone (population according to the 1951–1952 census) are: Casablanca, 682,388; Marrakech, 245,312; Fez, 179,372; Rabat, the capital, 156,209; Meknès, 140,380; Oudjda, 80,546; Safi, 56,751; Port Lyautey, 55,905; Salé, 46,582; Mazagan (El Jedida), 34,781; and Mogador, 22,291. Spanish zone cities (with 1945 population figures) include: Tetuán, the capital, 93,658; Larache, 41,286; and Alcazarquivir, 35,786. The cities of Melilla (1948 est., 94,319) and Ceuta (1948 est., 67,790) are Spanish presidios on the northern coast of Spanish Morocco.

Morocco's earliest inhabitants of record were Berber tribesmen who roamed the African coasts while Rome was extending her Mediterranean empire. The Berbers continue to form a majority of the native population, Arab tribes constituting the second largest indigenous element. These two Moslem groups are closely intermingled, with admixtures in some native tribes of African Negro stock. Jewish settlers in Morocco date from pre-Christian times; living principally in towns, their numbers were augmented by Jews expelled from Spain and Italy by edicts of the Inquisition. The Berbers are concentrated largely in the northern regions of Er Rif, the plains of the Middle Atlas, and the Sous Valley. Arab tribes are distributed principally along the Atlantic coastal plains, in the Moulouya and Sebou valleys, and in the eastern plateaus of the Grand and Middle Atlas.

Moorish Arabic has been increasingly spoken since the European occupation, and is now the predominant language. French and Spanish are the official languages in the respective protectorates, but numerous Berber dialects (principally the Zenatiya, Tamazirt, and Tashelhit) survive among some two million tribesmen in the more remote mountainous regions.

Except in the more modern cities, the unit of Moroccan social organization remains the tribe, headed by a kaid and sometimes consisting of a number of clans. Many of the old Moorish customs exist today, although the influence of European civilization has brought considerable change to urban areas. The proximity of the modern, well-constructed cities to the ancient walled towns with their picturesque gardens, fountains, mosques, mosaics, and narrow corridors emphasizes the curious blending of the new and the old in Morocco. While a new, well-to-do urban class of merchants and professional people has developed since the establishment of the French protectorate, there still remains the illiterate, impoverished peasants at one end of the economic scale, and the rich, powerful pashas at the other, with few interests in common except their Islamic faith and pride in their Moorish culture and history.

Natural Resources.—Morocco has become the world's third largest producer of cork, taken from extensive stands of cork oak forest in the Atlantic coastal region. Forests of evergreen oak, cedar, and pine are found on the slopes of the Atlas. Juniper and thuya trees growing near the Mediterranean yield oils and fragrant gums, while date palms are cultivated in many valleys of the Atlas, and the oil-yielding argan tree, unique in Morocco, is found in the Sous Valley. Alfa grass, used to make paper pulp, is grown on the eastern steppes of the Atlas. Maritime resources, developed since 1934 into important industries, include sardines, anchovies, and tuna.

Minerals in French Morocco have been exploited along modern lines since 1920 when the government began operating the Khouribga and Louis Gentil phosphate mines, which by 1953 were producing over 4 million metric tons annually, or about one sixth of the world's supply. There are large deposits of manganese, of which some 430,000 metric tons were mined in 1953. Production of lead had risen by 1953 to 110,000 metric tons, including some 70,000 tons from the Bou Beker mines. Other important minerals (with 1953 production figures) are hard coal (565,000 metric tons); iron ore (505,900 metric tons); and petroleum (102,600 metric tons). Zinc, cobalt, salt, and antimony also are mined on a smaller scale. The aggregate value of the mining industry in French Morocco increased from 22,000 million francs in 1950 to 37,500 million francs in 1953. Iron ore production in Spanish Morocco totaled 970,100 tons in 1952, and lead, antimony, graphite, and manganese ore were mined on a small scale.

Agriculture.—The area of land under cultivation in French Morocco increased from about 7 million acres in 1928 to more than 12 million acres in 1953; a corresponding increase in productivity has rewarded the efforts of the French administrators to introduce modern methods of agriculture. Major crop yields on an aggregate area of 4,556,000 hectares in 1951–1952, an average season, were estimated as follows, in thousands of metric tons: barley, 1,200; hard wheat, 480; soft wheat, 320; and corn (maize), 290. Also grown are citrus fruits (about 185,000 metric tons in 1951–1952), olives (160,000 metric tons in 1951–1952), sorghum, beans, chick-peas, and flax.

Cork oak forests cover some 776,000 acres, and vineyards, about 50,000 acres. Although occupying only about 7 per cent of the arable land, farms owned by Europeans produce 15 per cent of the grain harvest and 80 per cent of the citrus crop. Livestock in 1953 included about 13 million sheep, 8 million goats, and 3 million cattle. Animal products include annually some 4 million hides and skins, and some 12,000 tons of wool. Almonds, figs, cherries, plums, peaches, apples, and pomegranates are also grown for local consumption.

French policy, taking into account the large areas of land owned and operated collectively by native farmers and herdsmen, has introduced agricultural education and encouraged cooperatives and provident societies which assist small farm owners with loans. Modern equipment is being supplied in the rural areas. Agriculture is less well developed in the Spanish zone, where the chief crops are barley, wheat, sorghum, and olives.

Irrigation and Power.—The related hazards of drought and flood have been reduced by the construction of several large dams since 1930, among them the Sidi Saïd Machou, Kasba Zidania, Im Fout, and Daourat dams on the Oum er Rebia; El Kansera Dam, near Sidi Slimane, on the Beth; Cavaignac Dam on the N'Fis; and the Bin el Ouidane works on the El Abid. These and other smaller projects have been designed to control floods, to multiply the number of water supply points for livestock, and to reduce the incidence of malaria, as well as to provide water for irrigation. Modern irrigation methods have been applied successfully in arid areas of the Sous and Wad Dra valleys. By 1951, the total irrigated area had risen to about 500,000 acres, from 200,000 acres in 1946. Morocco has insufficient coal for her growing industries, for which power must be furnished indirectly by water. Four main dams, with a total capacity of 48.2 billion cubic feet, provide between 50 and 60 per cent of the electricity generated in a year of average rainfall. Electric power consumption, from less than 60 million kilowatt-hours in 1930, increased to 698 million kilowatt-hours by 1953.

Industrial Development.—Until after World War I, a flour mill in Casablanca had been the only large-scale industrial plant in French Morocco. French economic planning has sought to retain traditional native handicrafts, including the making of leather goods, carpets, saddles, furniture, basketwork, ceramics, embroidery, and jewelry, while adjusting the economy to a rapidly growing population, a widespread movement from the land into industrial centers, and the goal of a higher living standard for the population as a whole. Handicrafts employing some 130,000 workers (1953) are organized by a department of arts and crafts, have their own banks for credit, and produce many valuable articles for both domestic and overseas markets, including some 4 million pairs of Turkish slippers annually (233,000 pairs exported in 1953). Moroccan weavers produce more than 80,000 square yards of carpet annually.

First importance is given to food production, in which 120,000 persons (1953) find factory employment. Cheese, vinegar, chocolate, soap, paste, and cigarettes are produced; other industrial plants include breweries and distilleries, sugar refineries, oil and rice mills, and canneries handling fish, fruits, and fruit juices. By 1953, 31 flour mills in French Morocco had an output of 254,400 metric tons. Some 40,000 workers (1953) are engaged in lime, cement, and cork factories, and in foundries, machine shops, stone and marble quarries, and other adjuncts of the construction industries. In place of the traditional *babouche,* the native population has adopted boots and shoes, of which 720,000 pairs were manufactured in 1953. Forty-one factories were engaged in 1953 in metal manufactures. The fishing fleet, employing 9,000 persons (7,600 Moroccans) in 1953, has an annual catch, principally of sardines, anchovies, and tuna, of more than 120,000 metric tons (128,714 tons in 1953).

External Trade.—Principal exports from French Morocco, in order of value, are: phosphates, canned fish, barley, manganese ore, citrus fruit, lead, and dried vegetables; principal imports are sugar, textiles, tea, coffee, cereals, vehicles, machinery, and petroleum products. An adverse trade balance was reported in 1953, when exports (60 per cent to the franc area) totaled 93,827 million francs (95,848 million in 1952) and imports (60.7 per cent from the franc area) amounted to 103,874 million francs (180,534 million in 1952). The United States ranked second as a source of imports in 1952 (15,987 million francs), followed by Cuba (6,657 million) and Germany (5,510 million); while Germany ranked second as a market for exports (8,285 million francs), followed by the United Kingdom (7,902 million) and French West Africa (4,101 million).

The bulk of Spanish Morocco's external trade is with Spain and other Spanish possessions. Imports, including flour, sugar, tea, soap, cotton goods, automobiles, and petroleum products, amounted to some 806.8 million paper pesetas in 1951; while exports in the same year, including iron ore, fish products, goatskins, palm fiber, and lumber, amounted to 306.8 million paper pesetas.

Tangier serves as an entrepôt point for the supply of the Mediterranean area, and in modern times has been a center for black market dealings in restricted currencies and goods. With the post-World War II recovery of western European nations, the zone has lost some of its advantages as a haven for flight capital and a source of prohibited American luxury goods. Tangier's imports in 1953 were valued at 11,628.2 million francs, and exports, 969.6 million francs.

Transportation and Communication.—A primitive system of trails traversed only by pack animals has given way to a modern network of roads (about 28,200 miles in French Morocco in 1953, of which 6,300 miles were surfaced; about 540 miles in Spanish Morocco; and 65 miles in Tangier). The railroad system, begun in 1922, consists of standard-gauge lines totaling 1,054 miles in 1951 (984 miles in French Morocco, 58 in Spanish Morocco, and 12 in Tangier) and connecting with lines from Algeria and Tunisia. A main strategic line links Marrakech, Casablanca, Port Lyautey, Meknès, Fez, and Taza with Oudjda on the Algerian frontier.

Of the eight seaports on the Atlantic coast, Casablanca is by far the most important. With modern machinery and accommodation for the largest vessels, it ranks third among the ports of the French Union. Morocco is linked directly by air with Algiers, Oran, Paris, Bordeaux, Marseille, Perpignan, Lisbon, Rome, and Dakar. Casablanca-Cazes is a principal airport; there are also airports at Salé (near Rabat), Meknès, Oudjda, Marrakech, Achdir, Fez, Tetuán, Tangier, and other cities.

There is telephone service in all towns of

French Morocco, in Tangier, and in the larger towns of Spanish Morocco; and there are connections between Tangier and Madrid and Lisbon. Telegraph service exists in most towns, and there is cable service to France, Spain, and Gibraltar. There is a Sherifian postal service in the French zone, and a Spanish service in the Spanish zone; a British postal system is maintained in Tangier. A broadcasting system is operated from the four stations (1953) of Radio-Maroc; there were some 217,000 radio receivers in French Morocco in 1953. A television transmitter was constructed at Casablanca in 1954, with a relay to Rabat. Of the seven daily newspapers in French Morocco in 1953, five were in French and two were in Arabic.

Currency, Banking, and Investment.—The current French monetary system in French Morocco was established in 1920, the Moroccan franc having parity with the French metropolitan franc since 1928. Heading the banking system in the French zone is the State Bank of Morocco, established in 1907; in addition to minting operations and purchasing coinage metals for the administration, it maintains an exclusive right of issue. From its principal office in Tangier, the bank's operations are conducted through branches in ten cities in French Morocco and six cities in Spanish Morocco. A principal function of the 31 banks (1952) in the French protectorate is the granting of credits to agricultural and construction projects.

French investments in Morocco comprise both public and private capital, the former being drawn mainly from the "Fund for the Modernization and Equipment of Morocco," a development of the Monnet Plan in France. Under two quadrennial improvement plans (1949–1952 and 1953–1956), public investment was devoted largely to social welfare, medical research and care, agriculture, hydroelectric construction, and mining; while private investment was concentrated principally in commercial projects and industries producing consumer goods.

The official currency in the Spanish zone is the paper peseta (3.577 paper pesetas equal 1 gold peseta). Both the franc and the peseta are used in Tangier. Chief sources of revenue are customs duties, income from government monopolies, and taxes on agricultural products and consumer goods.

Government.—Promulgated by *dahirs* (imperial edicts) and exercised through a grand vizier serving as prime minister in the traditional *Makhzen* (central government), the sultan's power in the Sherifian Empire was formerly absolute in both religious and civil spheres. A few viziers in the imperial court communicated the sultan's will to the pashas and kaids (representing his civil authority in urban and rural areas, respectively) who executed the imperial commands on the local level. This power was increasingly curtailed after the division of Morocco into French, Spanish, and international zones, each with its own system of government.

French Zone.—Actual authority in the French zone, following establishment of the protectorate in 1912, was centered in the French administration, headed by a resident general who also served as foreign minister to the sultan. The sultan's power was first modified by the creation of technical administrative departments (*grandes directions*) in the Makhzen, headed by French specialists. In 1947, the Makhzen was enlarged by six new members, and high Moroccan officials began to be associated with finance, agriculture and communications, public health, and social affairs. In that year there also was created a Council of Viziers and Directors (enlarged in 1953) to present matters of legislation to the sultan.

The French administration, and the relationship of the sultan with it, were considerably altered in 1953 as a result of several reforms aimed at democratizing the state and eventually removing all traces of absolutism from its administrative and judicial systems. By dahirs of Aug. 12 and Aug. 31, 1953, the Limited Council, a body of six members headed by the grand vizier, was instituted to assume executive powers previously held by the sultan. The Government Council, a body of French and Moroccan members appointed by the protectorate to advise on financial and economic matters, was created in 1919 and reorganized in 1932, 1947, and 1953. In the latter year (by dahir of October 13) the council was made a wholly elected instrument of the Sherifian state, and thus became the basis for Morocco's first parliamentary body.

Important strides toward self-government were made in 1955 after the return to the throne of Sultan Sidi Mohammed ben Youssef. On Dec. 7, 1955, the protectorate's first representative government was installed, while at the same time the sultan renounced his absolute authority, to become Morocco's first constitutional sovereign (see below under *History*).

Spanish Zone.—The Franco-Spanish Convention of Nov. 27, 1912, recognized the Spanish protectorate in Morocco. The powers of the sultan were delegated to a caliph (khalifa), selected by the sultan from two candidates proposed by the Spanish government, and subject to control by the Spanish high commissioner resident at Tetuán. In 1948, a grand vizier was given responsibility for native affairs.

International Zone of Tangier.—The convention of Dec. 18, 1923, among Great Britain, France, and Spain, provided for the Tangier Statute which became effective June 1, 1925, and which was modified on July 25, 1928, when Italy also became a participating power. In 1945, the United States, Great Britain, France, and the Soviet Union agreed in Paris to a temporary international administration, pending the completion at some future time of a new convention by the signatory powers of the Act of Algeciras (1906). The Tangier Statute provided for a mendoub who would represent the sultan, and who subsequently presided over an appointive Legislative Council. The administration is headed by an administrator, who is aided by assistant administrators for public health, finance, justice, and other activities. A Committee of Control, consisting of the consuls general of Great Britain, Belgium, France, Italy, the Netherlands, Portugal, Spain, and the United States, has the right of veto. The Spanish government has control of the zone's special police force.

Education.—Most of the native population remains illiterate, with less than 30 per cent of the native school-age population (mostly boys) attending school. Until 1912, traditional Koranic *msids* (private schools) taught reading, and apt pupils continued their studies in the mosques. Natives now receive a limited education from Koranic elementary schools, and from several secondary schools operated in connection with mosques, among the latter the best known being the Kairoween University at Fez. Schools for Jewish

children are provided by the Alliance Israélite, with government aid. For the European population, there is a school system similar to that of France. Higher institutions at Rabat include the Institut des Hautes Études Marocaines, with faculties of law, science, and Arabic; the Institut Scientifique Chérifien; the Moroccan School of Administration; and a training school for Moslem teachers. There are also several technical, commercial, and other schools for Moslem, European, and Jewish students.

In the Spanish zone, the Delegation of Education and Culture since 1941 has supervised Moslem, Spanish, and Jewish educational and cultural facilities. A Moslem industrial school and two schools of Arabic culture are located at Tetuán. In Tangier, the various participating governments have set up their own schools, and there are some Moslem and Jewish schools for natives.

Total school enrollment in French Morocco in 1952 was estimated at about 530,000, including 288,231 in public schools (174,860 Moslems, 80,348 Europeans, and 33,024 Jews); about 62,000 in private schools; and about 180,000 in the traditional Koranic schools.

History.—Morocco first appears in history as the farthest westward extension of the Carthaginian Empire. With the fall of Carthage and the subsequent consolidation of Roman power in Africa, the provinces of Mauretania Caesariensis and Mauretania Tingitana were founded about 25 B.C. The colonies flourished until overrun, like Rome herself, by the Vandals in the 5th century. Reconquered by the Roman general, Belisarius, in 533–534 A.D., Mauretania remained under Roman (Byzantine) jurisdiction for another century, only to fall before Arab invaders under Okba (Uqbah ibn-Nafi) who swept over northern Africa in 682. By 711, Tariq ibn-Ziyad, then in control of the Tangier area with a force of Arabs, Egyptians, and Berbers, was able to invade Spain by way of Gibraltar.

The Idrisid Dynasty.—The Berber tribes, who occupied the country from the earliest historical times, were united under the sovereignty of successive Moorish dynasties, beginning with that of Idris I (Idris ibn-Abdullah, or Idris the Elder), who was enthroned at Volubilis (north of present-day Meknès) in 788 with the title of imam, or spiritual and temporal leader of Islam. His son, Idris II, founded the capital city of Fez about 800. The Idrisid dynasty lasted until the year 974, when it was overthrown by the Berbers. Two Berber dynasties—the Maknasa and the Maghrawa—followed briefly.

The Almoravids and Almohades.—Rising in the Sahara Desert in the early 11th century, the powerful Moslem sect of the Almoravids (Murabits) extended its conquests over northern Africa and ultimately into Spain. Its chief, Abdallah ibn-Yasin, was proclaimed ruler over Morocco in 1055, inaugurating the Berber dynasty in which his grandson, Yusuf ibn-Tashfin, founder of the city of Marrakech in 1062, succeeded him. A number of rulers of the Almohade (Muwahhid) dynasty followed the overthrow of the Almoravids near Tlemcen in 1147 by Abd al-Mumin, who captured Morocco and southern Spain.

The Merinide and Wattasi Dynasties.—Driven out of Spain in 1232 by the Christians, and defeated in Morocco in 1269, the Almohades gave way to the Merinide (Beni Merin) dynasty, which flourished until the middle of the 14th century under abu-Yusuf (r. 1258–1286), abu-Ya'qub (Yusuf IV, r. 1286–1307), abu-Saïd (r. 1310–1331), abu-al-Hassan (r. 1331–1351), and abu-Inan (r. 1351–1358), and then went into a decline for another century, giving way to the Wattasi (Beni Wattas) dynasty, from 1471 to 1550. During this time there was an influx of Portuguese settlers to the Atlantic coastal cities, beginning with the capture of Ceuta in 1415.

The Sa'adi Dynasty.—In the 16th century a new monarchial line began with the descendants of the Hasan, or Sa'adi, sherifs (nobles), who were partly of Arab stock. The Sa'adians entered Morocco from the southeast through the Dra Valley, conquered Marrakech (1520) and Fez (1548), and proceeded to force the Portuguese out of all western ports except Mazagan. The fifth of the Sa'adi dynasty, Ahmed al-Mansur, "the Victorious" (also known as el-Dhehebi, "the Golden"), who ruled from 1578 to 1603, captured Timbuktu (1591) and was soon master of all of Morocco. His reign is regarded as the golden age in Moroccan history; some of the structures erected by him in Marrakech still survive. At this time there grew up the system of primitive feudalism known as the *bled el Makhzen*—the Makhzen tribes who offered their military services to the monarch in exchange for exemption from taxes. Zidan (r. 1608–1628), who also left notable buildings, was his most eminent successor.

The Alaouite Dynasty: Mohammed XIV to Mohammed XVI.—The Alaouite dynasty (also known as the Filali or Hassini), of mixed Arab and Berber descent, originated among the Filali sherifs of the Tafilelt oasis area of southeastern Morocco, and continued to modern times. Opposing the influence of both Europeans and certain *Marabouts* (Islamic hermits or saints) in North Africa, the Alaouites expanded their power quickly and occupied Fez in 1649. Their first sultan, Mohammed XIV, ruled from 1649 to 1664. He was followed by Rashid II (r. 1664–1672), who made Marrakech his capital in 1668, and by Mulai Ismail, "the Bloodthirsty" (r. 1672–1727), who kept Morocco strongly fortified, heavily patrolled, and closely united through an elaborate system of bodyguards, fortresses, roving armies, and foreign legionnaires. He also beautified his capital at Meknès, drove the Spanish from Larache, took Tangier from the English, and in 1682 established diplomatic relations with France. After his death a period of disorder followed until the accession of Mohammed XVI (r. 1757–1789), who captured Mazagan from the Portuguese (1769).

The Growth of European Influence.—Piracy and the holding of prisoners for ransom were flagrantly practiced in Morocco, in common with other Barbary states, from the 16th to the 19th centuries. Nevertheless, communciation and trade with European powers, particularly the French, English, Dutch, and Spanish, became increasingly important. A treaty guaranteeing the safe movement of French ships and establishing a favored status for French consuls was signed with Louis XV in 1767. As a result of the conquest of Algeria by France in 1830, Abd-er-Rahman (r. 1822–1859) aided the Arab leader in Algeria, Abd-el-Kader, and subsequently both were defeated at Isly in 1844 by the French under Thomas Robert Bugeaud de la Piconnerie. At the beginning of the reign of Sidi Mohammed (Mohammed XVII, r. 1859–1873), Spain invaded northern Morocco, capturing Tetuán in 1860. British intervention prevented further Spanish

MOROCCO: *Above:* Sunday, market day in the European quarter of Tetuán, capital of Spanish Morocco and administrative center for other Spanish possessions in North Africa. *Right:* Near Meknes in French Morocco a peasant tramples a bag of wheat, a primitive method of threshing. *Below:* Diesel tractors hauling combines in French Morocco harvesting operations. *Lower left:* Modern resort hotel facing the beach at Mogador, on the Atlantic coast of French Morocco.

(Above) Paul Pietzsch from Black Star; (right) Burton Holmes from Ewing Galloway; (below) Ewing Galloway; (lower left) Trieschman from Black Star

Above: Tangier harbor at Morocco's northwest extremity, with surrounding territory constituting the International Zone.

Above left: One of Marrakech's many beautiful mosques. An Arab goes to its fountain to fill his petrol tin.

Left: Typical Moroccan farmer with his burro going to market.

(Above) Ross Madden from Black Star; (above left) Black Star; (left) Trieschman from Black Star; (below) A. Schiehsle from Black Star

Below: The harbor of Casablanca with its modern installations reflects French enterprise and engineering skill.

conquests, but in 1893, during the reign of El Hasan III (r. 1873–1894) the Spanish penetrated further inland, thereby obtaining slight boundary concessions and an indemnity of some $3 million by a treaty signed in 1894.

European influence in Morocco increased during the weak reign of Abd-al-Aziz IV (r. 1894–1908), when insurgent tribes of northern and central Morocco were in revolt, and lawlessness prevailed throughout much of the country. On May 18, 1904, Ahmed-ibn-Muhammed Raisuli, a Moroccan brigand, captured and held for ransom Ion Perdicaris, an American citizen, and his stepson, a British subject. The ultimatum of United States Secretary of State John Hay, "Perdicaris alive or Raisuli dead," followed by a demonstration by American warships and representations from European courts, compelled the sultan to comply with United States demands, and the captives were released. To safeguard her interests, France arranged to police Tangier with French Algerians, and a French military mission proceeded to Fez.

By the Franco-British Treaty of April 8, 1904, France declared her "disinterest" in Egypt, and Britain yielded to France responsibility for seeing to "the tranquillity of the country" (that is, Morocco) and for helping to bring about needed "administrative, financial and military reforms" there. Freedom of trade was guaranteed for 30 years in Egypt and Morocco. On Oct. 3, 1904, a Franco-Spanish agreement recognized the earlier Franco-British agreement; the maintenance of the territorial integrity of Morocco; the right of France to give the sultan military, economic, and financial assistance; and modified the limits of the Spanish zone of influence. This agreement was further implemented by secret clauses in 1905 and 1907.

German Intervention: The Algeciras Conference.—In the meantime, Germany began to take an active interest in the events transpiring in Morocco. By the Madrid Convention of 1880, Austria, Belgium, Denmark, Germany, France, Great Britain, Italy, Morocco, the Netherlands, Portugal, Spain, Sweden, Norway, and the United States had agreed upon the right of protection in Morocco. According to Article 17 of the treaty: "The right to the treatment of the most favored nation is recognized by Morocco, as belonging to all the Powers represented at the Madrid Conference." Germany's exclusion from the Franco-British agreements with Morocco in 1904 was interpreted as a violation of her rights under the Madrid Convention; and accordingly, on March 31, 1905, the German emperor, William II, visited Tangier where he assured the sultan of his intention to uphold the integrity of the Moroccan kingdom and the equality of Germany's commercial and economic interests there. A special German mission was sent to Fez, and was followed by British and Spanish missions, ostensibly to support French interests and policy.

After protracted discussions with the sultan, it was agreed that an international conference should be held at Algeciras in Spain; and delegates of the countries signatory to the Madrid Convention of 1880 met there in conference on Jan. 16, 1906. After strenuous opposition and counterproposals on the part of Germany (supported only by Austria) against the French program, agreement was reached in favor of the French. The Act of Algeciras, signed on April 7, 1906, and accepted by the sultan on June 18 of that year, reiterated the principle of commercial equality in Morocco, and provided for a joint Spanish-French police force in Morocco's ports. The various diplomatic representatives at Tangier were charged with effecting the specified administrative and economic reforms.

Establishment of the Protectorates.—The murder of Dr. Emile Mauchamp on March 19, 1907, at Marrakech resulted in the occupation of Oudjda by the French. Abd-al-Hafiz (Mulai Hafiz) took the throne in 1908 following the deposition of his brother, Abd-al-Aziz IV, but was himself forced to abdicate in favor of Mulai Yusef in 1912. Meanwhile, in July 1911, Germany dispatched the cruiser *Panther* to Agadir to protect the concessions of German financiers, and was assured the support of local chiefs in any resistance she might make against French paramountcy in the country. Great Britain hastened to assure France of her support, and a diplomatic crisis ensued among the great powers. Extended Franco-German negotiations resulted in two agreements of Nov. 4, 1911, virtually recognizing a French protectorate in Morocco but assuring German interests absolute equality in economic and commercial matters, and ceding to Germany about 250,000 square kilometers in the northern French Congo.

Thus the way was cleared for the Franco-Moroccan treaty of March 30, 1912, signed at Fez, whereby the sultan recognized the establishment of what amounted to a French protectorate in Morocco. Subsequent negotiations with Spain resulted in the agreement of Nov. 27, 1912, defining Spanish rights and interests in the Spanish northern zone. In the meantime, Gen. Louis H. G. Lyautey was appointed French resident general, and began pacification of the country which was in revolt against the sultan. The campaign of pacification proceeded slowly, extending beyond World War I, and was complicated by German operations conducted from Tangier.

Pacification Problems and Abd-el-Krim.—The pacification of the Spanish zone was not so successful, however, as a result of troubles among the Riffs. Following a successful attack on the Spanish forces at Annual in July 1921, the Riffian leader, Abd-el-Krim, conducted guerrilla operations against the Spanish, forcing them out of part of the northern zone by 1924, and creating a political crisis in Madrid. In 1925, Abd-el-Krim carried the fighting into neighboring French territory, and large reinforcements of French troops were dispatched to join the Spanish in a joint campaign under Marshal Henri Pétain. Abd-el-Krim surrendered on May 26, 1926, and was exiled to Réunion. Thereafter the French continued to subdue rebellious tribes in the vicinity of Taza, on the western slopes of the Atlas, and in the Sous Valley. Uprisings in the Grand Atlas in 1933, and in the Anti-Atlas in 1935 were put down, and by the latter year peace had been restored in the French zone.

Internationalization of Tangier.—The area about Tangier remained in dispute until the convention of Dec. 18, 1923, by France, Great Britain, and Spain, providing for the demilitarization of the zone and its administration by an international Committee of Control. Urged by Mussolini to make the Mediterranean an "Italian sea," the Italian Navy threatened Tangier and forced a conference at Paris in 1928, in which the Tangier Statute of 1923 was revised by the Paris Protocol

of July 25, to give Italy representation on the Tangier committee.

After the fall of France in June 1940, officials of the German Armistice Commission penetrated Morocco in great numbers, and German "tourists" began flocking to the country. On June 14, 1940, native troops under Spanish command marched out of Spanish Morocco into Tangier, and in the following November the commanding officer, Col. José Yuste, proclaimed himself governor and declared international control at an end. In March 1941, the mendoub was ejected from the zone. In 1945 the Big Four Allies in World War II agreed to restore the international administration and asked Spain to withdraw from the zone; the last Spanish occupying forces were withdrawn on Sept. 6, 1945, and on October 11, international control was restored.

World War II.—United States forces landed on the Moroccan coast on Nov. 8, 1942, preliminary to operations in the European theater during World War II. At Casablanca, President Franklin D. Roosevelt and Prime Minister Winston Churchill met secretly, Jan. 14-24, 1943, in one of the most important conferences of the war. With the coming to power of the Vichy government in France, Gen. Auguste Noguès remained in office in Morocco under Admiral Jean Darlan, who had been accepted by the United States as high commissioner; but in June 1943, Noguès was compelled to resign. Special measures introduced in Morocco during the German occupation of France were abolished, and large detachments of Moroccan troops took part in the campaign for the liberation of France, 1944–1945. Three United States Air Force bases were established in French Morocco in 1952, and the country was used as a base for Allied operations during most of the war.

The Growth of Nationalism.—Growing nationalist sentiment in French Morocco came more into the open after the removal of General Noguès in June 1943 and the subsequent reorganization of the French administration in accordance with the more democratic policies of the Committee for National Liberation. The nationalist Istiqlal Party soon organized demonstrations in the larger cities and eventually received some support from the sultan, Sidi Mohammed ben Youssef, who had succeeded Mulai Yusef in 1927, and who began advocating termination of the protectorate.

On Aug. 14, 1953, a conference of some 300 kaids, pashas, and Berber tribal chieftains at Marrakech, under the leadership of the pro-French pasha of Marrakech, Thami el-Mezuari el-Glaoui, decided to depose the sultan on the grounds that he had compromised his position by departing from Moslem orthodoxy and by allying himself with the Istiqlal Party. A week later, on August 21, following bloody clashes between nationalists and police in Oudjda and other cities, Sidi Mohammed ben Moulay Arafa, also of the Alaouite dynasty, was proclaimed the new sultan at Rabat. The French then proceeded to effect a series of administrative reforms (see section on *Government*), aimed at paving the way for Moroccan self-government.

Rioting, terrorist bombings, and assassinations continued sporadically through 1954 and into 1955 as the more extreme nationalists, backed by the Arab nations, demanded the return of the deposed sultan, Sidi Mohammed ben Youssef, who had been removed by the French from Corsica to Madagascar early in 1954. Spanish officials in 1954 rejected the authority of the new sultan, declaring that the Spanish zone would continue under the caliph appointed by ben Youssef until self-government would eventually be realized. On Aug. 20, 1955, 47 French men, women, and children were massacred by Berber tribesmen at Oued Zem, and within a period of two days at least 200 French and natives were killed in riots.

By Aug. 12, 1955, the French cabinet had come to a decision to ask the sultan to form a government which would be representative of all elements of the Moroccan population. When this plan failed, the French government called a group of Moroccan nationalists to meet with five French cabinet members (headed by Premier Edgar Faure) at Aix-les-Bains for discussions beginning August 22. The conference ended on August 27 with both sides in agreement on measures designed to restore order to Morocco and to inaugurate reforms leading to self-government.

Events then moved quickly in the closing weeks of 1955. The Aix-les-Bains agreements were soon sanctioned by the French government, which, after consulting the deposed sultan ben Youssef, approved on September 12 a plan for the honorable retirement of ben Moulay Arafa and the establishment of a Council of the Throne which would form a representative Moroccan government. The four-member council was instituted on October 15, but failed to form a government. On October 29, ben Moulay Arafa (who had vacated the throne on October 1) announced his abdication; and on November 5, ben Youssef (who had been brought to France from exile in Madagascar) was recognized as sultan by the French government. A joint statement by ben Youssef and the French Foreign Ministry on November 6 promised negotiations leading to Morocco's independence as "a democratic state with a constitutional monarchy" while remaining "united with France by the permanent links of an interdependence freely consented and defined." Sultan ben Youssef made a triumphal return to Rabat on November 16, and on December 7 he installed a nationalist cabinet headed by M'barek Bekkai and at the same time relinquished his absolute authority in order to become Morocco's first constitutional sovereign.

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MOROCCO, city, French Morocco. See MARRAKECH.

MOROCCO, type of leather. See LEATHER AND SHOE TRADE TECHNICAL TERMS.

MORON, mô-rôn′ (in full MORÓN DE LA FRONTERA), municipality, Spain, situated in Sevilla Province, near the Guadaira River and about 35 miles east-southeast of Seville, with which it is connected by rail. It is the trading center for a district raising wine grapes, olives, grain, and livestock, and has establishments producing cement, pottery, shoes, and soap. There are red hematite mines and marble quarries nearby. Morón contains the ruins of a Moorish castle destroyed by the French in 1811 and a Gothic church. Pop. (1950) 30,137.

MORON. See MENTAL RETARDATION.

MORONI, mô-rō′nē, or **MORONE,** mô-rō′nā, **Giambattista,** Italian painter: b. Albino, near Bergamo, Italy, ?1525; d. Brescia, Feb. 5, 1578. A member of the Brescian school, he was a pupil of Il Moretto. He painted a number of altarpieces but is best known for his portraits, which were highly regarded by Titian and are said to have influenced Sir Anthony van Dyck. Among them are a portrait of Antonio Navagero in the Brera Gallery, Milan; a self-portrait and one of Conte Secco Suardo in the Uffizi, Florence; *A Tailor,* in the National Gallery, London; *A Gentleman in Adoration Before the Madonna,* in the National Gallery, Washington; and a portrait of Bartolomeo Bongo, in the Metropolitan Museum of Art, New York.

MOROS, mō′rōz, Moslem Filipinos of Mindanao Island, where they live chiefly in the provinces of Cotabato, Lanao, and Zamboanga; the Sulu Archipelago, southwest of Mindanao; and southern Palawan Island. When the Spaniards arrived in the Philippines in the 16th century, they called the Filipinos converted to Islam Moros (Moors), meaning "Mohammedans." The name is still used popularly as a group name for Mohammedan Filipinos. According to the 1948 census, 4.1 per cent of the Filipinos are Mohammedans—a small minority in a largely Christian nation.

Some of the best-known Moro groups are the Yakans (Basilan Island); the Lanao Filipinos (divided into the Maranaos and Ilanums or Iranums); the skilled metalworkers known as Magindananos (Cotabato River Valley); who made bronze cannons (*lantaka*) before the Spaniards' arrival; and the Sulu Moros, who are noted as superb navigators. The Samals, often known as sea gypsies, are Moros who live on the immediate shore or in boats; those Moro Filipinos who dwell only on boats are called Badjaos (Bajau).

History.—The people of Sumatra were converted to Islam in the 13th century. These Mohammedanized Malays pushed northward through Borneo and Jolo into Mindanao, where Islam probably gained its first foothold in the middle of the 15th century. By the time the Spaniards appeared, there were Moro groups as far north as Mindoro and southwestern Luzon, and the explorer Miguel López de Legazpe found an estimated 80,000 of them inhabiting the shores of Manila Bay. The Spanish conquest of the Philippines stopped the spread of Islam in the islands. Mohammedanism in Mindanao might not have survived if the Spaniards had not been occupied in the early 17th century with Dutch occupation of Formosa and their attack against Manila, necessitating withdrawal to Luzon.

Soon the Spaniards and the Moros were at war—a conflict that lasted almost until the final days of Spanish sovereignty in the Philippines. Two important causes for the fighting were Spain's attempt to make Mindanao and Sulu colonies and to convert the Moros to Christianity. The Moros were organized into sultanates under the control of sultans, some of whom claimed descent from Mohammed himself. The absolutism of the sultans varied with their personal qualities. Under each sultan were *datos* (local chiefs), who assisted him in the administration of his sultanate. This political organization gave the Moros a military efficiency which was not possessed by other Filipinos.

In retaliation for Spanish expeditions against their homeland the Moros raided and sacked Christian Filipino communities in the Visayan Islands and as far north as Luzon. Travelers may still see the crumbling stone towers where Filipinos once watched to warn their people of marauding Moro fleets. With the introduction of the steamship and a better-organized military program, Spain was able to halt the Moro raids. Yet when she ceded the Philippines to the United States in 1898, her control over the Moro regions was largely ineffective.

Mindanao and Sulu were placed under a military government during the first years of American rule in the Philippines. Most Moros resisted United States attempts to govern their lands. It was during the military campaigns to pacify the Moros in 1903 that John J. Pershing gained world fame as a military leader. In 1914 civil government was established in the Moro regions, and in the following year the sultan of Sulu abdicated his rights of sovereignty, recognizing the United States (the sultanate was finally terminated in 1940). By 1922 four of the seven provinces of Mindanao and Sulu elected their own governors. Moro Filipinos have the same political rights as Christian Filipinos, and some of them are prominent national leaders. In the 1950's, however, the Philippine government had to send troops to quell some dissident Moro groups in Mindanao and Sulu.

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MOROSINI, mō-rô-sē′nē, **Francesco,** Italian general: b. Venice, Italy, 1618; d. Nauplia, Greece, Jan. 6, 1694. A member of a patrician Venetian family which included a number of doges and scholars, he joined the Venetian armed forces in 1636. From 1645, Venice was at war with the Turks, and Morosini was four times in command of the Venetian forces: 1657–1661; 1666–1669; 1684–1688; and 1693–1694. On the second occasion, in 1669, he was compelled to yield Candia, Crete, to the Turks in order to save its starving garrison, but in 1685–1687 he conquered the Peloponnesus, winning the sobriquet of Peloponnesiaco. In 1688 he became doge of Venice.

MOROTAI, mō-rô-tī′, island, Indonesia, situated in the Moluccas, 15 miles northeast of Halmahera, from which it is separated by Morotai Strait. It has an area of 695 square miles. See WORLD WAR II—*Island-Hopping in the Pacific* (Capture of Morotai). Pop. (1930) 7,833.

MORPETH, municipal borough, England, situated in Northumberland, on the Wansbeck River, 14 miles north of Newcastle. The trading

center for an agricultural region, it has establishments producing leather, woolen cloth, beer, and iron and brass products. In medieval times, Morpeth was a fortress in the warfare on the Anglo-Scottish border. The 14th century gatehouse of its castle still stands, and there are ruined castles nearby. In the town are a 14th century church, a clock tower, and a town hall designed by Sir John Vanbrugh. Pop. (1950) 10,797.

MORPHEUS, môr'fūs; popularly, môr'fē-ŭs (from Gr. *morphē,* form or shape), in Greek mythology, the god of dreams. The son of Hypnos or Somnus, the god of sleep, he is usually represented as a slumbering child. As his name implies, he shapes men's dreams.

MORPHINE, môr'fēn, an alkaloid of opium. The name is derived from the Greek god Morpheus (q.v.). Chemically, morphine is a complex derivative of phenanthrene that contains two OH groups (one phenolic, the other alcoholic) in which the hydrogen can be replaced by alkyl or acid radicals to form such substances as codeine, thebaine, and heroin. The chemical nature of these radicals modifies the effects on the body. For example, the replacement of one hydroxyl group by a methyl group (codeine) diminishes the narcotic and respiratory depressant actions but increases the convulsant action. When both OH groups are replaced by acids (diacetyl morphine), the narcotic effects are stronger than with codeine, and the convulsant action is weaker than with morphine.

Morphine was first isolated about 1805 by Friedrich W. A. Sertürner, a German pharmacist. Subsequently it was shown that most of the effect of opium is due to its morphine content. Morphine is available as morphine hydrochloride and morphine sulphate, the latter being the form commonly used medicinally. Both salts appear as white crystals or powder having a bitter taste but no odor. They darken if left exposed to light and lose water if exposed to air. The chemical formula for morphine sulphate is $(C_{17}H_{19}NO_3)_2 \cdot H_2SO_4 \cdot 5H_2O$.

Although morphine is useful medically, particularly for the relief of pain, it has undesirable properties and may cause constipation, vomiting, excitement instead of calmness, and depression of respiration. It also causes a severe drug addition that is very difficult to control. When an overdose of the drug is taken, death occurs from respiratory failure.

Morphine has been and still is used to some extent for the control of pain in expectant mothers just before delivery. Other drugs are used to better advantage, however, and are substituted whenever possible because morphine can pass from mother to child through the placenta and cause difficulty in breathing in the newborn infant.

The manufacture and distribution of morphine, like that of all narcotic drugs, is under the Harrison Narcotic Act of 1914. Such drugs can be dispensed only by doctors holding a narcotics license, which must be renewed yearly.

See also CODEINE; OPIUM.

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MORPHOGENESIS, môr-fō-jĕn'ē-sĭs, has been defined by the English biochemist Joseph Needham as "the coming-into-being of characteristic and specific form in living organisms." This involves an exceedingly complex and intricately regulated sequence of events, processes, and changes (growth and differentiation), resulting in development from egg to mature form, and according to the organism's own characteristic organization. Two groups of processes are responsible for development: (1) constructive or progressive processes that contribute to building up the organism—(a) growth, or the actual increase in living matter through synthesis and storing up new protoplasm, (b) morphogenetic movements, which transport new protoplasm to places were new form appears, and (c) differentiation, which becomes increasingly apparent through differences in chemical composition detectable between stages; and (2) limiting processes, which are either external such as limited food supply, or internal such as hormones and chemical inductors that guide the expression of hereditary characters (genes). Also characteristic of development is the early appearance of polarity (apex and base), which is present even in some eggs. The orderly sequence of events and changes during development is brought about by determination, which controls the ultimate fate of all parts of an embryo.

Numerous ingenious and delicate micrurgical experiments with eggs and developing embryos, especially those of amphibians, echinoderms, worms, and other groups, involving ablation (removal), addition (implantation), exchange (transplantation), and fusion, have disclosed two quantitatively different types of eggs: (1) mosaic eggs, whose parts are clearly determined from the earliest stages; and (2) regulation eggs, in which determination begins at a later stage. The latter are particularly suitable for experimental study, for alteration of development is possible by experiment. In vertebrate eggs, best known of those studied, determination is initiated by a controlling region (primary organization center), located near the blastopore. Secondary and tertiary organization centers appear later. The ability of an embryo to develop normally or nearly so or to regenerate after experimental interference is called regulation.

The modern study of morphogenesis involves methods, data, and points of view of morphology, physiology, biochemistry, genetics, physics, and mathematics. A completely satisfactory and universally acceptable theory of morphogenesis must mold all these into a logical, consistent whole.

THEODOR JUST.

MORPHOLOGY, môr-fŏl'ō-jĭ, the division of biological science which deals with the form and structure of animals and plants. The term, which is derived from the Greek word *morphē* (form), was originated by Johann Wolfgang von Goethe. It includes anatomy and histology and, in part, embryology and cytology. For the morphology of animals, see ANATOMY, COMPARATIVE; for that of plants, see PLANTS AND PLANT SCIENCE —*1. Classification, Morphology, and Evolution; 2. Anatomy.*

MORPHY, Paul Charles, American chess player: b. New Orleans, La., June 22, 1837; d. there, July 10, 1884. He learned chess at the age of 10, and at 12 had defeated many local amateurs. He was educated at Spring Hill College and at the University of Louisiana, where he studied

law for several years, occasionally playing a game. In 1857 at the first American chess congress held in New York, he had no difficulty in defeating his strongest opponents. During the next year, in England, he successfully met such players as Henry E. Bird, Boden and J. J. Löwenthal, and astonished the world of chess by playing as many as eight games simultaneously and without the board. His playing in Paris, where he won five games out of eight against Harrwitz, and exhibited his blindfold skill, was equally surprising. In 1859 he returned to the United States and here met the famous German player Adolf Anderssen, winning 7 of 11 games. Being now admitted to the bar, Morphy began to practice law in his native city; but his mental powers had been so impaired by the strain of his blind-fold chess-playing that he not only gave that up but relinquished chess entirely, and a little later abandoned all intellectual work. Morphy's skill at chess appeared to partake of the quality of genius. His brilliant achievements were not the result of long or deep deliberation, yet displayed all the elements usually observed when mental strength and quickness are sustained by profound study. Consult Löwenthal, J. J. *Morphy's Games of Chess* (London 1860).

MORRELL, Imogene Robinson, American artist: b. Attleboro, Mass.; d. Philadelphia, Nov. 22, 1908. She was married to Abram Morrell in 1869. She studied art in the United States and Europe and was a pupil of Adolf Schrodter at Düsseldorf and of Thomas Couture at Paris (1864). In 1874 she returned to America, opened a studio at Washington as a portrait and historical painter, and there established and became first president of the Washington National Academy of Fine Arts (1879). Some of her more notable paintings are *The First Battle of the Puritans; Washington Welcoming the Provision Trains at Newburgh, N. Y.; A Historical Portrait of General John A. Dix.*

MORRILL, mŏr'ĭl, **Anson Peaslee,** American politician: b. Belgrade, Maine, June 10, 1803; d. Augusta, Maine, July 4, 1887. He at first engaged in business in his native town, then in 1834 was sent to the state legislature; was sheriff of Somerset County 1839–40; and in 1850 land agent. In 1853 he was an unsuccessful candidate for governor on the Prohibition and Free-Soil tickets, but the following year he was elected as the first Republican governor of Maine, and later was a delegate to the convention which nominated John C. Frémont. In 1860 he was elected to Congress, but declined a re-election.

MORRILL, Justin Smith, American senator: b. Strafford, Vt., April 14, 1810; d. Washington, D. C., Dec. 28, 1898. He received a good primary and secondary education, was a merchant and then a farmer; was first elected to the House of Representatives in 1854. In 1867 was transferred to the Senate, in which he was long chairman of the committee of finance. With his 12 years in the lower house and 31 in the upper, he was more closely connected with Congress than any other man of his time, and was styled "The Father of the Senate." His Land-Grant College Act, approved by President Lincoln in 1862, for the creation of seats of learning in newly-settled states, has, with supplemental legislation, resulted in the erection of some 70 colleges. He introduced the war revenue tariff of 1861, commonly called the Morrill tariff, and during his later years consistently opposed the remonetization of silver. Senator Morrill wrote *The Self-Consciousness of Noted Persons* (1886).

MORRILL, Lot Myrick, American politician: b. Belgrade, Maine, May 3, 1812; d. Portland, Maine, Jan. 10, 1883. He was educated at Waterville College (now Colby University), studied law and was admitted to the bar in 1839, when he went to Augusta and established a law practice. He took an active part in politics, in 1853 was elected to the state legislature, and in 1856 was chosen president of the Senate. He was governor of his state 1858–60, and in the latter year was elected to the United States Senate, where he proved himself an indefatigable worker. He favored the resumption of specie payment and was an authority on financial, naval and Indian affairs. In 1876 he retired from the Senate to become secretary of the treasury under President Grant, and during his administration of that office constantly urged the return to specie payment. He declined an appointment to a foreign mission under President Hayes, and in 1887 became collector of customs at Portland, Maine, in which office he died.

MORRILTON, Ark., town and Conway County seat; altitude 347 feet; on the Missouri Pacific Railroad; 50 miles northwest of Little Rock. In the county, livestock and cotton are raised, and the city's industries are meat packing and the making of cottonseed oil, cloth, and cheese. Pop. (1940) 4,608; (1950) 5,483.

MORRIS, Anthony, American Quaker: b. London, Aug. 23, 1654; d. Philadelphia, Pa., Oct. 23, 1721. In 1683 he settled in Burlington, West Jersey, moving three years later to Philadelphia where he acquired wealth in brewing. He was at various times alderman and mayor of the city, also served in the provincial council and the assembly. He was a founder of the William Penn Charter School.

MORRIS, Charles, English song writer: b. 1745; d. near Dorking, Surrey, July 11, 1838. In 1764 he entered the 17th Foot, with which he served in America, later exchanged into the Irish Dragoons and then into the 2d Life Guards. In 1785 he was made bard of the Beefsteak Society, and before its gatherings sang many of his wittiest efforts. He was a boon companion and associate of Charles James Fox and the Prince Regent (George IV). His humor and vivacity led John Philpot Curran to say, "Die when you will, Charles, you will die in your youth." He wrote hundreds of songs, many being political ditties for the Whigs; and a posthumous volume, *Lyra Urbanica* (1840) collected them. His *A Reason Fair to Fill my Glass* was praised by Thomas Moore and set to music by Charles Dibdin.

MORRIS, Charles, American naval officer: b. Woodstock, Conn., July 26, 1784; d. Jan. 27, 1856. Entering the navy in 1799, he participated in the war with Tripoli, was an actor in the recapture of the *Philadelphia,* in the harbor of Tripoli (1804), being the first to gain her

deck when she was boarded. At the outbreak of the War of 1812 he was serving as executive officer of the *Constitution;* he was wounded in the engagement of *Old Ironsides* with the *Guerrière* (August 1812); and afterward successfully commanded the *John Adams* until, being blockaded by a British squadron in Penobscot River, he was compelled to destroy his ship to save her from being taken by the enemy. In the war with Algiers (1815) he commanded the *Congress,* and it was he who, in the *Brandywine,* carried Lafayette home to France (1825). After serving for some years as naval commissioner and as supervisor of the United States Naval Academy he became chief of the bureau of ordnance and hydrography, which position he held till the time of his death. Consult his *Autobiography* (1880).

MORRIS, Charles, American author: b. Philadelphia, Pa., Oct. 1, 1833; d. Sept. 6, 1922. Educated in Chester, engaged for a short period in teaching; for a considerable time was manager in a manufacturing concern; and after 1878 devoted himself to literary work. His publications include *A Manual of Classical Literature; Historical Tales* (11 vols.); *The War with Spain; Our Island Empire; Man and his Ancestor; Famous Men and Great Events of the Nineteenth Century; Home Life in All Lands;* a series of histories of the United States; *History of the World* and *History of Pennsylvania,* for schools; *Heroes of America* (4 vols.); *The Nations of Europe; Famous Days and Deeds in Belgium and Holland,* and various others. He also compiled *Half Hours with the Best Authors* (18 vols.); *Elocution, Oratory and Entertainment* (4 vols.); *The Famous Orators of the World;* and *Handy Dictionary of Biography.* He edited *Winston's Universal Dictionary; The International Dictionary;* and *Winston's Encyclopedia.*

MORRIS, Clara, American actress: b. Toronto, Canada, 1849; d. New Canaan, Conn., Nov. 20, 1925. She became leading lady in Wood's Theater, Cincinnati, Ohio, and in the winter of 1869–1870, joined Augustin Daly's Fifth Avenue Company, New York. She at once achieved success in emotional rôles and afterward made many tours throughout the United States. Her leading rôles include *Camille;* Alixe in the *Countess de Sommerive; Mercy Merrick; Miss Multon; Lady Macbeth; Leah the Forsaken;* and Cora in *L'Article 47.* After her retirement from the stage she wrote much for periodicals and published in book-form *A Silent Singer* (1899); *My Little Jim Crow* (1900); *A Pasteboard Crown,* fiction (1902); *Stage Confidences* (1902); *The Trouble Woman* (1904); *The Life of a Star* (1906); *Left in Charge* (1907); *New East Lynne* (1908); *Dressing Room Receptions* (1911). She was married to F. C. Harriott in 1874. In her later years she was afflicted with blindness.

MORRIS, Sir Daniel, British colonial expert: b. Loughor, Glamorgan, May 26, 1844; d. Feb. 9, 1933. He was educated at Cheltenham, at the South Kensington Royal College of Science and at Trinity College, Dublin, where he received high honors. He was assistant director of the Royal Botanic Gardens of Ceylon in 1877; investigated and checked the coffee-leaf disease; became director of the Botanic Department of Jamaica in 1879; was commissioner in the West Indian Imperial Department 1898–1908; a member of the Canadian and West Indian Trade Commission 1909–1910; and was scientific adviser in tropical agriculture to the Colonial Office 1908–1913. He was created K.C.M.G. in 1903. Among his publications are *Cacao: How to Grow and How to Cure it* (1882); *Agricultural Resources of Saint Helena* (1884); *The Vegetable Resources of the West Indies* (1888); *Sisal Industry of the Bahamas* (1896); *Report to the West India Royal Commission on the Agricultural Resources of the West Indies* (1897); and *Forest Resources of Newfoundland* (1916).

MORRIS, Edward Joy, American author: b. Philadelphia, Pa., July 16, 1815; d. there, Dec. 31, 1881. He was graduated from Harvard in 1836 and was admitted to the bar in 1842. He was a member of the Pennsylvania legislature in 1841–1843 and of Congress in 1843–1845, and in 1850 was appointed to a mission in Naples where he remained four years. He was again in Congress as a representative of Pennsylvania in 1858–1861, and from 1861–1870 was Minister to Turkey. He published *Notes of a Tour through Turkey, Greece, Egypt, Arabia Petraea to the Holy Land* (2 vols., 1842), as well as translations of works on Turkey, Norway, and Corsica, and numerous magazine and newspaper articles.

MORRIS, Edward Parmelee, American Latinist, best known as a Plautine scholar: b. Auburn, N. Y., Sept. 17, 1853; d. Nov. 16, 1938. He was graduated at Yale in 1874, studied at Leipzig and Jena, was professor of Latin at Williams 1885–1891, and at Yale, and edited the following plays of Plautus: *Mostellaria, Pseudolus* (1890), and *Captives and Trinummus* (1898); Horace's *Satires* (1909) and *Epistles* (1911); *Sentence-Questions in Plautus and Terence; The Subjunctive in Plautus; On Principles and Methods in Latin Syntax* (1902).

MORRIS, George Perry, American journalist: b. Montclair, N. J., Feb. 18, 1864; d. June 12, 1921. He was educated at Rutgers College and Johns Hopkins University, and in 1891 was associate editor of *The Congregationalist.* In 1888–90 he was on the editorial staff of the New York *Mail and Express,* on *The Congregationalist,* Boston, in 1891–1907 and on the staff of the Boston *Herald* 1907–1911. He was on the staff of the *Christian Science Monitor* (1911–1918). He has published *The Norwegian Company System* (1894); *Historic Towns of New England* (1898). He was a contributor to various magazines, especially character studies of living notables.

MORRIS, George Pope, American journalist and poet: b. Philadelphia, Oct. 10, 1802; d. New York, July 6, 1864. With Samuel Woodworth (q.v.), in 1823, he founded the New York *Mirror,* a weekly journal of literature, afterward published as the *New Mirror* and the *Evening Mirror,* in which many of the early writings of Bryant, Poe, Halleck, Willis and other American authors first appeared. In 1845 Morris established the *National Press,* which in the following year became the *Home Journal,* and which, with the assistance of N. P. Willis (q.v.), he continued to edit almost to the end

of his life. He wrote *Brier Cliff* (1826), a popular drama based on incidents of the American Revolution, and the libretto of a three-act opera, *The Maid of Saxony* (1842, music by Charles Edward Horn), based on the career of Frederick the Great. The final collection of his *Poems* (4th ed., 1860) contains *Near the Lake, My Mother's Bible, We Were Boys Together, A Long Time Ago,* and the familiar *Woodman, Spare that Tree.*

MORRIS, Gouverneur, gŭv-ẽr-nẽr′, American statesman and diplomat: b. Morrisania, now part of the Bronx, New York, N. Y., Jan. 31, 1752; d. there, Nov. 6, 1816. He was the grandson of Lewis Morris (1671–1746), jurist, royal governor of New Jersey, and first lord of the manor of Morrisania; and the son of Lewis Morris (1698–1762), also a jurist, second lord of the manor. His mother, Sarah Gouverneur, was of French Huguenot descent. Lewis Morris (1726–1798), signer of the Declaration of Independence, third and last lord of the manor, was his elder half-brother.

Gouverneur Morris graduated from King's College (now Columbia University) in 1768, and was admitted to the bar in 1771. During the early differences between Great Britain and the American colonies, like most of the New York landed aristocracy, with their dread of social upheaval, Morris hoped for a compromise leading to reunion with the mother country; but after the Battle of Lexington he identified himself wholeheartedly with the colonial cause, and in 1775 he was a delegate of Westchester County in the revolutionary provincial congress of New York. A member of this assembly until 1777, Morris became a leader of the moderates and an ardent defender of the authority of the Continental Congress at Philadelphia and of the power of a central government as against the governments of the colonies.

Chosen a delegate to the Constitutional Convention of New York in 1776, he was a member of the committee, on which Robert Livingston and John Jay also sat, which drafted the state's first constitution. During Burgoyne's invasion of 1777, Morris was a staunch supporter of Gen. Philip Schuyler, and with Jay he made a futile trip to Philadelphia to prevent Schuyler's being superseded by Horatio Gates.

From 1778 to 1779, Morris was a member of the Continental Congress, and on an official visit of inspection to Valley Forge he became a lifelong admirer of George Washington and one of the ablest defenders of Washington's military policies. During his term in Congress, Morris drafted several important papers, including *Observations on the American Revolution* (1779), a report on the negotiations relative to Lord North's abortive proposal of conciliation with the colonies in 1778; the instructions to Benjamin Franklin as minister to France; and instructions to the envoy to be appointed to negotiate a treaty of peace with Great Britain. John Adams was subsequently entrusted with this mission, and the instructions drafted by Morris were the basis of important provisions in the Treaty of Paris of 1783.

Defeated for re-election to Congress in 1779, Morris moved to Philadelphia and resumed the practice of law. From February to April 1780 he contributed a series of brilliant essays on the country's finances to the *Pennsylvania Packet,* and these brought his appointment as assistant to Robert Morris (no relative), the superintendent of finance. Serving in this post from 1781 to 1785, Morris drew up a plan for a decimal system of coinage to replace the British system, which was later adopted after being perfected by Jefferson and Hamilton.

In 1787, Morris was elected a Pennsylvania delegate to the Constitutional Convention. Taking part in many debates, he advocated a strong central government which would entirely dominate the states, a president elected for life, a Senate of men appointed for life by the president, suffrage in national elections restricted to freeholders, and he opposed the equal representation of states in the Senate; yet in defeat he loyally accepted the will of the majority and devoted his very considerable literary skill to giving the Constitution its final form.

After the convention Morris returned to live at Morrisania, which he had bought from his brother, but business soon took him to France as an agent of Robert Morris. He reached Paris in February 1789, in time to witness the beginning of the French Revolution. His diary, published as *A Diary of the French Revolution* (Boston 1939), is an important source of information on this period in French history. In 1790, Morris was appointed a confidential commissioner to treat with Great Britain regarding the controversies over debts, trading posts, and commercial privileges that had arisen from the Treaty of Paris. The disappointing results of this mission nearly cost Morris the office of minister to France, to which he was appointed in 1792.

Unknown to his government, Morris at this time was deeply involved in a plot to help Louis XVI escape from Paris. At considerable personal risk, Morris remained in that city until 1794, when he and the French minister to the United States, E. C. E. Genêt, were recalled simultaneously. This practically ended his political life, although he served as United States senator from 1800 to 1803, filling an unexpired term. In 1810 he became chairman of the Erie Canal Commission, a project he had been actively promoting for some 25 years.

Both his background and his business career had made Morris a convinced Federalist, and in later years his disgust with Jefferson's administration drove him to extremes. He condemned the War of 1812 and the embargo and approved the Hartford Convention; at the end of his life he seems to have lost all faith in the future of the country he had labored so long to establish.

Bibliography.—Sparks, Jared, *The Life of Gouverneur Morris,* 3 vols. (Boston 1832); Morris, A. C., ed., *The Diary and Letters of Gouverneur Morris,* 2 vols. (New York 1888); Roosevelt, Theodore, *Gouverneur Morris* (Boston and New York 1888); Walther, Daniel, *Gouverneur Morris, Witness of Two Revolutions,* tr. by E. Denniston (New York and London 1934); Davenport, B. C., ed., *A Diary of the French Revolution* (Boston 1939); Swiggett, Howard, *The Extraordinary Mr. Morris* (New York 1952).

MORRIS, Gouverneur, American writer: b. New York, N. Y., Feb. 7, 1876; d. Gallup, N. Mex., Aug. 14, 1953. A banker and a prolific writer of magazine short stories and popular novels, Morris was a great-grandson of Gouverneur Morris (1752–1816). Among his books were *Tom Beauling* (1901), *Aladdin O'Brien* (1902), *When My Ship Comes In* (1915), *We Three* (1916), *The Wild Goose* (1919), *Yellow Men and Gold* (1921), and *Tiger Island* (1934).

MORRIS, Sir Henry, English physician: b. Petworth, Sussex, Jan. 7, 1844; d. June 14, 1926. He was educated at Epsom College and University College and studied medicine and surgery at Guy's Hospital, London. He delivered the Cavendish lecture (1893); Hunterian lectures (1898) and was Bradshaw lecturer at the Royal College of Surgeons (1903), and afterwards distinguished himself frequently on the lecture platform. He was former surgeon and lecturer in anatomy and surgery at Middlesex Hospital Medical College, examiner in surgery at University of London and in anatomy at University of Durham. He was for six years Chairman of the Court of Examiners of Royal College of Surgeons, president of the Royal Society of Medicine (1910–1912) and Royal College of Surgeons (1906–1909). He was created baronet 1909. Among his literary works are *Anatomy of the Joints of Man* (1879); *Surgical Diseases of the Kidney and Ureter* (1885); *Gynecology* (1891); *Injuries and Disease of the Genital and Urinary Organs* (1895); *Treatise on Human Anatomy* (1898; 4th ed., 1907); *Injuries of the Lower Extremity.* His *Treatment of Inoperable Cancer* (1902) and *Suggestion in Relation to the Treatment of Disease* (1910); *Looking Back, or from Superstition to Research—Christian Science Refuted* (1909), all contributed to his reputation.

MORRIS, Henry W., American naval officer: b. New York, 1806; d. there, Aug. 14, 1863. He entered the navy in 1819 and in 1828 was made lieutenant. He was on duty in New York and various other stations from 1839 until 1855, when he was fleet captain in the Mediterranean under Commodore Silas Stringham. In 1861 he superintended the completion of the *Pensacola,* and in 1862 took command of her, successfully passed the Confederate fortifications on the Potomac and took a distinguished part in the battles at Fort Jackson, Fort Saint Philip and Chalmette. He guarded New Orleans after its capture, but failing health necessitated his return to the North, where he soon after died. He was promoted commodore in 1862.

MORRIS, John, English Jesuit: b. Ootacamund, India, 1826; d. 1893. He studied (1845) at Trinity College, Cambridge, became (1846) a Roman Catholic, was ordained (1849), and became vice rector of the English College, Rome (1852–1855). Returning to England he was appointed secretary to Cardinal Wiseman and to his successor Cardinal Manning. He entered the Society of Jesus in 1867, was rector of Saint Ignatius College, Malta (1877–1878), was made professor of canon law and church history at Saint Bruno's College, Saint Asaph (1879) and was rector at Roehampton 1880–1886. He wrote *Condition of Catholics under James* (1871); *The Troubles of our Catholic Forefathers* (1875); *Cardinal Wiseman's Last Illness* (1871); *Life and Martyrdom of Saint Thomas Becket* (2d ed. 1885). Consult Pallen, J. H., *Life and Letters of Father John Morris* (London 1896).

MORRIS, John Gottlieb, American Lutheran clergyman: b. York, Pa., Nov. 14, 1803; d. Lutherville, Md., Oct. 10, 1895. He was graduated from Dickinson College in 1823 and studied theology at the Princeton and Gettysburg seminaries, receiving his license to preach in 1826. He founded the first English Lutheran church of Baltimore and was in charge of it from 1827–1860, after which he held various important charges. He was chiefly instrumental in the founding of the College for Women in Lutherville and of the town. From 1834 until his death he was lecturer at Pennsylvania College, and he also lectured in the Smithsonian Institution at Washington. He was prominently connected with scientific and religious societies, and founded the *Lutheran Observer* in 1831 which he edited until 1833. He was librarian of the Peabody Institute at Baltimore, 1860–1865. Among his many publications are *Catechumen's and Communicant's Companion* (1831); *Life of John Arndt* (1853); *Fifty Years in the Lutheran Ministry* (1878); *The Stork Family in the Lutheran Church* (1886), etc.

MORRIS, Lewis, American statesman: b. New York, Oct. 15, 1671; d. Kingsbury, N. J., May 21, 1746. He practiced law in New York, was judge of the Superior Court of New York and New Jersey in 1692, became one of the governor's council and a member of the assembly, and drew up and presented to Queen Anne the complaint against Governor Cornbury formulated by the assembly. From 1710–1738 he was chief justice of New York and New Jersey, in 1731 was acting governor of New Jersey, in 1738 was prominent in effecting the separation of New Jersey from New York, and from 1738 until his death was governor of New Jersey.

MORRIS, Lewis, American patriot, one of the signers of the Declaration of Independence: b. Morrisania, Westchester County, N. Y., Apr. 8, 1726; d. there, Jan. 22, 1798. After being graduated from Yale College in 1746 he engaged in farming on a very extensive scale on his paternal estate at Morrisania. He took strong ground against the act of Parliament compelling the inhabitants of the province of New York to furnish with supplies the foreign troops quartered upon them. He was elected to the Congress of 1775, was a member of the committee to devise means for supplying the colonies with munitions of war, and after the close of the session was sent west to detach the Indians from the British. In 1776 he resumed his seat in Congress, and signed the Declaration of Independence, although his estate was at that time in the hands of the enemy. As a consequence his manor was laid waste and his family expelled. In 1777 he was succeeded in Congress by Gouverneur Morris, his half brother, but afterward served in the state legislature. The latter part of his life was spent at Morrisania. He was one of the boldest and most zealous promoters of the American Revolution.

MORRIS, Sir Lewis, Welsh poet: b. Carmarthen, Wales, Jan. 23, 1833; d. London, England, Nov. 12, 1907. He was graduated from Jesus College at Oxford, studied law and was admitted to the bar of Lincoln's Inn in 1861, practicing until 1881. Was deputy chancellor of University of Wales and prominently associated with the cause of education. In 1895 he was knighted. His verse was fluent, the utterance of simple truths in unaffected language, and it was very popular, but deficient in strength, his *Epic of Hades* (1876–1877) going through many editions. Other volumes of his verse are *Songs of Two Worlds* (1872); *Gwen: a Drama in Monologue* (1879); *The Ode of Life* (1880); *Songs Unsung* (1883);

'A Vision of Saints' (1890); 'Harvest Tide' (1901); 'The Life and Death of Leo the Armenian' (1904); 'The New Rambler: From Desk to Platform' (1905), etc.

MORRIS, Mary Philipse, American Tory: b. Philipse Manor, New York, 1736; d. York, England, 1825. She was one of the famous Philipse family, daughter of the second lord of the Manor, Frederick Philipse. A beautiful brunette, she is the original of Cooper's heroine in 'The Spy,' and was long said to be one of George Washington's loves; but the story that she rejected him is untrue. Two years after meeting Washington she married George Morris (1758), an English officer, with whom she lived in what was afterward Washington's headquarters and the Jumel house. Her property was confiscated at the opening of the Revolution and she went to England. Her surviving children, being free from attaint according to the ruling of the English Attorney-General, sold their rights to John Jacob Astor for $100,000, and the British government paid them more for their losses.

MORRIS, Robert, American financier and statesman, a signer of the Declaration of Independence: b. Liverpool, England, 31 Jan. 1734; d. Philadelphia, 8 May 1806. He came to the colonies about 1747 and entered at Philadelphia the counting-room of Charles Willing, merchant; in 1754 formed a partnership with Thomas Willing maintained until 1793; acquired a very considerable fortune for the America of that time; and despite his strong loyalty to England, opposed the Stamp Act and signed the non-importation agreement of 1765. In October 1775 he was elected to the provincial assembly, and in 1776–78 was a member of the Continental Congress. On 2 July 1776 he voted against the Declaration of Independence and on 4 July absented himself; but on 2 August he was one of the signers. When hostilities began his services became of increasing value. When Congress fled from Philadelphia to Baltimore on 12 Dec. 1776, Morris was left in charge of its affairs, and when it reassembled at Baltimore on 20 December was made with George Clymer of Pennsylvania and George Walton of Georgia a committee for the execution of Continental business. Morris did all that was done. Most of the business of the colonies during December and January was transacted by him; he prepared American ships for sea, assumed charge of incoming freights and supplied Washington with money. On 20 Feb. 1781 he was elected superintendent of finance. He found the treasury in a disordered state through a vastly depreciated paper currency, and at the lowest point in the fortunes of the Continental army borrowed money on his own credit and was the instrument in the difficult task of financing the war. He presented to Congress a plan for the organization of the Bank of North America, accepted 28 May; and himself subscribing $39,200 worth of shares. The bank was incorporated 31 Dec. 1781 and began operation 7 Jan. 1782. Morris resigned January 1783, but on request did not retire until 1 Nov. 1784. He was a member of the Pennsylvania assembly in 1776–78, 1778–79, 1780–81, 1785–87. In 1787 he was a member of the convention that framed the United States Constitution. He declined the Secretaryship of the Treasury, and was United States Senator from Pennslyvania in 1789–95. With James Greenleaf and against Washington's advice, he entered land speculation, held vast territories, especially in the western half of New York State in anticipation of immigration after the war, and purchased in the new city of Washington 6,000 lots at $80 each, and agreeing to build yearly 20 brick houses. Largely through the defaulting of his partner he was compelled to make an assignment, and was imprisoned for debt at Philadelphia from 19 Feb. 1798 to 26 Aug. 1801. The influence of his credit, his ability in raising loans and his financial skill were of the utmost importance to the struggling cause of the Revolution; and it is generally admitted that he was a momentous force in Washington's administration and fully earned the title of the «Financier of the Revolution.» Consult Sparks, 'Diplomatical Correspondence of the Revolution' (1829–30); the 'Life' by Sumner (1892) in the 'Makers of America' series; Rolles, 'Financial Administration of Robert Morris' (1878), and Oberholtzer, 'Robert Morris: Patriot and Financier' (1903).

MORRIS, Thomas, American statesman: b. Augusta County, Va., 3 Jan. 1776; d. Bethel, Ohio, 7 Dec. 1844. He removed in 1795 to Columbia, Ohio, and was employed by the Rev. John Smith, the first senator from Ohio. He fixed his residence in 1800 in Clermont County, studied law, was admitted to the bar, was a member of the State legislature from 1806 to 1830, was a judge of the State Supreme Court (1815–21), and in 1832 was elected to the United States Senate as a Democrat, where he distinguished himself as an opponent of slavery and was engaged in important debates with Calhoun and Clay in defense of the right of petition and of the duty of the general government to discourage slavery. His anti-slavery sentiments rendered him distasteful to the Democratic party, by which he had been elected, and he permanently retired in March 1839. In 1844 he was nominated for Vice-President by the Buffalo convention of the Liberty party, on the ticket with J. G. Birney (q.v.) for President. Consult the 'Life' by F. B. Morris (1856).

MORRIS, William, English poet and artist: b. Walthamstow, Essex, 24 March 1834; d. Hammersmith, London, 3 Oct. 1896. He was educated at Marlborough College and Exeter College, Oxford, where he began a lifelong friendship with Edward Burne-Jones. Both were attracted by the Anglo-Catholic revival, and intended to enter the Anglican priesthood, but early abandoned that resolve, and was for some nine months a pupil in the office of the noted architect, George Edmund Street. In 1856 he founded *The Oxford and Cambridge Magazine,* to which he contributed often, and which he published at his own expense for the year it was issued. Two years later (1858) appeared 'The Defense of Guinevere and Other Poems,' in the pages of which the temper of the Middle Ages may be said to find its most accurate modern interpretation. In 1867 he published the 'Life and Death of Jason,' an epic of 17 cantos in heroic couplets, which showed him to be a teller of stories *par excellence.* By this time he had definitely entered upon his career

of weaver anew of old tales from classic or mediæval sources, and the next year (1868) appeared the first volume of 'The Earthly Paradise,' a series of stories retold from classical and mediæval originals, but with a mediæval setting. A second and third volume followed in 1869 and 1870, the entire work comprising 24 tales with the addition of interludes and preludes and 12 lyrics of the months. In 'The Earthly Paradise,' as in the 'Jason,' Morris took Chaucer for his master as well in the structure of his verse as in what may be termed the processional nature of his descriptive passages. Three verse forms are employed by him, the seven-lined decasyllabic stanza known as the Chaucerian heptastich, the four-foot couplet and the heroic couplet. 'The Earthly Paradise' includes some 40,000 lines, but when once the reader has fallen under the poet's sway his leisurely manner will not be found wearisome. In 'The Lovers of Gudrun,' one of the tales of 'The Earthly Paradise,' Morris had already turned to Iceland for a theme and in 'The Story of Sigurd the Volsung and the Fall of the Niblungs' (1876) he returned to Icelandic myth for his subject. The poet regarded this poem as his masterpiece and in the opinion of not a few critics it ranks as almost the greatest, if not the greatest epic of the 19th century. In his hands the ancient myth becomes alive and throbs with all the intensity of primeval passion. Besides these works Morris published also in verse 'Love is Enough, or the Freeing of Pharamond' (1872); 'The Æneids of Virgil done into English verse' (1875), in which the metre adopted is that of Chapman's Homer; 'The Odyssey of Homer done into English verse' (1887); 'The Dream of John Ball' (1888), and 'Poems by the Way' (1892).

In 1859 Morris married Miss Jane Burden. In 1861 he founded the firm of Morris, Marshall, Faulkner and Company and began the manufacture of wall-paper, stained glass and artistic furniture, and to his labors in this particular is traceable much of the reform which English and American trade has experienced in household art during the last generation. In 1890 he established the Kelmscott Press at Hammersmith, and there published exquisitely printed editions of Chaucer, Beowulf and other works, as well as of his own writings. Still another side of his nature was shown in the trend of his human sympathies. He had long been known as poet and craftsman, but from 1885 he was active as a social reformer, lecturing frequently to workingmen in halls or in the open air, and helping to support the *Commonwealth,* a Socialist journal. It is not wholly easy to understand this side of his nature, for intensely democratic as he became, in theory at least, he was an equally intense lover of that very beauty which a social upheaval would destroy. The ugliness of much of modern life led him to Socialism, but he was thoroughly sincere in his attitude, illogical as it may seem to many. However difficult it may be to adjust satisfactorily to our minds the attitude of the poet-Socialist with the character of his work as a craftsman, which was offered to the world at prices practically prohibitory for the majority of persons, it is an unquestionable fact that the world is a pleasanter, wholesomer world for his having lived in it. He helped his generation to perceive that there is no necessary alliance between utility and ugliness; he raised the standard of household taste, and as a poet he was one of the most melodious of his time. In his later years he essayed a form of composition in mingled prose and verse greatly enjoyed by many, though perhaps not wholly to the taste of those who liked him best as the author of 'The Earthly Paradise' and 'Sigurd'—a series of romances beginning with 'The Tale of the House of the Wolfings' (1889), and succeeded by 'The Roots of the Mountains' (1890); 'News from Nowhere' (1891); 'The Story of the Glittering Plain' (1891); 'The Wood beyond the World' (1894); 'The Well at the World's End' (1896); 'The Water of the Wondrous Isles' (1897), and 'The Story of the Sundering Flood' (1898). With Erikir Magnusson, the Icelandic scholar, he published 'The Story of Grettir the Strong' (1869); 'Volsunga Saga' (1870), and 'Three Northern Love Stories and Other Tales' (1875). Still other works by him are 'The Decorative Art' (1878); 'Hopes and Fears for Art' (1882); 'Signs of Change' (7 lectures, 1888); with Belfast Bax, 'Socialism: Its Growth and Outcome' (1893); 'Architecture, Industry and Wealth' (1903). Morris received a tentative offer of the laureateship on the death of Tennyson, but his socialistic theories would have suited ill with the post, and he indicated that it would not be acceptable to him. He was a devoted admirer of mediæval architecture, and his account in the 'Earthly Paradise' of the front of Peterborough cathedral is one of the finest descriptions of an architectural feature to be found in English literature. He has also written informative and interesting monographs on mural painting and related subjects. See EARTHLY PARADISE, THE. Consult the 'Lives' or studies by Cary (1902); Clutton-Brock (1914); Jackson, Holbrook (1908); Mackail (1899); Noyes, Alfred (1909); Vallance (1897); Riegel, 'Die Quellen von William Morris's Dichtung, "The Earthly Paradise,"' in Erlanger Beiträge zur englischen Philologie (1890); Warwick, 'William Morris, 'His Homes and Haunts' (1912); 'Collected Works of William Morris' (20 vols., London 1913); and Saintsbury, 'Corrected Impressions' (1895).

MORRIS, William O'Connor, Irish jurist and author: b. Kilkenny, 26 Nov. 1824; d. 3 Aug. 1904. He was educated at Oxford, was admitted to the Irish bar in 1854 and was a county court judge from 1872 until his death. He wrote 'Great Commanders of Modern Times'; 'Napoleon'; 'Moltke'; 'Irish History'; 'Hannibal'; 'Ireland: 1798–1898'; 'The Great Campaign of Nelson'; 'The Campaign of 1815'; and 'Memories and Thoughts of a Life' (1895).

MORRIS, an island at the entrance to Charleston Harbor, S. C., south of the main channel. It is east of James Island, nearly a mile south of Fort Sumter and about a mile and a half from Fort Moultrie. At Cummings Point, on the north end of the island, three small batteries took part in the bombardment of Fort Sumter, 12–13 April 1861. Later Battery Wagner was constructed on the south end of the island and the batteries on the north end

were strengthened and called Battery Gregg. Attempts were made, in 1863, by the Union forces under Admiral Du Pont and General Hunter to secure possession of the island, and later by Admiral Dahlgren and General Gilmore. A landing was made on July 10 and on the 11th and 18th an encounter took place, and a regular siege began. See also FORT SUMTER.

MORRIS, city, Illinois, and Grundy County seat; altitude 504 feet; 21 miles southwest of Joliet; on the Illinois River; the Lakes to Gulf Waterway; and the Chicago, Rock Island and Pacific Railroad. The site was long occupied by Indian tribes. The first settlement was made in 1834; it was laid out in 1842 and named for Isaac N. Morris, one of the Illinois and Michigan Canal commissioners who was responsible for having the village selected as the county seat; and in 1857 the town was incorporated.

With the completion of the Illinois and Michigan Canal in 1848, the community developed rapidly and became an important shipping point for the surrounding region, a fertile agricultural area in which there are large bituminous coal fields and beds of clay used for brick and tile. Industries include food products, beverages, leather, vending machines, egg cartons, and flour mills. It has modern public school buildings. On the western edge of Morris is the 33-acre Gebhard Woods State Park, occupying the old Canal Parkway. Pop. (1950) 6,926.

MORRIS, city, Minnesota, county seat of Stevens County; altitude 1,140 feet; on the Great Northern and the Northern Pacific railroads, about 140 miles northwest of Minneapolis. It is situated in an agricultural region devoted largely to the growing of wheat, livestock raising, dairy farming and poultry raising. There are several grain elevators, flour mills, creameries, etc. Morris is the seat of West Central Agricultural College, which was originally an Indian mission school operated by Roman Catholic nuns.

Morris attained its present status under the supervision and jurisdiction of the federal government. It is housed in 14 buildings, including administrative offices, dormitories, classrooms, etc. There is an experimental station and a weather station operated in connection with the college. There is also in Morris a National Guard armory, containing an excellent collection of war relics, representative of the Civil, Spanish-American and World wars. Nearby lakes afford excellent fishing, and wild fowl afford good shooting. Pop. (1940) 3,214; (1950) 3,809.

MORRIS DANCE, or **MOORISH DANCE,** supposed to have been derived from the Moriscos in Spain, was formerly danced at puppet-shows, etc. It was introduced into England in the reign of Edward III, when John of Gaunt returned from Spain. In the May-games morris-dancers formed an important part. Robin Hood, Friar Tuck, Little John and the Hobby Horse were introduced as characters in the dance. In the reign of Henry VIII the morris-dancers were dressed in gilt leather and silver paper, and sometimes in coats of white and spangled fustian. Suppressed by the Puritans it survives in the north of England.

MORRIS PARK, a once famous New York racetrack.

MORRIS PLAINS, New Jersey, residential borough in Morris County; alt. 405 feet; on the Delaware, Lackawanna and Western Railroad; 35 miles west of New York. Nearby is the state mental hospital. Founded about 1750, Morris Plains was incorporated in 1926. Pop. (1950) 2,707.

MORRIS PLAN, The. The Morris Plan of industrial loans and investments takes its name from a Southern lawyer, Arthur J. Morris, formerly of Norfolk, Va., but now of New York. Since 1910 Morris Plan banks or companies have operated in more than 125 cities in 30 states and the District of Columbia; the name has come by common usage to express a method of industrial banking which is so generally recognized as to have made for itself a place in dictionaries. The plan, as originated in 1910 in Norfolk, contemplated an extension of credit to men and women based on their character and earning power. The Fidelity Savings and Trust Company of Norfolk began operation of the Morris Plan on March 23, 1910, providing for Americans a type of banking service which had existed on the continent of Europe for over half a century. As reported on Dec. 31, 1951, the total assets of 58 Morris Plan banks and companies were $956,266,566.

Until the development of the Morris Plan of making industrial loans, a would-be borrower, in need of a small amount of money to tide him over some urgent and unusual financial difficulty, usually had to rely upon the generosity of a friend or place himself at the mercy of a loan-shark. In either case, the system was bad. The amount needed might vary from $50 to $5,000 and the prospective borrower might be either a merchant, a salaried or professional man or woman, or a wage earner. Such a person might be unknown to the commercial banks, or, if known, perhaps owned no securities upon which he could borrow. It was to take care of such cases that the Morris Plan was developed. At a Morris Plan bank a borrower discloses his needs, and, if the statement made by him is satisfactory, is given an application blank and a note which is signed as a part of the legal procedure. In addition to the borrower's own statement and application, the company must be supplied with the statements and signatures of two of the borrower's associates, friends, or relatives, of such reputation and financial standing as are acceptable. These "endorsers," as they may be called, become "co-responsible parties" to the loan, and are legally responsible to the lending company (unless the loan has been protected by a Morris Plan insurance policy) in the event of the death or delinquency of the borrower.

The discount rate is usually 6 per cent (often less, and seldom exceeding 8 per cent). For small loans the service charge ranges up to 2 per cent. Most loans are to wage earners or small salaried workers, but many are to individuals, firms, or small corporations to facilitate business expansion.

The total number of Morris Plan loans in the period 1910–1945 amounted to 17,809,466 for an aggregate amount of $4,681,571,654. Investment certificates were the main source of loanable funds until the mid-1930's. Today practically all Morris Plan banks are members of the Federal Deposit Insurance Corporation. Subject also to state regulations, they are authorized to accept deposits in the form of savings or checking accounts. Funds derived from this

source provide the major portion of the capital which is loaned. Thus the small saver finances the small borrower.

In 1917 the Morris Plan Insurance Society was created as an additional feature of this service. Under this system loans can be protected by the payment of a nominal fee so that in the event of a borrower's death, the obligation of the borrower's family and endorsers is canceled.

The Morris Plan Company of New York is the largest operating company. It was organized 31 Dec. 1914 with a capital of $100,000. On 31 Dec. 1930 its working capital exceeded $4,300,000 and its total resources were over $49,000,000. The Company maintains 12 offices in New York.

Morris Plan borrowers do not make monthly or weekly repayments on their loans. The Plan provides a definite "thrift process" which is designed to assist the borrower in forming the habit of systematic saving. He agrees to purchase a Morris Plan certificate of a denomination sufficient to liquidate his loan when it shall become due. On this certificate monthly or weekly installments are paid. The borrower holds the certificate book, which is, in effect, his bank book. At the end of the 10 or 12 months period, which is the usual period for Morris Plan loans, the certificate has been paid for. It is then used by the borrower as collateral with which to cancel his loan.

The Morris Plan Corporation of America, located in New York City, is the organizing force for all work connected with the establishment of new banks and companies operating under this system. JOSEPH B. GILDER,
Late Secretary of the Industrial Finance Corporation.

MORRISON, Arthur, English author: b. 1863. He was for a number of years secretary to a charity-trust in London's East End, and there made the studies utilized in his "Tales of Mean Streets" (1895), and "The Child of Jago" (1896). He wrote also "Martin Hewitt, Investigator" (1896), detective stories; "The Dorrington Deed-Box" (1897); "To London Town" (1899); "The Hole in the Wall" (1902); "The Red Triangle" (1903); "Divers Vanities" (1905); "Green Ginger" (1909); "The Painters of Japan" (1911), and he has collaborated in the production of three plays.

MORRISON, George Ernest, British traveler and Sino-expert: b. Geelong, Victoria, Australia, 4 Feb. 1862; d. 30 May 1920. He was educated at the Melbourne and Edinburgh universities, receiving (1887) degrees M.D. and C.M., crossed Australia on foot (1882–83) and crossed from Shanghai to Rangoon by land (1894); as special correspondent for *The Times* (London) he traveled from Bangkok, Siam, to Yunnan City, China, and round Tonquin (1896), and in the same capacity crossed Manchuria from Stretensk, Siberia, to Vladivostok (1897). He was in Pekin during the Boxer siege (1900) and was present at the Japanese triumphal entry into Port Arthur (1905). In 1907 he again crossed China from Pekin to the French border of Tonquin and thereafter did much travel and exploration in China and Russian Turkestan. On account of his great store of knowledge of Chinese topography and politics he was made political adviser to the President of the Chinese Republic in 1912. He wrote "An Australian in China: being the Narrative of a Quiet Journey Across China to Burma" (1895).

MORRISON, Henry Clay, American Methodist (South) bishop: b. Montgomery County, Tenn., 30 May 1842. He was educated in the public schools and after teaching for several years entered the ministry in 1865. He received important charges in Louisville, Ky., and Atlanta, and was missionary secretary in 1890–98 when he raised $140,000 for the Board of Missions. He was appointed bishop in 1898, and five times elected to the General Conference. He died 20 Dec. 1921.

MORRISON, James Dow, American Protestant Episcopal bishop: b. Waddington, N. Y., 1844. He was graduated from McGill University, Montreal, in 1865, took orders in the Episcopal ministry and after holding rectorates at Herkimer and Ogdensburg, N. Y., was consecrated first missionary bishop of the diocese of Duluth in 1897. In 1907 he organized the diocese of Duluth of which he became first diocesan bishop. He has published "Fundamental Church Principles" (1899); "Suffragan Bishops" (1910), and also sermons and addresses.

MORRISON, John Frank, American army officer: b. Charlottesville, N. Y., 20 Dec. 1857. He was graduated from the United States Military Academy and commissioned 2d lieutenant, 20th Infantry in 1881. During his service as a subaltern and captain he was noted as a student of tactics and an authority on general military science. He served in the Santiago campaign and later in the Philippines with distinction. In the Russo-Japanese War he was selected for service as an observer and accompanied General Kuroki through the campaign from the Yalu to Liao Yang and Mukden. On his return home in 1905 he was detailed as a student to the nascent Army War College and in the following year went to Leavenworth service schools as instructor. In 1907 he became chief of the department of military art in that institution. The drastic reforms and reorganizations he there carried out led to a high degree of efficiency under his administration. During 1912 and 1913 he was sent to Hawaii and the Panama Canal Zone to plan the defenses of those places. He served on the Mexican border in 1914 as colonel and in 1915 was sent on a mission to China. At the end of 1915 he was promoted to brigadier-general, and to major-general in 1917. In January 1918, shortly after his return from France, he was appointed to the newly-created office of Director of Training, and, later, Commander of the 8th Division. He was awarded the D. S. M. in 1919. His teaching revolutionized American infantry drill regulations; some of his lectures have been collected and published, notably "Seventy Problems: infantry tactics, battalion, brigade and division" (1914); "A study in Troop Leading," etc. (in collaboration with E. L. Munson: 1911 and 1918); "Training Infantry" (1914).

MORRISON, John Tracy, American lawyer and politician: b. Jefferson County, Pa., 25 Dec. 1860. He was graduated from the University of Wooster, Ohio, in 1887, and from the law department of Cornell University in 1890. In the latter year he moved to Caldwell, Idaho,

where he established a law practice and became active in Republican politics. He served as chairman of the state committee from 1897 to 1900, and was governor of Idaho from 1903 to 1905.

MORRISON, Robert, Scottish missionary, the first Protestant missionary to China: b. Morpeth, Northumberland, Jan. 5, 1782; d. Canton, China, Aug. 1, 1834. While working as a last and boot-tree maker, he became interested in theology and studied Latin, Greek, and Hebrew. He attended Hoxton Academy in 1803, and the Missionary Academy, Gosport, in 1804. Ordained in 1807, he was sent to China by the London Missionary Society. In 1809 he was appointed translator to the East India Company's factory in Canton, and in the following year began to print the New Testament in Chinese from a text which he had carefully revised. He completed this work in 1814, and in the same year published his *Chinese Grammar.* With the assistance of Dr. William Milne, he also translated the Old Testament. The work was completed in 1819 and published in 1823. In the following year, on a visit to England, he was elected a fellow of the Royal Society. With his colleagues, Morrison superintended the extensive publication of religious works for diffusion among the Chinese, and in 1818 he founded the Anglo-Chinese College in Malacca. His other published works include *Horae Sinicae* (1812); *A View of China for Philological Purposes* (1817); and the monumental *Dictionary of the Chinese Language,* published in three parts from 1815 to 1823.

MORRISON, William Ralls, American legislator: b. Monroe County, Ill., Sept. 14, 1824?; d. Waterloo, Ill., Sept. 29, 1909. After serving in the Mexican War, he went to the California goldfields. Returning to Illinois in 1851, he attended the preparatory department of McKendree College in Lebanon, and from 1852 to 1854 served as clerk of the circuit court of Monroe County. He was admitted to the bar in 1855, and from 1854 to 1860 was a member of the state legislature, serving as speaker in 1859–1860. At the outbreak of the Civil War, he organized the 49th Illinois Volunteer Infantry Regiment and was elected its colonel. He remained in the army until 1863, when he was wounded at Fort Donelson. Elected to Congress that year, he served until 1865. Re-elected in 1873, he became a strong advocate of tariff reform. Of the several tariff bills he introduced, the most celebrated was the so-called Horizontal Bill, defeated by only five votes in 1884. Morrison continued to serve in Congress until 1887, when he became a member of the Interstate Commerce Commission. He remained with the commission for 10 years, serving as chairman after 1892.

MORRISON, city, Illinois, seat of Whiteside County, situated at an altitude of 670 feet, on the Chicago and North Western Railway, 12 miles east of Clinton, Iowa. The center of a dairy farming area, the city has milk-processing plants as well as factories producing refrigerators, stoves, automatic control devices, and furniture. Nearby is Unionville Mill, erected in 1858 and still grinding flour and feed. Morrison was founded in 1853 and incorporated in 1867. In 1874 the inventor James Sargent installed his first time lock on the door of the safe in the First National Bank of Morrison. The city is governed by a mayor and council and owns its water supply system. Pop. (1950) 3,531.

MORRISTOWN, town, New Jersey, seat of Morris County, situated at an altitude of 405 feet, on both banks of the Whippany River, 17 miles west-northwest of Newark. It is served by the Delaware, Lackawanna and Western and the Morristown & Erie (freight only) railroads and has a municipal airport. Primarily a residential community, it also has considerable trade and ships flowers, fruit, and vegetables grown in the surrounding area. In addition, there are factories producing rubber goods, clothing, electrical products, pharmaceuticals, paving materials, and umbrellas.

The chief point of interest is Morristown National Historical Park, established in 1933, which covers 958.4 acres partly within and partly outside the town. The park consists of three units: Ford House, Fort Nonsense, and Jockey Hollow. Ford House, which served as George Washington's headquarters in 1779–1780, is stored with Washingtoniana and has been a museum since 1873. It was built by Col. Jacob Ford, Jr., Revolutionary War powdermaker, in 1774. Behind the mansion is a historical museum established in 1938. The earthworks at Fort Nonsense, originally built at Washington's order in 1777, have been reconstructed. In Jockey Hollow are recreations of camp buildings used by the Continental Army in 1779–1780 and 1780–1781 and the Wick House (1746). The Jabez Campfield House (1760) was the scene of Alexander Hamilton's courtship of Elizabeth Schuyler. Other notable buildings include the county courthouse, erected in 1826, and the municipal building (1918), originally the home of Theodore N. Vail (q.v.). Near the town is the Seeing Eye, the famous institution for training dogs to lead the blind.

The site of Morristown was settled in 1709–1710 as West Hanover. In 1739 the name was changed to Morristown in honor of Lewis Morris (q.v.), first governor of New Jersey. During the American Revolution the town supplied iron to the Continental Army. From January to May 1777, and from December 1779 to June 1780, it was Washington's headquarters. Here also Samuel F. B. Morse and his associate, Alfred Vail (qq.v.), developed the magnetic telegraph, in 1837–1838. The town was incorporated in 1865. Government is vested in a mayor and council. Pop. (1950) 17,124.

Consult Sherman, A. M., *Historic Morristown, New Jersey* (Morristown 1905).

MORRISTOWN, city, Tennessee, seat of Hamblen County, situated at an altitude of 1,350 feet, on the Southern Railway, 41 miles east-northeast of Knoxville. It is the shipping center for an area raising tobacco, poultry, and dairy cattle, and has factories producing textiles, hosiery, canned foods, beverages, and furniture. Morristown is the seat of Morristown Normal and Industrial College, a coeducational junior college for Negroes founded in 1881. First settled in 1783, the city was incorporated in 1855. Its water supply system is publicly owned. Pop. (1950) 13,019.

MORRISVILLE, borough, Pennsylvania, situated in Bucks County, at an altitude of 20 feet, on the Delaware River, opposite Trenton, N. J. It is served by the Pennsylvania Rail-

road. The borough's industrial establishments produce chemicals, plastics, and rubber products. Nearby is the Fairless Works of the United States Steel Company, constructed in 1951–1952. Morrisville was named for Robert Morris (q.v.) and incorporated in 1804. Government is by mayor and council, and the water supply system is municipally owned. Pop. (1950) 6,787.

MORRO CASTLE, the name of two fortifications in Cuba. The first is at the east side of the entrance to Havana Harbor; built by the Spaniards in 1589–1597, it was taken by the British under Admiral Sir George Pocock in 1762, and bombarded by United States forces in the Spanish American War. The second, at Santiago de Cuba, was built soon after the first; it was captured by the United States in the Spanish American War.

MORROW, Dwight Whitney, American lawyer, banker, and diplomat: b. Huntington, W. Va., Jan. 11, 1873; d. Englewood, N. J., Oct. 5, 1931. He was educated at Amherst College, where he was a classmate of Calvin Coolidge, and from which he received his B.A. degree in 1895. Upon his graduation from Columbia Law School in 1899, he entered the employ of the law firm of Reed, Simpson, Thacher and Barnum (later Simpson, Thacher and Bartlett), of which he was made a member in 1905. He maintained this connection until 1914, when he joined the banking firm of J. P. Morgan & Co., with which he was associated until 1927. Morrow helped to frame the workmen's compensation law of New Jersey in 1911, and as a member of the New Jersey Prison Inquiry Commission (1917) and chairman of the state board of institutions and agencies (1918–1920) brought about many reforms. In 1918 he served as adviser to the Allied Maritime Transport Council. In 1927, President Coolidge appointed him ambassador to Mexico. He served in this capacity for three years, doing much to improve American-Mexican relations. Among other achievements, he succeeded in settling disputes over oil rights and aided materially in resolving the conflict between the Mexican government and the Roman Catholic Church. In 1930 he was a delegate to the London Naval Conference, and later that year was elected to the United States Senate to fill the unexpired term of Walter E. Edge.

His wife, Elizabeth Morrow (nee Cutter, 1873–), whom he married in 1903, wrote several volumes of prose and poetry and in 1939–1940 served as acting president of Smith College. Their daughter, Anne Spencer Morrow, married Charles A. Lindbergh (q.v.) in 1929.

MORROW, William W., American jurist: b. near Milton, Ind., July 15, 1843; d. San Francisco, Calif., July 24, 1929. He moved to California in 1859, was admitted to the bar in 1869, and engaged in the practice of law in San Francisco. From 1870 to 1874 he served as assistant United States district attorney, and from 1879 to 1882 he was chairman of the Republican state central committee. He was attorney of the state board of harbor commissioners (1880–1883), special attorney for the United States before the French and American Claims Commission (1881–1883), and special United States attorney in connection with the *Alabama* claims (1882–1885). From 1885 to 1891 he was a member of Congress. Morrow was a member of the federal judiciary for 32 years, serving as judge of the federal court of the northern district of California (1891–1897), and of the circuit court and circuit court of appeals (1897–1923). His decisions, many of them on important constitutional questions, are said to have totaled more than 650. He was also the author of *An Introduction to California Jurisprudence.*

MORS, môrs, or **MORSO**, môrs'û, island, Denmark, situated in Lim Fjord, Thisted County, in northwestern Jutland. The largest island in the fjord, it has an area of 142 square miles. The shores are marked by precipitous cliffs, and the interior rises to a height of 289 feet. Nykjøbing is the chief town. Pop. (1945) 26,988.

MORSE, Edward Sylvester, American zoologist: b. Portland, Me., June 18, 1838; d. Salem, Mass., Dec. 20, 1925. He studied conchology for three years as a special student of Louis Agassiz at the Lawrence Scientific School, Harvard University. After teaching zoology and comparative anatomy at Bowdoin College (1871–1874), he went to Japan and taught at the Imperial University in Tokyo (1877–1880). On this and subsequent visits to the Orient, he added to his knowledge of zoology a remarkable intimacy with Chinese and Japanese art, especially ceramics, and with the folklore and archaeology of both China and Japan. His collection of Japanese pottery was acquired by the Boston Museum of Fine Arts, and he served as its curator after 1892. From 1880 until his death he was director of the Peabody Museum in Salem. Besides numerous scientific papers on zoology, ethnology, and archaeology, he was the author of *First Book of Zoölogy* (1875); *Japanese Homes and Their Surroundings* (1886); *Glimpses of China and Chinese Homes* (1902); *Mars and Its Mystery* (1906); and *Japan Day by Day* (2 vols., 1917).

MORSE, Harmon Northrop, American chemist: b. Cambridge, Vt., Oct. 15, 1848; d. Chebeague Island, Me., Sept. 8, 1920. He was graduated from Amherst College in 1873 and received his doctorate from the University of Göttingen in 1875. He was assistant in chemistry at Amherst (1875–1876), a member of the staff of the chemistry department of Johns Hopkins University (1876–1883), associate professor of chemistry there (1883–1892), professor of analytical chemistry and adjunct director of the laboratory (1892–1908), and professor of inorganic and analytical chemistry and director of the laboratory (1908–1916). He also served for a number of years as research associate of the Carnegie Institution, Washington, D.C. Morse investigated new methods of quantitative analysis, did research on permanganic acid and its salts, and accumulated data on the osmotic pressure of aqueous solutions. In addition to about 60 scientific articles, he published *Exercises in Quantitative Chemistry* (1905); and *The Osmotic Pressure of Aqueous Solutions,* Carnegie Institution Monograph No. 198 (1914).

His brother, Anson Daniel Morse (1846–1916), was an educator and historian. He taught at Amherst College from 1876 to 1907 and wrote a number of studies on American political parties.

MORSE, Harry Wheeler, American physicist: b. San Diego, Feb. 25, 1873; d. March 12, 1936. He

graduated (1897) at Leland Stanford Jr. University, and took the degree of Ph.D. (1901) at the University of Leipzig. He was instructor of physics (1902–10), assistant professor (1910–12) at Harvard and professor of chemistry at the University of California (1912–13); engaged in corporation industrial chemistry until 1920 when he became a consulting chemist and metallurgist. He translated Ostwald's 'Letters to a Painter on the Theory and Practice of Painting' (1906) and is joint author of 'Ostwald's and Morse's Elementary Chemistry' (1907), and author of 'Chemistry and Physics of the Lead Accumulator' (1912). Numerous monographs on spectroscopy, fluorescence, diffusion, electrochemistry, etc., are from his pen.

MORSE, Hosea Ballou, American authority on Chinese affairs: b. Brookfield, N. S., 18 July 1855. He was graduated (1874) at Harvard University and was appointed in the same year assistant in the Imperial Chinese Customs service, being promoted (1887) to deputy commissioner and (1896) commissioner. From 1903–07 he was statistical secretary (commissioner of customs) to the inspector-general of customs, retiring 1909. By Imperial decree (1885) he was sent on a special mission connected with the terminating of the Franco-Chinese War, and fulfilled special duties (1885–87) connected with the reorganization of the subsidized China Merchants' Steam Navigation Company. In 1889 he was appointed special commissioner to arrange for opening Hunan Province to foreign trade. For his numerous services he has received (by Imperial rescript) The Decoration of the Double Dragon, III division, 2d class (1885); Double Dragon 1st class (1903); Order of Chia Ho, 3d class, Republic of China (1916). He has written 'The Currency of China' (1906); 'Trade and Administration of the Chinese Empire' (1908, new ed. 1920); 'International Relations of the Chinese Empire' (1910–18); 'Chronicles of the East India Company in China, 1635–1834' (1925).

MORSE, Jedidiah, American Congregationalist clergyman and geographer: b. Woodstock, Conn., 23 Aug. 1761; d. New Haven, 9 June 1826. He was graduated from Yale in 1783; studied theology under Jonathan Edwards; was pastor at Charlestown, Mass., from 1789 to 1820; and spent his last years in New Haven. He was intensely orthodox; established in 1805 the *Panoplist,* a religious journal combating Universalist views; and was an able and successful teacher. He wrote 'A Compendious History of New England,' with Elijah Harris (1804); 'Annals of the American Revolution' (1824), and a series of excellent biographies.

MORSE, John Torrey, American historian: b. Boston, 9 Jan. 1840. He was graduated at Harvard in 1860, and was lecturer on history there from 1876 to 1879. For two years he was associated with Henry Cabot Lodge in the editorship of the *International Review.* Served on board of overseers of Harvard University for 11 years and was member of the Massachusetts legislature in 1875. He also studied and practised law in Boston for a time and wrote treatise on 'Law of Banks and Banking' which has now reached seventh edition; also 'Law of Arbitration and Award.' His literary work was chiefly in historical biography, and he edited the 'American Statesmen' series, which is ranked among the best biographical works for the interpretation of American history. For this series he wrote 'Abraham Lincoln' (1893); 'Benjamin Franklin' (1889); 'John Adams' (1884); 'John Quincy Adams' (1883); and 'Thomas Jefferson' (1883); his other works include 'Life of Alexander Hamilton' (1876); and 'Life and Letters of Oliver Wendell Holmes' (1896); also 'Life and Letters of Colonel Henry Lee' (1905). D. 27 March 1937.

MORSE, Richard Cary, American clergyman: b. Hudson, N. Y., 19 Sept. 1841. He was graduated (1862) at Yale and took (1865) the degree of A.M., when he studied theology at Princeton and Union Theological seminaries (1867). From 1867–69 he was assistant editor of the *New York Observer* and was ordained (1869) to the Presbyterian ministry. He was general secretary of the international committee Y. M. C. A. (1869–1915), continuing as consulting general secretary. His work was connected with the supervision and extension of the Y. M. C. A., especially in North America; but his labors have taken him on tours to India, Australia, China, Korea, Japan, the Philippines and Russia. He wrote 'Robert R. McBurney, a Memorial' (1899); 'Polity of Young Men's Christian Associations' (1904); 'Fifty Years of Federation of the Y. M. C. A.' (1905); 'History of the North American Y. M. C. A.' (1913). He died 25 Dec. 1926.

MORSE, Samuel Finley Breese, American inventor and artist: b. Charlestown, Mass., 27 April 1791; d. 2 April 1872. He was the eldest son of the Rev. Jedidiah Morse (q.v.). After graduating at Yale in 1810, he visited England with Washington Allston (q.v.) to study painting. In 1813 his first attempt at sculpture, a 'Dying Hercules,' won for him the gold medal of the Adelphi Society, and he received the same from the hands of the Duke of York. He returned to New York in 1815, and in 1824–25 organized an association which became the present National Academy of Design. He was its first president and continued in office for 16 years. He again spent three years in study in Europe, and then returned to New York to take the professorship in the University of the City of New York.

Morse had always been fond of the study of chemistry and natural philosophy, and it became at last a dominant pursuit with him. In consequence of his intimacy with Prof. J. Freeman Dana, who was lecturing in the same institution on the electro-magnet, Morse became interested in electrical matters, and in 1832, while returning home from Havre on the packet ship *Sully,* he first conceived the idea of the telegraph. But though thus early devised, yet circumstances prevented the complete construction of the first recording apparatus in New York until 1835, when he exhibitetd it at the New York University building. In 1837 he made another and more perfect exhibition, and filed his caveat at Washington. He now considered his apparatus sufficiently perfected for commercial introduction, and in 1838 he asked Congress to construct an experimental line from Washington to Baltimore to show its practicability. From the skepticism of many and the ridicule of others, Morse's request was not acted upon by Congress, and, disappointed and almost disheartened, he repaired to England in hopes of

getting some foreign government to aid him. The result of this visit was a refusal to grant him letters patent in England, and the obtaining of a useless *brevet d'invention* in France. For four years he struggled and put up with many privations, and, as if it were designed to try him up to the last moment, no recognition of the matter was taken till the last night of the Congressional session. He retired to bed disheartened and discouraged before the session was closed. But in the morning — the morning of 4 March 1843 — he was startled with the announcement that the desired aid of Congress had been obtained in the midnight hour of the expiring session, and $30,000 placed at his disposal for his experiment between Washington and Baltimore. In 1844 the work was completed, and demonstrated to the world the practicability and the utility of the Morse system of the electro-magnetic telegraph. The first message, "What hath God wrought?" was sent from the United States Supreme Court room in the Capitol at Washington to Baltimore, 24 May 1844. From that day the telegraph was a success.

Honors were showered upon him by European sovereigns and governments. Probably no American has ever received so many marks of distinction. In 1848 Yale College conferred on him the complimentary degree of LL.D., and in the same year he received the decoration of the Nishan Iftichar in diamonds from the sultan of Turkey. Gold medals of scientific merit were awarded him by the king of Prussia (set in a massive gold snuff box), the king of Würtemberg, and the emperor of Austria. From the emperor of the French he received in 1856 the cross of chevalier of the legion of honor; in 1857 from the king of Denmark the cross of knight of the Dannebrog; and in 1858 from the queen of Spain the cross of knight commander of the Order of Isabella the Catholic. The sum of 200,000 francs was presented to him jointly by the principal governments of Europe. It has been said that much of this money was spent in the ceaseless litigation and lawsuits in which he was involved in the defense of his patent rights.

Professor Morse also had the distinction of laying the first submarine telegraph line, which was done in New York harbor in 1842. He likewise set up the first daguerreotype apparatus and was associated with John W. Draper in taking the first daguerreotypes in America. A letter from Professor Morse to the Secretary of the Treasury in 1843 seems to contain the earliest suggestion of the possibilities of an Atlantic cable. His last public act was the unveiling of the statue of Benjamin Franklin, in Printing House Square, New York. Consult Prime, 'Life of S. F. B. Morse' (New York 1875) and Morse, E. L. (son), 'Samuel Finley Breese Morse, his Letters and Journals' (2 vols., Boston 1914).

MORSE, Sidney Edwards, American journalist and inventor, son of Jedidiah Morse (q.v.) and brother of S. F. B. Morse (q.v.): b. Charlestown, Mass., 7 Feb. 1794; d. New York, 24 Dec. 1871. He was graduated at Yale in 1811; studied law; established the *Boston Recorder* in 1815 and the *New York Observer* in 1823, the pioneers of American religious journalism; invented a flexible piston-pump in 1817 and the cerographic method of printing maps in 1839; improved a bathymetre for deep-sea soundings; and, like his father, was an able and successful geographer. His 'New System of Modern Geography' ran to half a million copies.

MORSE, Sidney H., American sculptor and editor: b. Rochester, N. Y., October 1832; d. San Mateo, Fla., 18 Feb. 1903. In youth he worked at marble-cutting and acquired a taste for sculpture. Later he studied at Antioch College and afterward began to preach in Unitarian pulpits in the West; still later made further preparation for the ministry at Harvard, and for some time was settled in Haverhill, Mass. From 1865 to 1872 he was editor of the *Radical,* a worthy successor of the famous *Dial.* Morse counted among his friends and contributors Emerson, A. B. Alcott, Samuel Johnson, Samuel Longfellow and many others prominent in literature and reform. When he discontinued the *Radical* he turned with enthusiasm to sculpture and produced many notable works. He made a bust of Emerson, which is in the Second Church, Boston, the present edifice of the society to which Emerson ministered (1829–32), and another of the same subject, regarded by Emerson's friends as the best extant. His other subjects include Channing, Parker, James Martineau, Walt Whitman, Carlyle, Thomas Paine, Lincoln, Holmes and President Cleveland. Morse wrote much for periodicals and attained fame as a lecturer. One of his poems, 'Sundered,' is to be found in Emerson's 'Parnassus.'

MORSHANSK, môr-shänsk', Russia, a district town in the province of Penza, on the navigable river Tsna and on the Syfran-Vyasma Railway. It has a gymnasium for girls, a city bank and factories producing tobacco, soap, tallow, spirits, etc., besides doing a lively trade in grain. Its population is about 28,000.

MORSÖE, mŏrs'ė-ë. See Mors.

MORTALITY, a term applied to that branch of investigation which determines the proportion of the number of persons who die in any assigned period of life or interval of age, out of a given number who enter upon the same interval, and consequently the proportion of those who survive. Tables showing how many out of a certain number of infants, or persons of a given age, will die successively in each year till the whole become extinct, are generally called tables of mortality. There is no fixed number of lives upon which such tables are based, but the observation of a large number is indispensable to accuracy, and the larger the number that can be duly observed the greater will be the degree of accuracy attained. It must always be borne in mind, however, that a strict observation of a moderate number will yield truer results than a looser induction from a larger number. The basis of such calculations must be an accurate register of the number of births and deaths, and in the case of the latter, at what ages, in a given district or extent of country.

In Great Britain the bills of mortality, or abstracts from parish registers, were long the only means of arriving at these results; but being found very imperfect and unsatisfactory, they were supplanted in 1836 by a general regis-

tration. The results furnished by such tables are very various and of great interest. The registers, if kept with sufficient accuracy and minuteness, enable us to determine the proportion of deaths, not only at different ages and in different regions, but at different seasons, in persons of different occupations and habits, in towns or the country; and thus afford valuable materials for the science of political economy. Although much more attention has been paid to this subject in recent times, yet the observations have not been so extensive nor so accurate as is desirable.

Although the collection of regular statistics of mortality is of recent origin, the subject has always excited much interest, and many general facts have been collected regarding it. The tendency of mortality to diminish with the progress of civilization has been satisfactorily established by statistics. The average rate of mortality is affected by regular or constant causes, such as race, climate, age, sex, profession, social position, density of population, political institutions, habits, etc., and by such irregular or occasional causes as war, famine, pestilence, etc., but notwithstanding the interruption of these occasional causes a constant tendency to a mean has been found to exist in any given state of society. The fact that the tendency of population to increase or diminish is quite independent of the rate of mortality was first established by Malthus, who showed that the increase of population depended on the facility of procuring the means of subsistence and not on the duration of life. The mortality in the United States, for example, is greater than in England, yet the population of the United States doubled itself in 25 years and that of England in 43 years, while in various European countries which have a lower mortality than the United States, the population will not double in a century.

Some statists have attached considerable importance to the effects of race on population. It is extremely difficult, however, to establish anything in regard to race independently of circumstances and social habits. It has been shown, for example, that the average mortality among the Jews in Prussia is less than among the Christians, that the mortality varies greatly among the various races who inhabit the Austrian Empire, being least among the Germans, and that a similar difference prevails in the departments peopled by various races in France, but all such evidence is open to the most obvious exceptions. The influence of climate on mortality is inseparably associated with that of migration. It cannot be established that any climate, except perhaps the extremes of heat or cold, moisture or dryness, is in itself exceptionally favorable or unfavorable to human life, but change of climate is frequently adverse to it.

The most remarkable fact in respect to age is the great mortality which commonly takes place among children under five years of age. This is especially remarkable in large towns, but is not wholly confined to them. Although the diseases to which infancy is liable may naturally account for part of this excessive mortality, the greater part of it must be attributed to ignorance and want of due care in the training of children, partly arising from the unfavorable circumstances in which, through the too rapid increase of population, they are brought into the world. This is both directly and indirectly a considerable cause of the extra mortality of large towns and other dense centres of population. The question whether city or country life is most conducive to a low rate of mortality is still undecided. Direct statistics prove nothing, as the death rate of towns is raised by immigration from the country and other causes. In regard to sex it is established that women live longer than men, and that among men the married live longer than the single. The condition of life in respect of poverty or wealth is known to have a considerable influence on mortality. Dividing France into two classes, rich and poor, the annual mortality was found to be 1 in 46 in the former and 1 in 33 in the latter. This gave to the rich an average duration of life of 57 and to the poor one of 37 years. See LONGEVITY; VITAL STATISTICS.

MORTAR, a calcareous cement used in building. It differs in its characteristics according to the nature, proportions or treatment of its constituents. The proportions vary from one and one-half to four or five of sand to one of lime. Hydraulic mortar is made from certain limestones which include in their composition so large a proportion of iron and clay as to enable them to form cements which have the property of hardening under water and are called hydraulic limestones. The proportions of clay vary in different quarries, and often in the same from 8 to 25 per cent. See CEMENT; LIME.

MORTAR, or **MORTER,** a vessel usually of metal but frequently of other suitable material, used by pharmacists and others in preparing powders and other medicines. Also a piece of ordnance. See ORDNANCE.

MORTAR, utensil employed by the Indians of America and other indigenous races for the grinding or mashing of grains and other substances used as food or for other ends. The Indian mortar naturally had a different name in each tribe, and some of these names were familiar to the whites. A survival of these Indian mortar names is the metate of Mexico (q.v.) derived from the Aztec word *metal.* The mortar has many forms ranging from a flat stone to a deep receptacle of stone, bone or wood in which the grain or other substance is reduced by pounding or grinding to a floury or plastic state. Throughout the area occupied by the Pueblo Indians in the United States, and in Mexico, Central America and the greater part of South America, and especially in Colombia, Venezuela and the Pacific Coast countries the grinding of grain, seeds, nuts, roots and other substances is done on a flat stone, generally rectangular in form. For the most part the grinding is performed by means of a stone muller more or less cylindrical in shape, which is rarely used as a roller, the substances being crushed between the metate and the muller by pressure and rubbing. This was the process used throughout the great corn belt stretch from Arizona to southern Chile at the time of the discovery of America; and throughout this vast region it is the process generally in use to-day, more especially among the Indians and mestizos for reducing corn and other substances to a condition for cooking.

Forms of Mortars.— Throughout other parts of North America there were many forms of mortars distinctly different from those in use in the region already indicated, but closely related to one another in shape. Among the Iroquois and other northern and eastern tribes of the United States and parts of Canada the natives made use of wooden mortars hollowed into the top of a block cut from the trunk of a tree. In this hollow, which was of considerable size and depth, the corn or other substance was put, in a dry or wet condition, and pounded into a more or less fine powder or into a soft, semi-liquid mass, by means of a long wooden pestle, with a pounding surface at both ends. The remains of very primitive mortars in many parts of the American continents show the various processes through which the modern mortars have passed to reach their present perfection. Originally a rough unworked flat stone was used as a grinding surface and an unshaped rounded stone served to do the pounding. From this primitive utensil to the carefully shaped metate of the Mexican or the handsomely carved and hollowed mortar of the Alaskan and British Columbian tribes is a long step which bridges a lengthy period of cultural development. In the granite rock of California mortars in the shape of excavations are frequently found on the sites of old Indian villages. Some of these are very primitive in form, while others, evidently of a much later development, are carefully shaped and seem to follow a regular plan of structure. It is probable that the flat stone metate form and the hollow mortar form both originated in pounding grain on a flat surface, the two natural methods of preventing the loss of the pulverized grain being to reduce the pounding to rubbing or rolling, and to pound the grain, in a deepish hole, as was done in the California granite rock. The tribes of the great forest area of the North, having no hollow rock beds or stones easily worked, hollowed out the ends sections of tree trunks or sides of logs by means of fire which also hardened the inner surface of the mortars, dried the wood and made them very durable. In regions where stone and wood were not available, bone, rawhide and other materials were converted into mortars for the grinding of food materials. In the whale country some of the races addicted to whale hunting used the vertebræ of that animal for mortars. Some of these are still employed. In the Eastern States of the United States primitive mortars made of holiowed but otherwise unshaped boulders are frequently encountered; and similar mortars are formed in California, side by side with other globular mortars, which are evidently but a more artistic development of the boulder form. A further evolution of the artistic form was reached when stones were quarried from the rocky bed, shaped to exact pre-determined form and proportions and frequently decorated with conventional forms, mystic signs or figures of household gods.

The pestle took upon itself as many shapes and designs as the mortar, and like relation of the latter to the metate, it was first cousin to the muller, both of which had their origin in the rough, unworked stone used by primitive man to pound or crush his food, and other objects. Some pestles were heavy and several feet long; others were short instruments which could be used with one hand. Metates and mortars were of many shapes, sizes and designs, and their uses were almost as varied as their forms.

Uses of Mortars.— Indians, throughout the buffalo country, put the buffalo meat into a rawhide bag which they placed in a hole in the earth with the open mouth upward. While here they pounded the meat into shape for pemmican. Some Indians placed their shallow mortars in closely-woven baskets considerably larger than the mortars so that the grain that fell from the latter, in the process of grinding or pulverizing, might be saved. Others of the Pueblo Indians placed a basket-shaped hopper in the mouth of the mortar to prevent the pounded grain from hopping out. It is probable that very large «mortar holes» found in rock were also used as boiling pots, in which the heated water was obtained by dropping superheated stones into the hole. The large wooden portable mortars of the forest-region Indians were generally set on the ground so as to make them firm and steady. The ordinary metate of Mexico and Central America has generally three legs upon which it stands steadily. In many cases these give it an artistic appearance. Most of these metates are made of lava rock, especially in the districts where lava is plentiful. Metates are made of rocks of different grades of coarseness. Thus it is possible, by passing ground grain from one metate to another, to finally obtain a flour as fine as the finest turned out by the best modern mill machinery. Fine metates and mortars are also made from granite, limestone, sandstone and other rocky material. Perhaps the most artistic development of the mortar is to be found among the Haida Indians of Alaska, who probably learned their art from Asiatic tribes. Not only are mortars of a great variety of forms and designs but they are also of many sizes, ranging from tiny little vessels to huge excavations. The reason is that they were put to a variety of uses. The smaller mortars were employed as receptacles in which to grind paints, medicines, shells, tobacco and other substances used in medicine, personal decoration, ceremonies, incantations and dances. All the grinding of corn and other food products was almost universally done among the American Indians by women; but in the case of the ceremonial substances, especially those considered of a sacred nature, where the efficacy of the charm, ceremonial use or medicine depended upon the manner in which the grinding was done, this work was generally left to the medicine men, who were learned in all the ceremonial forms and traditions of the tribe.

Bibliography.—Hodge, 'Handbook of American Indians'; Morehead, 'Prehistoric Implements'; 'The American Indian in the United States'; Morgan, 'League of the Iroquois'; Nordenskjöld, 'Cliff Dwellers of the Mesa Verda'; Schoolcraft, 'The Indian Tribes of the United States'; Thurston, 'Antiquities of Tennessee.'

MORTARA, môr-tä'rä, **Edgar,** Jewish boy whose forcible removal from his parents by the orders of the archbishop of Bologna in 1858 aroused great excitement in Europe and led to protests from several powers, but the Pope

declined to interfere. The plea made in justification of the act was that Mortara had been early baptized into Christianity by a Roman Catholic maid-servant. The Roman Catholic authorities, however, declined to return him; and despite the many protests in the matter, he remained, of his own choice in 1870, with the Church and entered the Augustinian order. Consult 'The True Story of the Jewish Boy, Edgar Mortara' (1860), and Vollet, 'Edgar Mortara' (1881).

MORTARA, môr-tä'ra, Italy, capital of the province of Pavia, on the Arbogna, also chief town of the Lomellina, and junction of the Novara-Mortara-Alessandria, the Mortara-Milano and the Vercelli-Mortara-Pavia and the Mortara-Casale railways. It has a Gothic church (San Lorenzo) and the Santa Croce convent church, also a theatre, gymnasium and technical school. It has manufactures of machinery and hats and does considerable trade in its rice and cheese products. The Austrians under Duke Albrecht won a battle here against the Piedmontese in 1849. It had a population of 8,770 for the entire commune.

MORTE D'ARTHUR. This great English collection of Arthurian romances, written before 1470 by Sir Thomas Malory, as one of the cardinal books whose influence has reached beyond any mere personal fame. Personally, indeed, Malory has remained almost unknown. Even the probability that this 15th century gentleman and soldier served with Richard, Earl of Warwick, pattern of chivalry, was recovered only 25 years ago; but 400 years have proved the vitality of his book. After inspiring the conduct of noble English youth for generations, it was reinterpreted in Tennyson's most popular poem, 'The Idylls of the King'; and, surviving so unusual a competition, it is still reprinted, read and loved. Yet as a translation, in great part from known French sources, it is not in our modern sense original. Therefore the reasons for its fame are the more significant as going to the roots of permanent literary interest. The first reason, of course, is style. Writing in the early days of English prose, Malory has the dignity and ease of such early historians as Froissart; but his even and leisurely pace does not preclude the force of direct diction. This rare combination of dignity with simplicity has been sufficient to preserve his work without any great strength of structure, any compelling movement of the whole. The 'Morte d'Arthur' is not composed as a whole, not planned to lead us on stage by stage to a culmination. True, the closing books are felt as the tragic conclusion of Arthur's chivalry in a world of violence; but with many of the preceding stories it has no specific connection. Rather Malory worked as the mediæval romancers from whom he drew had worked before him. Collecting all the well-known stories — and a few less well known — that had come to be associated with the great name of Arthur, he used them much as he found them; and he told each for itself. Though he sometimes suggests complication of plot or development of character, he never worked for these in the ways of the modern novelist. The Renaissance had but touched England; and its literary ideas, even if they had been prevalent, would hardly have moved so thorough a mediævalist as Malory. He turned away from the actual wars of the Roses to the legendary wars of Arthur's knights because of his intense sympathy with the ideals of a passing chivalry. He is far more mediæval than Chaucer. Though in style he has his own distinction, in composition he is the typical mediæval transmitter.

Every one of the stories that he thus brought together has a long history. Many of them reach far back into folklore. Most of them before they came to him had been told over and over again. The successive versions, their relations, their combination, the transference of a tale from Gawain to Percival and then to Galahad, the building up of a cycle of Grail stories and the attaching of this to the Arthurian cycle — all these have claimed much scholarly investigation and still offer problems as difficult as they are significant. But of this Malory was no more aware than the thousands of readers who have gone to him, not for history or folklore, nor for psychology or drama, but for the solace and inspiration of high adventure.

Beginning with the perennial story of the prince wondrously born and sent in the nick of time to claim the crown, right wrong, and establish a kingdom of justice, courtesy, and honor, he ends with the traditional hope that the same king, though in his stricken age borne away to the Isle of Avilon, may yet return to reign. Only to the latter books belongs properly the title 'Morte d'Arthur,' which is borne also by several mediæval poems. Between the young prince smiting the stone with his miraculous sword and the old king fighting his last battle against treason in the dim West, what a store of quests and deliverances, what a goodly array. Balen and Balan still show a primitive wildness in spite of the faint hint of the coming Grail; and the fairies, though crowded to the back of the stage by the stir of chivalry, still peep from their Celtic twilight. Morgan le Fay is dangerous in revenge. The Lady of the Lake gives the magic sword, and to her at the last it returns. Merlin the wizard, after all his triumphs of wisdom and skill, «was assotted and doted on one of the ladies of the lake.» But these are only old echoes. The stories are of chivalry; of Beaumains, youth proving its unconquerable force; of Tristram and Iseult, the immortal lovers, and Guenever, the queen mistress who drew the peerless Lancelot across steel and fire and even across loyalty; of Gawain, his earlier fame tarnished, but still the courteous; of a hundred good knights who sought wild paths and frightful risks and stiff battles because they must make life an adventure.

Following these old adventures with adventurous hearts, readers have always been glad that they are numerous, and have not missed in the thronging of Malory's stories that unity which he did not seek. From the conquest of Rome to the earliest adventures of Lancelot, from Beaumains to Tristram, Malory goes leisurely, but always with zest; and by the way he pauses for yet other stories. The 'Morte d'Arthur' is a storehouse of romance. And above all the other quests, above the errant fighting throng, shines the supreme quest of the Holy Grail, the great romance of the Mass. Malory's aim, then, was not that modern literary distinction which comes from

originality of composition; it was to make men love the high things that he loved. His work was to him the handing on of the great traditions of chivalry. Caxton, who printed it in 1485, well calls it a «noble and joyous book.»

CHARLES SEARS BALDWIN.

MORTEN-MULLER, môr'tĕn-mül'lĕr, Norwegian painter: b. Holmestrand, Christianiafiord, 29 Feb. 1828; d. 1911. He began to study art in Düsseldorf (1847) first under Tidemand and Eude, and later as a pupil in the academy under J. W. Schirmer. He removed to Stockholm in 1850, but in 1866 opened an art school in Christiania under government patronage He returned to Düsseldorf in 1871 and devoted himself to setting forth the wild scenery of his native country in a series of vast canvases. Fiord, valley and mountain height are represented with fine imaginative yet truthful line and color. The most noteworthy of his landscapes are 'Norwegian Landscape' and 'Entrance to Hardangerfiord' (both in the National Gallery of Christiania); 'A Fir Forest' (in the Gallery at Hamburg); 'Romsdalfiord,' with historical figures put in by Tidemand (1876); 'Start of the Fishing-boats by Night'; 'Waterfall and Pine Forest' (1879); 'Fisherman's Cot in Christianiafiord' (1880); 'Woodland Lake by Moonlight' (1892). His works combine romantic picturesqueness with color power of startling realism. In 1874 he was appointed court painter and member of the Stockholm Academy.

MORTGAGE, môr'gāj («dead pledge»), *in law,* the conveyance of property, movable or immovable, as security for the payment of a debt on the condition that if the debt be duly paid the conveyance shall be void. The term is applied: (1) To the act of making such a conveyance; (2) to the deed by which such conveyance is made; (3) to the rights thereby conferred on the mortgagee. He who makes the mortgage is the mortgagor; he for whose benefit it is made is the mortgagee. Whatever may be sold may be mortgaged. Mortgages may therefore cover chattels or real estate. Mortgages must be in writing, either in one single instrument containing the whole case or in two, one containing the conveyance, the other the condition of the conveyance, this last document being the «defeasance.» A deposit of titledeeds, with a verbal agreement, creates an equitable mortgage in some States which recognize this proceeding as a mode of securing a debt. The different States regulate the time in which mortgages are to be recorded, in order to protect innocent purchasers, but an unrecorded mortgage is good as against the mortgagor or any purchaser knowing of its existence at the time of his purchase. The tendency of courts now is to regard a mortgage as a lien rather than a conveyance of the land, and it is now generally regarded as a mere security for the payment of a debt.

Important changes in the law of mortgages were made by a new British act, effective 1 Jan. 1926. See also FORECLOSURE.

MORTGAGE BANKS. See BANKS AND BANKING—WORLD'S SYSTEM.

MORTGAGE GUARANTY INSURANCE. See GUARANTY INSURANCE.

MORTIER, môr'tyā', **Edouard Adolphe Casimir Joseph,** Duke of Treviso, French marshal: b. Cateau-Cambrésis, 13 Feb. 1768; d. Paris, 28 July 1835. He entered the army in 1791, fought in the campaigns of 1792 to 1795, was brigadier-general in 1798 on the fields of South Germany and Switzerland, and besieged (1803) Hanover, being raised (1805) to rank of marshal. In the war with Prussia he commanded the army against the Swedes and was victorious at Anklam (1807), whereupon he agreed to an armistice at Schlatkow (18 April). He commanded the left wing of the army in the battle of Friedland and was created Duke of Treviso (1808), to be given in that year command in Spain, where he won the battle of Ocaña (1809). He commanded the young Guards in the Russian campaign and also in 1813. In 1814 he, together with Marshal Marmont, defended Paris, but submitted to Louis XVIII and was made a peer of France. By March 1815 he had again joined the forces of Napoleon, thereby losing his title of peer, on the latter's defeat and the second Restoration. He was elected (1816) member of the Chamber of Deputies and retained the place till the end of 1818. In 1819 the dignity of the peerage was restored to him, being made hereditary in 1824. He was made chief chancellor of the Legion of Honor (1834) and became Minister of War and president of the council in the same year. He was killed (1835) by the infernal machine of Fieschi at the king's side as he was passing along the Boulevard du Temple, Paris. Monuments have been erected in his memory in his native city and also Lille.

MORTIFICATION. See GANGRENE.

MORTIMER, môr'tĭ-mĕr, **John Hamilton,** English artist: b. Eastbourne, Sussex, 1741; d. 1779. After studying under Sir Joshua Reynolds, he carried off the first prize of the Society of Arts, London (1763). He was elected R.A. in 1779. A bold and vigorous draughtsman and a good colorist, he was fond of dramatic scenes in which there was an element of the terrible. His style and manner are well exemplified in the pictures 'Battle of Agincourt'; 'Voltigern and Rowena'; 'Hercules Slaying the Hydra'; now in the South Kensington Museum. He was very successful as an etcher, and designed stained glass for Salisbury Cathedral and Brasenose College, Oxford.

MORTIMER, Roger, 8th Baron of Wigmore and 1st Earl of March, English noble: b. about 1287; d. Smithfield, 29 Nov. 1330. He had been convicted of treason in the reign of Edward II and pardoned; but notwithstanding the king's clemency took part in the rebellion of the Earl of Lancaster, and was made prisoner in 1322. Having escaped from the Tower, where he was confined, he went to France and at Paris in 1325 met Queen Isabella, who had been sent thither by Edward to negotiate a treaty. Fascinated by his pleasing address, the queen was soon known to be living in guilty intimacy with the exile, and, having secured the person of her young son, began to mature plans with Mortimer and the other leaders of the barons for getting possession of the kingdom. Mortimer went with her to England in 1326; the king was deposed and his son Edward III proclaimed in his stead, and for some years Isabella and her paramour governed the realm in the name of the young prince. Mortimer is popularly regarded as responsible for the

death of the dethroned monarch in his prison (1327). The failure of the Scottish expedition in 1327, and the «shameful peace» with Scotland in the following year, had wounded the pride of the English people. The nobles wearied of his arrogance and Edward resolved to take the sceptre into his own hands. While the queen and Mortimer were in Nottingham castle during the session of Parliament at that town, the king and Lord Montacute with attendants entered by night through a subterranean passage and carried off the earl. The king summoned a new Parliament to meet him at Westminster, and on 26 November Mortimer was condemned by this Parliament and executed three days later.

MORTMAIN, môrt'mān, in English law, lands held by a corporation were said to be held in mortmain (*mortua manu,* by dead hand), because they were then not alienable. The expression has particular reference to estates held by religious and eleemosynary corporations in England. At one time half the land in England was vested in religious houses. As early as 1279 the English Parliament began to deal with the evils arising from the transfer of lands to religious corporations; the lords of the soil were deprived of escheats or other feudal profits: «a dead hand yieldeth no service.» In 1736 by the Mortmain Act the power of devising land by will to charitable purposes was destroyed. The law on this subject was consolidated by the Mortmain and Charitable Uses Act (1888), under which no bequest for a charitable purpose was to involve the acquisition of land. The Act of 1891 enacted that land may be devoted to any charitable use, but it must be sold within a year from the testator's death, unless the time be extended by certain authorities. It also permits the acquirement of land directed to be acquired for a charity if the court or the charity commissioners consent. A large number of acts from 1841 onward have exempted from mortmain restrictions land bequeathed for school sites, burial-places, places of worship, literary and scientific institutions, public parks, but maximum limits are imposed in several cases.

The old English statutes of mortmain have not been regarded as in force in the United States except in Pennsylvania, where the dedication of property to superstitious uses, and grants to a corporation without statutory license, are forbidden. In some States the right of religious corporations to hold land, and the power to make, devise or bequeath land to religious societies or charitable purposes, is restricted.

MORTON, Charles, English-American Puritan divine: b. Pendavy, Cornwall, 1627; d. 1698. He studied at Wadham College, Oxford, was appointed (1655) rector of Blisland, but his puritanic tendencies caused his ejectment in 1662. He was made master of the dissenters' school at Stoke Newington, London (1685), where Daniel Defoe was numbered among his pupils. Prosecutions by the ecclesiastical courts caused him to migrate (1686) to New England and he became minister of the first church at Charlestown, Mass. He was prosecuted for a seditious sermon (1687) but acquitted. He got into close connection with Harvard and was given (1692) the management of the inward affairs of the college with the title of vice-president. His succession to the college's president, Increase Mather, seemed likely but for his death. He approved the prosecutions for witchcraft at Salem. Consult Quincy, Josiah, 'History of Harvard University' (Cambridge, Mass., 1840).

MORTON, or **MOURT, George,** Puritan colonist: b. York, England, about 1585; d. 1628 (?). He affiliated himself with the Puritans in 1600 and settled in Holland, but was for some years previous to 1620 London agent for the Puritans. Authorities disagree as to his career, some placing his emigration to America in 1620 while others fix it at 1623, and the same uncertainty prevails as to his death, the dates varying from 1624 to 1628; there is no conclusive evidence as to whether it occurred in England or America. For many years he was credited with the authorship of Mourt's 'Relation or Journall of the beginning and proceedings of the English Plantation at Plimoth,' published in London in 1622. Careful investigation, however, seems to prove conclusively that the authorship must be credited to Winslow and Bradford, and that at most only a small portion of it can be claimed by Morton. The work, which is regarded as the most authentic history of the times in existence, has been several times reprinted. Consult 'Mourt's Relation,' with introduction and notes by Henry Martyn Dexter.

MORTON, Henry, American scientist: b. New York, 11 Dec. 1836; d. there, 9 May 1902. He was graduated from the University of Pennsylvania in 1857 and became professor of physics and chemistry at the Episcopal Academy of Philadelphia in 1860. His lectures in 1863 at the Franklin Institute in Philadelphia attracted attention throughout the United States and Europe by reason of his brilliant and unique experiments. He was one of the founders of the Philadelphia Dental College in 1863 and its first professor of chemistry, and in 1864–70 was resident secretary at Franklin Institute, where he continued his lectures. In 1867 he was appointed professor of chemistry at the University of Pennsylvania, and in the same year became editor of the Franklin Institute *Journal.* He conducted the photographic branch of the United States eclipse expedition to Iowa in 1869, and in additon to securing several excellent photographs of the eclipse, proved that the bright line of the sun's disc adjacent to the moon is due to a chemical action in the process of developing the plate and not to diffraction as had hitherto been held by the best scientists. In 1870 he was chosen president of the newly-founded Stevens Institute of Technology, and under his direction the faculty was selected and the course of instruction formed. His management of the institute made it one of the leading technological schools of the country; he gave it the benefit not only of his great learning but also several munificent gifts in the establishment and endowment of various necessary departments. His reputation as a scientist became world-wide and his services as a chemical expert were eagerly sought in litigation. From 1878–85 he was a member of the United States Lighthouse Board and in 1876–81 he was president of the American Chemical Society. Besides writing numerous

papers on electricity and fluorescence, he assisted in the preparation of 'The Student's Practical Chemistry' (1868).

MORTON, James Douglas, 4th earl of, regent of Scotland: b. Dalkeith, Scotland, about 1530; d. Edinburgh, 3 June 1581. He married a daughter of the third earl and succeeded to the earldom on the death of his father-in-law, in 1553. He became Lord High-Chancellor of Scotland 10 years later, but fled to England in 1556 on account of his share in the murder of Rizzio. He was soon pardoned and on Bothwell's abduction of Queen Mary joined the confederated lords against him. He stood sponsor for James VI at his coronation, and led the van at the battle of Langside (1568). He again became one of the leading opponents of Bothwell; was chancellor, and in 1572 regent of the kingdom. Having made himself many enemies by maladministration, he resigned, but recovered authority not long after. His enemies, however, at length proving too strong for him, he was charged as accessory to the murder of Darnley, tried, condemned and beheaded by the decapitating instrument he himself had introduced into Scotland.

MORTON, James St. Clair, American soldier: b. Philadelphia, Pa., 24 Sept. 1829; d. Petersburg, Va., 17 June 1864. He was graduated from West Point in 1851, was appointed to the engineering corps and in 1855–57 was assistant professor of engineering there. He was in charge of the Chiriqui expedition in Central America in 1860, and later superintended the work on the Washington aqueduct. In 1861 he was in command of the fortification at Tortugas, and in May 1862 was appointed chief engineer of the Army of the Ohio. In October 1862 he was promoted brigadier-general and was transferred to the Army of the Cumberland as chief engineer in command of the bridge-brigade. He built the entrenchments around Murfreesboro, Tenn., and was engaged in the battles at Chattanooga and Chickamauga. He was chief engineer of the Ninth army corps in the Richmond campaign of 1864, and was killed in the battle of Petersburg. He published 'An Essay on Instruction in Engineering' (1856); 'Memoir on Fortification' (1858); 'Life of Maj. John Saunders, of the Engineers' (1860), etc.

MORTON, John, English prelate: b. Milborne, Saint Andrew, Dorsetshire, England, about 1420; d. Knoll, Kent, 15 Sept. 1500. He studied at Balliol College, Oxford, and subsequently became principal of what is now Christ Church College. He adhered with great fidelity to Henry VI and the house of Lancaster, but nevertheless Edward IV made him master of the rolls and bishop of Ely (1478). Richard III imprisoned him, but he escaped to Flanders and under Henry VII became archbishop of Canterbury and chancellor (1486). It was he who suggested the union of the house of Lancaster and York by the marriage of Henry with Elizabeth of York, daughter of Edward IV. In 1493 he became a cardinal.

MORTON, John, one of the signers of the Declaration of Independence: b. Ridley, Delaware County, Pa., 1724; d. April 1777. After working for several years as a surveyor he began the practice of law. In 1764 he was elected to the general assembly of Pennsylvania, of which he became a conspicuous member, serving for a number of years and being speaker from 1772 to 1775. In 1765 he was a member of the Stamp Act congress; in 1766 became sheriff in his county, and was shortly afterward appointed one of the judges of the Supreme Court of Pennsylvania. He was always an earnest advocate of the rights of the colonies and warmly supported the Revolutionary War. In 1774 he was elected a delegate to the 1st Continental Congress, and was a member of that body till his death, taking active part in its debates and in the framing of the Articles of Confederation. He gave the casting vote of Pennsylvania in favor of the Declaration of Independence, the four other delegates present from that State being equally divided as to the measure, and affixed his signature to the Declaration.

MORTON, John Maddison, English dramatist: b. Pangbourne, 1811; d. 1891. He was educated in France, then held a clerkship in Chelsea Hospital, London (1832–40). In 1881 he became a Charterhouse brother when in sore need of a pension. He wrote farces, showing exceptional facility in the adaptation of French dialogues to suit English taste. While he was a prolific writer of plays little survives for recent presentation except his ever-popular 'Box and Cox' (1847). Consult 'Dictionary of National Biography,' Vol. XXXIX (London 1894).

MORTON, Julius Sterling, American agriculturist and statesman: b. Adams, N. Y., 22 April 1832; d. Lake Forest, Ill., 27 April 1902. He was graduated from Union College in 1854 and removed to Nebraska City in 1855, where he was editor of the Nebraska City *News*. In 1856–57 he was a member of the Territorial legislature, and in 1858 secretary of the Territory. Upon the resignation of Governor Richardson in 1858 he acted as governor, and in 1893–97 was Secretary of Agriculture under President Cleveland. He was the originator of Arbor Day and an active member of various agricultural and horticultural societies.

MORTON, Levi Parsons, American banker and politician: b. Shoreham, Vt., 16 May 1824; d. Rhinebeck, N. Y., 16 May 1920. In 1843 he established a mercantile business at Hanover, N. H.; in 1850 entered the banking business in Boston; and later removed to New York, where in 1863 he founded the large banking firm of Levi P. Morton & Company (later Morton, Bliss & Company), which assisted in floating the government war loan during the Civil War. He also established a branch of his firm in London, and the Morton Trust Company of New York, and gained a reputation as an able financier. He was elected to Congress on the Republican ticket in 1878 and served one term (till 1881); he was then appointed United States Minister to France, where he remained till 1885; in this capacity he secured legal status in France for American corporations. In 1888 he was elected Vice-President of the United States, and made an especially able presiding officer in the Senate. In 1894 he was elected governor of New York State, serving for one term; in the last year of administration he urged in a special message the abolition of the

ward-trustee system of school government in New York city public schools, and signed the bill which enforced this reform. In 1896 he was New York State's candidate for the Presidency at the National Republican Convention. After retiring from public life he resumed his banking operations and became a director in several insurance companies.

MORTON, Nathaniel, American historian: b. Leyden, Holland, about 1613; d. Plymouth, Mass., 29 June 1685. He was of English descent, came with his father to Plymouth in 1623, became an inmate of Governor Bradford's family and his public assistant, and from 1645 until his death was secretary of the colony. In compliance with the request of the commissioners of the New England colonies, he compiled (1669) and published his principal work, 'New England's Memorial, or a Brief Relation of the Most Remarkable and Memorable Passages of the Providence of God Manifested to the Planters of New England.' For nearly two centuries, or until Bradford's 'History of Plymouth' was discovered in 1855, Morton's work was the principal authority on the matters it dealt with. He compiled it largely from Bradford's manuscripts and Edward Winslow's journals. 'New England's Memorial' was several times reprinted in the American colonies, and was also reproduced in England. Besides various other works, Morton was also the author of 'A Synopsis of the Church History of Plymouth' (1680).

MORTON, Oliver Perry, American statesman: b. Salisbury, Wayne County, Ind., 4 Aug. 1823; d. Indianapolis, 1 Nov. 1877. He studied law, was admitted to the bar in 1846, began the practice of his profession in Centreville, Ind., and became a circuit judge in 1852. He was an anti-slavery Democrat, but, after being read out of the party for his refusal to support the Kansas-Nebraska bill, became one of the leaders of the new Republican party, and was defeated as its candidate for governor in 1856. Four years subsequently he was elected lieutenant-governor, and when, in January 1861, Governor Lane was elected to the national Senate, Morton became governor. His active loyalty to the government did much to sustain the administration during the trying times of the Civil War. At its outbreak he at once sent troops to the field, but in the next year was greatly hindered in his efforts by a hostile legislature and subsequently by the efforts of a secret, disloyal society known as the Knights of the Golden Circle. Several plots at his assassination were hatched. Nevertheless he surmounted all obstacles, and his services to the nation were thankfully recognized by its chiefs. He was elected a United States senator from Indiana as a Republican in 1867, serving till 1877, and in the latter year was a member of the Electoral Commission. Consult 'Life,' by Foulke (1899). After the close of the Civil War he had been stricken with paralysis in his lower limbs, but his intellectual powers rose above his physical disability, and he continued until his death one of the most eloquent, forceful and dominating figures in public life. The fact that he sometimes addressed the Senate standing supported by two canes earned for him the waggist sobriquet of the "Devil on Two Sticks."

MORTON, Paul, American financier and politician: b. Detroit, 22 May 1857; d. New York, 1911. He attended the Nebraska public schools, and at the age of 16 started his commercial career as office boy in the land office of the Burlington and Missouri River Railroad, at Burlington, Iowa; after several promotions he entered the employ of the Chicago, Burlington and Quincy Railroad, rising from clerk to chief clerk, then successively assistant general freight agent, general passenger agent, and general freight agent. In 1890 he became vice-president of the Colorado Fuel & Iron Co., for six years, when he accepted the vice-presidency of the Atchison, Topeka and Santa Fé Railroad, greatly distinguishing himself in railroad and public affairs. He influenced great advances in the railroad system, and was a true friend and advocate of the rights of the employees in large corporations; also favored publicity as assisting in the work of the investing public and productive of honesty in management. Until 1896 he had been very stanchly Democratic but the "silver question" won him over to the Republican party. In 1904 he was appointed by President Roosevelt Secretary of the Navy, but he retired (1905) to become president of the Equitable Life Assurance Society of New York. He thoroughly reorganized the corporation's system and advanced to fruition many measures that brought about uniformity in tariffs and stability in executive departments of insurance. His death occurred suddenly and unexpectedly as he was, unaccompanied, passing between the different public offices in the course of business.

MORTON, Samuel George, American anatomist: b. Philadelphia, Pa., 26 Jan. 1799; d. there, 15 May 1851. He studied medicine at the University of Pennsylvania and in Edinburgh; began to practice in Philadelphia in 1824; was immediately prominent in the Academy of Natural Sciences being its secretary 1825 and its president 1850; became professor of anatomy in Pennsylvania College in 1839; and made special studies of ethnology, craniology and plant physiology. His valuable collection of skulls, numbering 1,500 specimens (900 human), led him to urge the diverse origin of the human race. He contributed to Silliman's *Journal,* and published 'Crania Americana' (1839); 'Crania Egyptica' (1844), and 'Illustrated System of Human Anatomy' (1849). Consult 'Life' by Meigs (1851).

MORTON, Thomas, English prelate: b. York, 1564; d. 1659. He studied at Saint John's College, Cambridge, receiving the degrees M.A. (1590), and D.D. (1606), becoming a Fellow and university lecturer in logic. He became one of the chaplains of James I and (1606) dean of Gloucester, was transferred (1609) to deanery of Winchester, to canonry of York (1610) and was made bishop of Chester in 1616. He was translated to Litchfield and Coventry (1618), in which fields he devoted his endeavors to win over the Nonconformists and recusants. In 1632 he was appointed to the see of Durham, holding the position canonically till his death, though Parliament decreed his deprivation in 1647. He had been impeached (1641) on the fall of Charles I, but was released after four months' imprisonment without trial, and was again imprisoned in 1645

because he refused to surrender the seal of Durham. After being driven (1648) from Durham House, London, he ultimately resided at Easton-Maudoit with Sir Christopher Yelverton. Most of his written works were devoted to exposure of Romish fallacies. His three most noted works are 'Apologia Catholica' (1605); 'Catholic Appeal' (1609); 'Causa Regia' (1620).

MORTON, Thomas, English colonist in America: b. England about 1575; d. Agamenticus (or Acomenticus), Me., 1646. He was an attorney of Clifford's Inn, London, of a somewhat doubtful reputation, and seems to have practised mainly in western England. In 1622 he landed in New England, where he remained three months; and in 1625 returned with Wollaston's Company. Wollaston soon after left for Virginia, and in the summer of 1626 Morton assumed control over those of Wollaston's following that remained. The settlement, Mount Wollaston (now Braintree, Mass.), near the coast, he called Mare Mount (Merry Mount); and in the spring of 1627 he erected a Maypole, and with the «salvages» proceeded to hold May-day to the scandalizing of their Puritan neighbors of Plymouth. Contrary to law, he supplied the Indians with firearms and instructed them in their use; and he was a rival of the Plymouth settlers in the fur-trade. He was accordingly arrested by Capt. Miles Standish and sent back to England (1628). But in August 1629 he was again in New England. In August or September 1630 he was a second time arrested and banished. He published, in 1637, 'New English Canaan,' which Nathaniel Morton ('New England's Memorial') denounces as «full of lies and slanders, and full fraught with profane calumnies,» but which as a satire is sometimes not unamusing, and contains information of interest regarding local features and the Indians. When he ventured back to New England (1643) he was imprisoned for about a year while evidence for a libel suit was being collected, and was finally let go on payment of a fine of $500. Nathaniel Hawthorne's 'The Maypole of Merry Mount' (in 'Twice-Told Tales,' 1837) and J. L. Motley's 'Merry Mount' (1849) are based on Morton's career.

MORTON, William James, American physician: b. Boston, 3 July 1845; d. 1920; son of W. T. G. Morton (q.v.), whose name is connected with the first anæsthetic use of ether. He was educated at the Boston Latin School, Harvard University and Vienna. On his graduation there, in 1872, his thesis on «Anæsthetics,» gained him the Boylston prize. He practised medicine at Bar Harbor, Me., and in Boston; went to Kimberley, South Africa, where, besides practising his profession, he engaged in diamond-mining. Settling in New York he became editor of the *Journal of Nervous and Mental Diseases;* from 1882–85 was adjunct professor of nervous diseases at the New York Post-Graduate Medical School; served as neurologist to the New York Infant Asylum, 1887–90; and was afterward professor of nervous diseases and electrotherapeutics at the New York Post-Graduate School. As an authority in electrotherapeutics he won wide recognition, and by his mechanical device for establishing the «static induced current» of electricity — the «Morton current» of the scientific world—supplied a means for producing the X-ray, and rendered a service of great practical value to medicine and surgery. Indicted in January 1912, in association with Julian Hawthorne and others, on a charge of fraudulent use of the mails in the promotion of bogus mining companies, conviction followed nearly a year after; he was sentenced to 12 months' imprisonment, but was released in October 1913, pardoned by the President and reinstated in his profession.

MORTON, William Thomas Green, American dental surgeon: b. Charlton, Mass., 19 Aug. 1819; d. New York, 15 July 1868. He established himself in the practice of dentistry in Boston, and there in March 1844 became a student of medicine in the office of Dr. C. T. Jackson (q.v.), the scientist. In November 1846 he obtained a patent for the process of anæsthesia by what he called «letheon,» now known as ether. Jackson claimed the discovery of etherization previous to the winter of 1841–42, and Morton's patent was contested by both Jackson and Horace Wells, another of Jackson's pupils. Morton communicated his knowledge of the process to Dr. J. C. Warren, and anæsthesia by ether was made public through an operation performed by Warren at the Massachusetts General Hospital 16 Oct. 1846. The French Academy of Sciences investigated the matter and decreed a Montyon prize of 2,500 francs to Jackson for the discovery, and another of like amount to Morton for the application of the discovery to surgical operations. In 1852 a bill appropriating $100,000 as a national testimonial to Morton was introduced in Congress, but failed, as it did also in 1853 and 1854. Testimonials accrediting to him the application of ether as an anæsthetic were signed by the medical profession in Boston (1856), New York (1858) and Philadelphia (1860). Consult Weyman, 'Trials of a Public Benefactor' (1859).

MORTUARY CUSTOMS. See Burial; Dead, Disposal of.

MORWITZ, môr'vĭts, **Edward,** German-American journalist: b. Dantzig, Prussia, 12 June 1815; d. Philadelphia, 13 Dec. 1893. After thorough training in the sciences and medicine at various German universities, he was graduated in 1840 from Berlin University, where he became an assistant physician and wrote 'The History of Medicine' (1848–49). In 1843 he practised his profession at Conitz, Prussia, but after the Revolution of 1848 settled in the United States. In 1853 he bought the German *Democrat* of Philadelphia and in 1855 issued a German political weekly, *The United States Journal,* followed in the same year by a German Sunday paper, *The New World.* He gave great support to the Union during the Civil War, and assisted in the raising of troops and the placing of government loans. In 1862 he took a leading part in establishing the German Press Association of Pennsylvania, and in 1870 organized the movement to raise funds for aiding German soldiers in the Franco-German War, about $600,000 being received for that purpose. He at one time owned or controlled about 300 newspapers, both German and English, and was a powerful factor in welding together the German population of the State.

He invented a breech-loading gun before leaving Germany.

MOSAIC, an imitation or reproduction of a painting or ornamental design, formed generally by means of pieces of opaque glass of different colors; also by colored stones (especially marbles and precious stones) placed side by side, and attached by being bedded in a cement. The art originated in the East, but received its perfection from the Greeks, and was thus conveyed to the Romans. In Italy many floors ornamented with mosaic work have been found among ancient ruins. Afterward, when the art was revived in Italy, the Venetian school becoming very celebrated, Clement VIII, in the 17th century, had the interior of the dome of Saint Peter's decorated with this kind of work. The art was largely employed for copying painting by famous artists, and thus rendering permanent their original freshness and beauty. The Roman school of mosaicists is still the most famous, though excellent works have been produced in recent times by Venetian and also by Russian artists. There is a studio for the production of mosaics in the Vatican at Rome. The most important works executed here in recent times are a series of portraits of the popes. In the most costly mosaics precious stones have been cut to furnish materials; but in common works of this art enamels of different colors, manufactured for the purpose, are the material employed. Roman enamels are made of small rods of opaque colored glass. In the first place cakes of glass are made of every variety of color and shade likely to be required. As many as 10,000 shades are said to be in use. These cakes are drawn out into rods thicker or thinner, according as they are to be used for finer or for coarser work, a great number being mere threads. They are kept in bundles, and arranged in sets corresponding to their colors. For a work of moderate size a piece of dark slate or marble is prepared by being hollowed out like a box and filled with plaster of Paris; upon this plaster the artist draws the design or pattern, and the workman proceeds with his work by removing small squares of the plaster, and filling in these with pieces cut from the glass rods, the pieces being fixed in their places by a cement. Gradually, in this manner, all the plaster is removed, and a picture is formed by the ends of the pieces of colored glass. It will easily be understood that this is a very slow process, and there are large pictures that have taken as many as from 12 to 20 years to produce. When mosaic pictures are to be viewed near at hand they are polished perfectly smooth with a flat stone and emery, and present a glossy surface similar to that of paintings in oil. When they are to be viewed at a distance the surface is left rough, when they present an appearance similar to pictures in fresco. Inlaid works, of agate and other costly stones, are executed on the same principle as mosaic, except that the stones are larger, and cut to the shape of different parts of the object to be represented. Works of this class are known as Florentine mosaics. Flowers and ornamental designs are the chief objects of this branch of the art. A mode has been invented of sawing the plate with the mosaic pictures into two or three sheets, and thus increasing the number of works produced at one time. Consult Barwell and Druitt, 'Mosaics and Stained Glass' (New York 1909); Furnival, W. J., 'Leadless Decorative Tiles' (Stone, Staffordshire, 1904).

MOSANDRIUM, or **MOSANDRUM** (from K. G. Mosander, a Swedish chemist), supposedly a new rare earth metal, whose oxide was thought to have been discovered in 1878 by Lawrence Smith, in specimens of the mineral samarskite obtained from North Carolina. It was afterward shown to be a complex substance containing terbium, samarium, dysprosium, traces of praseodymium and neodymium and probably gadolinium.

MOSASAURIA, an order of marine reptiles of the Upper Cretaceous Period, typical of the reptilian subclass *Pythonomorpha.* They were of world-wide distribution and their remains occur so plentifully in the western United States as well as in the Old World that their structure is thoroughly known. They were large predaceous marine lizards, resembling the modern monitors in many features, but reaching in many species the size of crocodiles — larger in some cases, but no skeletons are known indicating a greater length than 45 feet. They had four limbs with all the bones well developed but enclosed in a mitten of flesh and skin, forming paddles, which, with their great tails, must have made them powerful and agile swimmers. "Their cup-and-ball vertebræ indicate great flexibility of the body, their sharp teeth denote ability to capture slippery prey, and the structure of the lower jaw shows that they probably ate in a hurry and swallowed their food entire. . . . In the mosasaurs, as in the cormorants, among birds, there is a sort of joint in each half of the lower jaw, which permits it to bow outward when open; . . . if the reader will extend his arms at full length, the palms touching, and then bend his elbows outward, he will get a very good idea of the action of a mosasaur's jaw"— Lucas. The mosasaurs were of three types, namely, *Tylosaurinæ,* resembling gavials, with a long slender beak or exension of the snout beyond the teeth, and long paddles strengthened with numerous phalanges; *Platecarpinæ,* short-headed, very long-tailed reptiles, including *Platecarpus, Prognathosaurus, Brachysaurus* and some other genera; and *Mosasaurinæ.* The last were the typical mosasaurs, apparently the most completely marine and powerful and perfected of the race. The two genera are *Mosasaurus* and *Clidases.* None survived the close of the Cretaceous. Consult Zittell-Eastman, 'Text-book of Paleontology' (1902), in which will be found detailed and illustrated descriptions of various forms, and many references to the literature of the subject.

MOSAYLIMA, mō-sā-lē'mä, or **MOSEILEMA,** Arab prophet and rival of Mohammed (q.v.): b. early in the latter half of the 6th century; d. 633. He seems to have been a prophet in the tribe of Bani Hanifah, in Nejd, before Mohammed arose; and his name Rahmân, "the merciful," one of Mohammed's favorite titles for Allah, may be held proof that he claimed to be the Messiah. Tradition says that Mohammed scornfully refused Mosaylima's suggestion that they should share the spiritual leadership of the earth; but modern criticism makes it more probable that the Prophet compromised with him considerably, and it is even suggested

that Mohammed wished to make him his successor by testament, but was prevented by his attendants as he was dying. A break between Abu Bekr, the caliph, and Mosaylima came speedily; perhaps Mosaylima even openly opposed Islam. At any rate in the 11th year of the Hegira, his forces though far superior in numbers were met and defeated by Khaled, the Sword of God.

MOSBY, mŏz'bĭ, **John Singleton,** American lawyer and soldier: b. Edgemont, Powhatan County, Va., 6 Dec. 1833; d. Washington, 30 May 1916. He was graduated at the University of Virginia (1852), admitted to the bar (1855) and was practising law at Bristol, Va., when the Civil War broke out. He enlisted as private in the Confederate army and was later promoted adjutant of the 1st Virginia Cavalry. In two months' time, however, he was reduced to the ranks. Mosby, undaunted, then offered his services as scout to Gen. James E. B. Stuart, and in that capacity guided Stuart's cavalry in a desperate raid on McClellan's army on the Chickahominy in June 1862. In 1863, after enduring a short captivity, he went to Richmond and recruited an independent body of fighters which soon became famous under the name of Mosby's Partisan Rangers. This small cavalry command, of which he was colonel, became a terror to the Union troops and did much damage in cutting off means of communication and destroying supply trains, capturing outposts, etc. They adopted a guerrilla style of warfare and operated through Virginia and Maryland. Subsequently his force was pressed into the regular Confederate army as the 43d battalion of Virginia cavalry, and served till the cessation of hostilities. His men were dispersed and concealed when not engaged in raiding, and he had in force a perfect system of reassembling them at the shortest notice. At Chantilly (16 March 1863) he defeated a much larger force than his own. Probably his most brilliant exploit was the capture of Brigadier-General Stoughton, United States army, at Fairfax Courthouse, in the same month. To accomplish this he made a raid inside the Federal lines. At Danesville (1 April 1863) he successfully defended himself against a force sent especially to capture him. He harassed the rear of Grant's army, in its advance on Fredericksburg, to such an extent that Grant was forced to send a special detail to protect his communications and supplies. One of Mosby's most important raids resulted in the capture of Sheridan's entire supply train, which he surprised near Berryville.

Mosby was commissioned captain in March 1863, major two weeks later and colonel some time after that. His regiment was disbanded 21 April 1865, and he again took up the practice of law, settling at Warrenton, Va.

Mosby became a Republican after the War and supported General Grant for the presidency. It is said he originated the phrase "the solid South." He was United States consul to Hongkong 1878–85, afterward practised law in San Francisco, Cal., and was assistant in the Department of Justice at Washington 1904–10. He delivered a lecture in Boston, on Stuart's Cavalry, in December 1886, which was afterward published in book form and entitled 'War Reminiscences' (1887). He also wrote 'The Dawn of the Real South' (1901). Consult Crawford, 'Mosby and His Men' (1867); Scott, J., 'Partizan Life with Mosby' (1867); Williamson, 'Mosby's Rangers' (1896).

MOSCHELES, Felix, British portrait painter: b. London, 8 Feb. 1833; d. Tunbridge Wells, January 1918. He was the son of Ignaz Moscheles, the distinguished pianist and composer, and the life-long friend of the great Mendelssohn. Felix was educated at King's College, London, and was then sent to Hamburg and Karlsruhe. His childhood was spent amid a circle of literary and artistic celebrities, including Mendelssohn, Joachim, Malibran, Lablache and Dante Gabriel Rossetti. In later years the list was extended by many of the most famous characters of the age. In 1846 his father migrated to Leipzig to take over the directorship of the Conservatoire. Here Felix was taught drawing and architecture. In 1850 he went to Paris to pursue his art studies, arriving in the days of the Republic which followed the flight of Louis Philippe, and he witnessed the *coup d'état* which placed Napoleon III on the throne. A lucky arrest brought Moscheles into touch with Mme. Achille Fould, whose husband was then at the head of affairs, and who was a friend of the Moscheles family. The young artist was introduced into the best circles of Parisian society. At the Atelier Gleyre, where he studied, he made the acquaintance of Du Maurier, afterward the famous *Punch* artist. Moscheles pursued his later studies in Antwerp, where Alma-Tadema, Maris, Neuhuys and Heyermans were his fellow-students. He afterward opened a studio and settled in London, where he and Du Maurier formed a merry circle with Poynter, Whistler, Stacy Marks and Charles Keene. In 1862 he painted a portrait of Mazzini, which after the latter's death he offered to the Italian nation, but the offer was refused. Moscheles had long been interested in the question of universal peace and international arbitration. He discussed this subject with President Cleveland during a visit to America in the '80's, when he crossed the Atlantic with Henry Irving, carrying an introduction from Robert Browning. He painted Cleveland's portrait and later one of Browning, which is now in the Armour Institute, Chicago. Among his works are studies of Gounod, Rubinstein and Sir H. M. Stanley. He exhibited in Antwerp, Paris and London, and published two volumes of autobiography, 'In Bohemia with Du Maurier' and 'Fragments of an Autobiography,' besides editing Mendelssohn's letters to his parents. He was president of the International Arbitration and Peace Association and of the London Esperanto Club.

MOSCHELES, Ignaz, German pianist and composer: b. Prague, 30 May 1794; d. Leipzig, 10 March 1870. Of Jewish parentage, studied under J. D. Weber, director of the Prague Conservatory of Music, and afterward under that of Albrechtsberger and Salieri, at Vienna. On the completion of his studies he made a successful professional tour in Germany, and in 1820 arrived at Paris, where he met with an exceptionally enthusiastic reception and afterward made tours of other continental capitals. In 1825 he settled in London, where he was professor of music at the Royal Academy for 21 years. Here he had Thalberg for a pupil, as

he had formerly, in Berlin, had Mendelssohn. At the latter's request he went from London to Leipzig where he was professor of music in the conservatory there from 1846 till his death. Among his finest compositions may be mentioned his Concertos Nos. 3, 4 and 5, the Concertos Fantastique and Pathétique; his great Sextette and Trio; his Sonatas Caractéristique and Mélancolique; and the duo for pianoforte, *Hommage à Händel.*

Consult *Briefe von F. Mendelssohn-Bartholdy an Ignaz und Charlotte Moscheles* (1888).

MOSCHEROSCH, môsh'ĕ-rôsh, **Johann Michael** (properly MOSENROSH; pen name PHILANDER VON SITTEWALD), German satirist: b. Willstatt, near Strasbourg, March 5, 1601; d. Worms, Germany, April 4, 1669. He was a descendant of an Aragon (Spanish) family, and was educated at Strasbourg. After various government appointments in different places, he became privy councillor to the landgravine of Hesse-Cassel.

He was admitted to the Fruchtbringende Gesellschaft in 1645 with the surname "Der Träumende" ("the Dreaming One" or "the Dreamer"). His works include: *Wunderliche und Wahrhaftige Gesichte Philanders von Sittewald,* a keen satire on the manners and customs of his time, and written in the style of Francisco Gomez de Quevedo y Villegas' *Los Sueños.* Other works are *Insomnis cura parentum, Christliches Vermachtnis eines Vaters;* and *Die Patientia,* the manuscript of which was found in the municipal library at Hamburg, Germany, in 1897.

MOSCHUS, mŏs'kŭs, Greek bucolic poet of Syracuse in Sicily, flourished about 150 B.C. Four idyls form the whole of the remains of Moschus, which exhibit great elegance of style and delicacy of conception. The Επιτάφιος βίωνος (*Lament for Bion*) was imitated by Shelley in *Adonais.*

A translation by J. M. Edmonds was published in 1912. The works of Moschus have commonly been edited with those of Bion (q.v.) and Theocritus (q.v.), and the three have been well translated by Andrew Lang (1889). See also THEOCRITUS, BION AND MOSCHUS, IDYLS OF.

MOSCOSO DE ALVARADO, môs-kō'sō thå äl-vä-rä'thō, **Luis de,** Spanish adventurer: b. Badajoz, Spain, about 1530; d. Peru, about 1560. He served under his kinsman Pedro de Alvarado in his expedition to Guatemala in 1523–1527 and in 1534 accompanied him to Peru where he was for two years a follower of Pizarro, and then returned to Spain to live in luxury for several years on the proceeds of his services. In 1538 he attached himself to De Soto's expedition to Florida and upon the latter's death in 1542 took command and after many hardships succeeded in returning to Mexico. He was honored by the viceroy, Antonio de Mendoza, and in 1551 accompanied him to Peru where he was entrusted with important commands until his death.

MOSCOW, town, Idaho, and Latah County seat; altitude 2,564 feet; 95 miles southeast of Spokane, Washington; on the Northern Pacific; Great Northern; and Union Pacific railroads. The town is in the heart of the fertile Palouse country. White pine and mixed timber, wheat, hay, and peas are grown near by, and the town is a center for the pea industry. Other industries are concerned with lumber, seed, harvesters, creameries, flour and brick. The University of Idaho (q.v.) is here. Moscow was settled in 1879 and incorporated in 1887. Pop. (1940) 6,014; (1950) 10,593.

MOSCOW (Rus. MOSKVA), city and capital, USSR, located approximately in the center of European USSR, at latitude 55° 45′ N. and longitude 37° 37′ E. Though in the western part of the Soviet Union, the city lies close to the USSR center of population. Moscow is situated on both banks of the Moscow (Moskva) River, a tributary of the Oka, which in turn flows into the Volga. It is 550 feet above sea level on slightly hilly territory in the wooded steppe zone of mixed woods and meadows. In configuration, it resembles a rough circle surrounding the Kremlin, which was the original settlement in medieval times, and is today the residence of the USSR Communist rulers.

The Kremlin is one of the greatest remaining monuments of medieval Russian architecture. It is a huge citadel, a virtual little town of palaces, churches and government buildings, surrounded by stone walls 40 feet high and 12 feet thick. On top of several of the wall towers are huge red transparent stars, which are lighted at night. One side of the Kremlin faces the Moscow River. Around the other sides is the region of the "central squares," of which the most famous is Red Square, the site of Lenin's tomb and the place of the huge annual civilian and military parades. The central squares were in medieval times surrounded by the so-called Chinese Wall, most of which however has long since been torn down. Here are the main governmental buildings, the larger theaters and hotels, and the main shopping district. From this central core, wide avenues radiate out in all directions, leading toward neighboring cities, whose names they often bear. As one travels out these avenues, one crosses two boulevards, A and B, both circling the city center, some distance out. Originally both were city walls, which later were demolished as superfluous in modern times. Today city suburbs even extend far beyond boulevard B, the outermost of the two.

Moscow's climate is cool and continental. The average temperature for July is 65.6°F.; for January, 14°F. Winter temperatures as low as —44°F., however, are not uncommon. Because of its northerly location, summer days are very long, while winter daylight lasts only six hours. Rainfall is adequate, with an annual precipitation of 24.1 inches. The heaviest rains fall at the end of summer.

All the leading organizations of the Soviet regime are located in Moscow. Here can be found the headquarters of the USSR Communist Party, including its Secretariat, Presidium, Central Committee and Propaganda Administration. The Councils of Ministers (cabinets) and Supreme Soviets (legislatures) of both the USSR and the Russian Soviet Republic meet and work in Moscow. All USSR cabinet ministries are in the city, including the State Planning Committee, USSR Army and Navy headquarters, and the main offices of the Soviet secret police. As the site of the State Bank, Moscow is the financial center of the entire USSR. Other organizations of nationwide authority in the city

include: the Central Council of USSR Trade Unions, the Secretariat of the Young Communist League, and the Central Council of the Voluntary Society to Aid the Army, Navy and Air Force.

Moscow is the scientific and propaganda center of the USSR. It is the seat of the USSR Academy of Science, and contains 82 colleges and universities. The largest center of book publishing in the Soviet Union, here are published the USSR's two main newspapers: *Pravda* (organ of the USSR Communist Party), and *Izvestia* (organ of the USSR government). Moscow also contains 40 stage theaters, of which two are world famous: the Bolshoi (Grand) opera and ballet theater, and the Moscow Art Theater (dramatic). In addition there are many museums, including the Tretiakov art gallery with its collections of the major works of the great Russian artists.

Moscow is also the center of railway transportation in the Soviet Union. Eleven railways radiate out of the city in all directions, not counting the belt railroad circling Moscow in the suburbs. The city is likewise the air transportation center in the USSR, airlines radiating out in all directions to the capitals of all Soviet republics, Leningrad, the Crimea, the Arctic, and even to Vladivostok. Large airports ring Moscow, some civilian but most of them military. Paved highways run from the city to Leningrad, Minsk, Ryazan, Voronezh, Gorki, and Yaroslavl. A newly completed auto road connects Moscow directly with the Crimea.

Great efforts were made during the 1930's and 1940's to improve the Moscow River port. An 80-mile canal was dug north of the city to divert Volga water into the Moscow River. This canal serves a triple purpose. First, it ensures the city an adequate supply of water. Second, hydroelectric power stations along the canal and its reservoirs help supply Moscow's enormous demands for electricity. Third, deep-draft Volga River ships can now reach the Moscow River port. By using various river systems and connecting canals, it is possible to sail from Moscow to the Baltic, White, Black, Azov, and Caspian seas, for which reason the capital is now called a "port of five seas." Nevertheless, most freight and passengers still enter and leave Moscow by rail.

Despite great decentralization of industry during the Soviet regime, Moscow today remains the largest industrial city in the Soviet Union, accounting for 15 per cent of all USSR industrial output. In czarist days, the capital was a huge center for textile industry, and was even known as the "city of calico." Today, Moscow contains almost every branch of manufacturing industry, including huge heavy industries. Most Moscow industries are those requiring technical skill, and take advantage of the large pool of skilled labor which Moscow possesses by virtue of its early industrialization. The chief branch of industry today is machinery manufacture, with concentration on complex and precision machines. In many instances, the pilot plants for new Soviet industries were first built in Moscow, which then loaned its experienced personnel to factories constructed later in other regions. The city contains the Stalin auto plant (the second largest truck factory in the USSR), and is a major center of aircraft design and manufacture. Other major products include watches, machine tools, and electrical equipment of all types. There also are large steel, synthetic dye, lumber, confectionary, baking, and sausage industries. The old czarist textile mills have been modernized and expanded under the Soviet regime, and Moscow is still one of the two leading textile centers of the USSR.

To supply all these industries with electricity, Moscow has a large number of steam electric power stations operating both in and outside the city, and using peat and lignite as fuel. Those in the city often provide heat for the houses of their district, as well as current. In addition, Moscow receives hydroelectric power from stations as far away as the upper Volga. Natural gas is piped into the city from the Saratov gas fields several hundred miles away on the lower Volga.

Moscow's huge industries require enormous quantities of raw materials which are transported to the city from all parts of European USSR, the Caucasus, and even from Asiatic USSR as far east as mid-Siberia. Altogether, 25,000,000 tons of freight flow into the city each year, the largest items being building stone, bricks, timber, coal, metal, grain and oil. Annual outgoing freight shipments are much smaller, only 5,000,000 tons, because Moscow specializes in production of machines and goods high in value but light in weight. The main items shipped out are machines, textiles and books, Moscow supplying these products to all parts of the USSR, even including the Pacific coast.

Because of its crooked narrow streets and the variegated architecture of its buildings Moscow has often been called Russia's biggest village. Since the 1930's, the Soviet regime has done much to modernize the city, widening main streets and lining them with multi-story new apartment houses and government buildings. Another improvement was the construction of the Moscow subway, with each station built of marble or granite, and decorated with mosaics of colored stone. Nevertheless, Moscow still remains a city of sharp contrasts. Turning off a broad modern boulevard, one often finds himself in a crooked lane, lined with low old buildings of almost medieval style. Even more startling is the common suburban sight of a big modern apartment house and a log cabin standing side by side. The city has an acute housing shortage, and large areas of the older sections are slums. Though the vast majority of Muscovites are Russians, members of every race in the USSR can be found in the city.

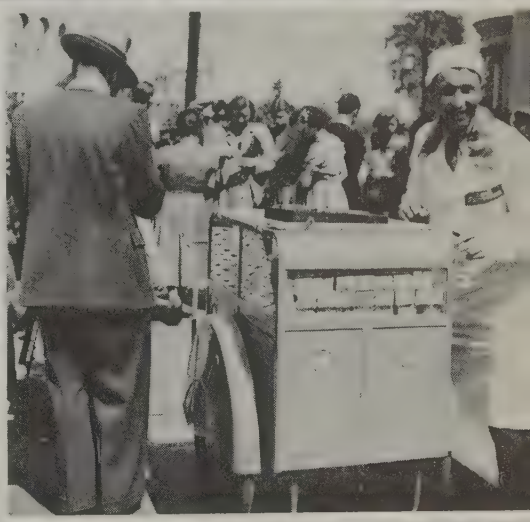
History.—Moscow was first mentioned in ancient documents in 1147, when it was a small village on the site of the present Kremlin. The city was burned down by the Mongols in 1238, but revived and by the end of the 13th century was already a separate principality. Moscow's central location in European Russia was ideal for trading, since it was on a Volga tributary, and by easy portages boats could transfer from the Volga system to all other great Russian rivers west of the Urals. Trading was also encouraged by the poor soil and unsuitable climate for good crops near Moscow. Even in medieval times, the city was an emporium for trade with the Arctic, Baltic, Ukraine, Iran, Central Asia and Siberia. Early Moscow also had a long succession of able rulers, who used their power as Mongol tax collectors to bring neighboring Russian principalities under Muscovite control. When

MOSCOW

Above: Sadovaya-Chernogryazskaya Street, a thoroughfare on the site of an old city wall.

Right: A corner on Gorki Street opposite the Moskwa Hotel.

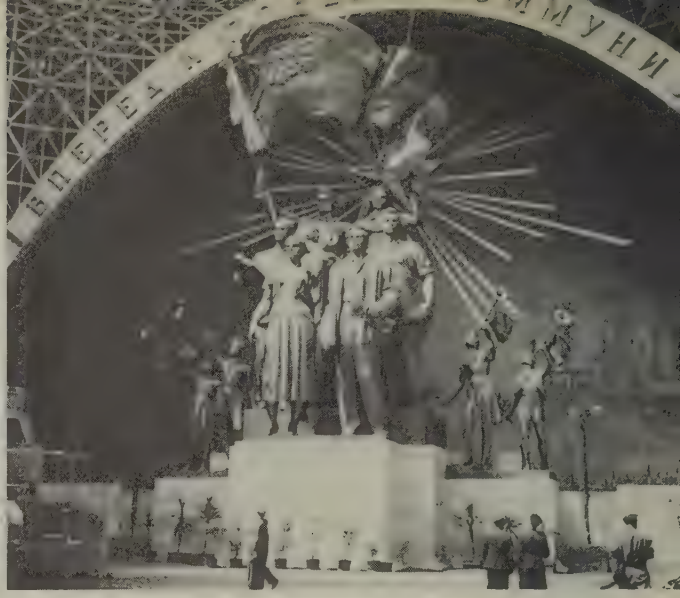
Below: Young artists have been given this corner in the Sokolniki Park of Culture and Rest.



Right: Ice cream vendor, serving a state monopoly, finds customers in all seasons, though the quality is poor and cost high.

Below: Sverdlov Square in the heart of Moscow, with the famous Bolshoi Theater at the right.

(Top left, center left) Sovfoto; (top right, bottom) Van Sprang from Black Star; (center right) Edo Koenig from Black Star



Top left: The Cathedral of the Annunciation, with its nine golden domes, is one of three churches in the Kremlin.

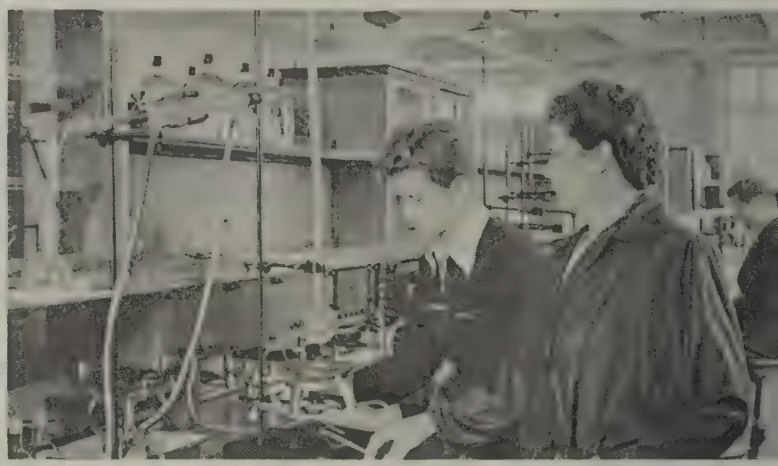
Above: Monumental sculptural group in the Agricultural Exhibition glorifying the united efforts of the people.

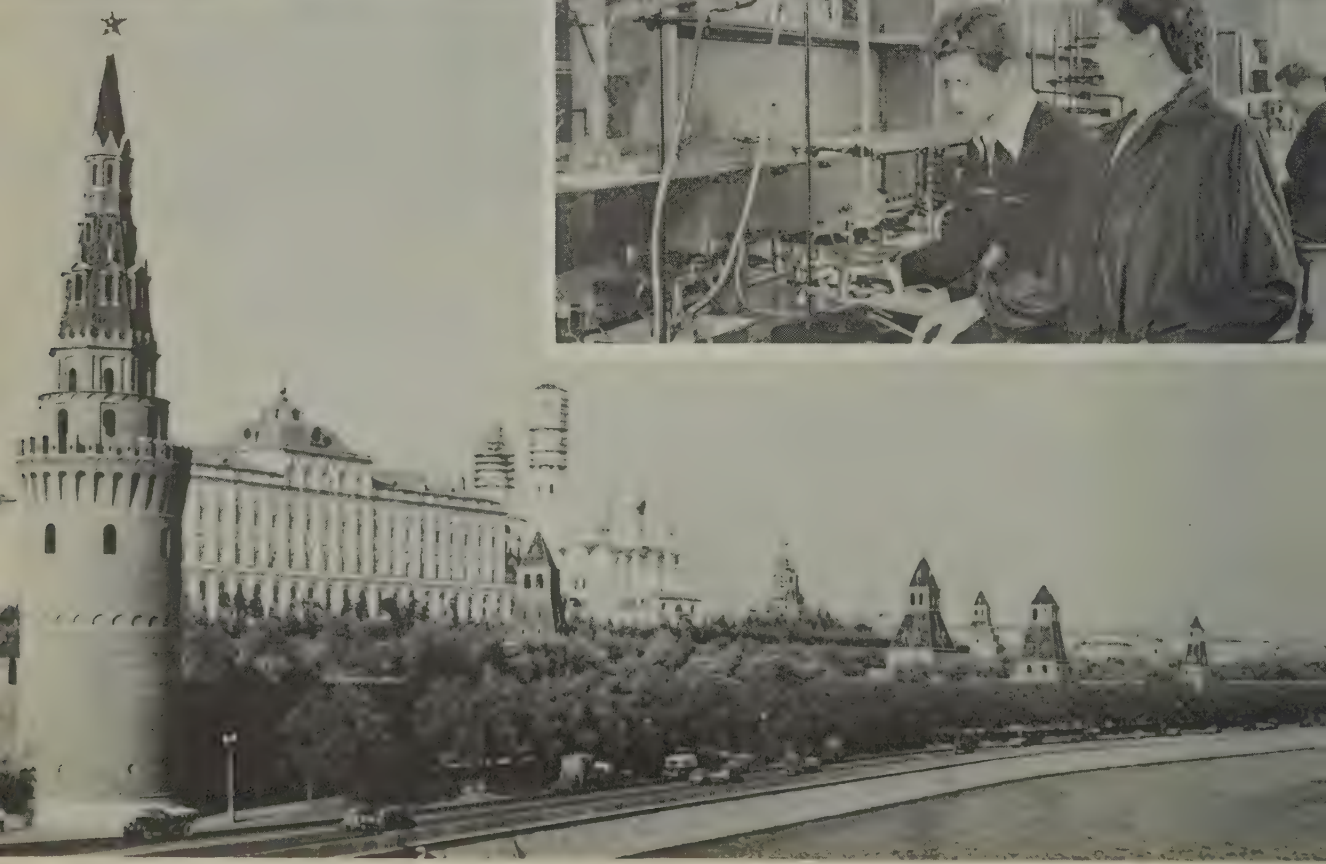
Left: Western-style modern concrete apartment houses are gradually replacing the charming but dilapidated wooden houses of the old city.

Below: Students working in the organic chemistry laboratory of Moscow University.

Bottom: The walled Kremlin, seen from a bridge on the Moscow River.

(Top left, right) Edo Koenig from Black Star; (left, bottom) Van Sprang from Black Star; (below) Sovfoto





central European Russia had thus been united, Moscow broke the Mongol yoke. In 1547 Moscow's ruler Ivan the Terrible took the title of Czar (Caesar) and called the city the Third Rome. From then on, Moscow was the capital of the ever expanding czarist state until 1711, when Peter the Great moved his residence to St. Petersburg (now Leningrad). However, Moscow remained an important commercial city, and the czars usually lived in the Kremlin part of each year. In 1812 Napoleon captured the city, but was forced to evacuate his army when Moscow burned down. The city was rebuilt, and by 1912 had a population of 1,600,000. After the Bolshevik Revolution, Lenin in 1918 moved the capital of Soviet Russia back to Moscow, to be more safe from foreign invasion. Under Soviet rule Moscow has grown tremendously, its population more than tripling over the czarist level. In the winter of 1941, the city was besieged by German troops, who were driven back in the first major German defeat of World War II. Pop. (1950) 5,100,000.

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MOSEILIMA. See MOSAYLIMA.

MOSELEY, mōz'lĭ, **Edward Augustus,** American lawyer: b. Newburyport, Mass., March 23, 1846; d. Washington, D.C., April 18, 1911. He engaged for several years in both the East and West Indian trade. He then studied law, was admitted to the Massachusetts bar and was also a member of the state legislature for several terms. His chief interest was in the lessening of danger in railroad travel, and he became the leading authority in the United States on all measures or appliances for procuring the safety of railroad employees and travelers. Largely for this reason he was appointed secretary of the Interstate Commerce Commission at the time of its formation. His efforts in obtaining and enforcing the Safety-Appliance Law gained him testimonials from all the railroad men's organizations in the United States, and the formal thanks of the Commonwealth of Massachusetts.

He published *Arbitration as Applied to Railways and Their Employees; Safety Appliances on Railroads; One Hundred Years of Interstate Commerce Law* (1900); *The Transportation Question as Affected by the Cullom Bill* (1900); *Federal Supremacy* (1907).

MOSELEY, Henry, English mathematician: b. Newcastle-under-Lyme, 1801; d. Olveston, Gloucestershire, Jan. 20, 1812. He was graduated at St. John's College, Cambridge, and after studying theology was ordained a priest of the Church of England. From 1831–1844 he was professor of natural and experimental philosophy and astronomy at King's College, London, and was one of the first inspectors of schools to be appointed (1844). He was appointed canon of Bristol in 1853, next becoming chaplain to the queen. He was given the degree LL.D., *hon. causa,* Cambridge, 1870.

Among his best-known works are *A Treatise on Mechanics, Applied to the Arts* (1834); *Astro-Theology* (1838; 3d ed., 1860); *Lectures on Astronomy* (1839; 4th ed., 1854); *The Mechanical Principles of Engineering and Architecture* (1843), much in use to this day as a textbook and frequently re-edited and revised.

MOSELLE, mō-zĕl', department, France, in Lorraine (northeastern France), having an area of 2,405 square miles. It is bounded on the north by Luxembourg, the Saar, and Germany; east by the department of Bas-Rhin (Alsace); south and west by Meurthe-et-Moselle. The capital is Metz (1946 pop. 65,472). The department is drained by the Moselle traversing its western part, the Saar in the eastern part, and the latter's tributary the Nied intermediate between the two. The chief crops are grains, potatoes, hops, and fruit. There are important mineral deposits: iron is mined in the Thionville basin, coal in the beds extending south from the Saar. The chief industry is metallurgical, in the Metz-Thionville region. Twice annexed to Germany (1871–1918 and 1940–1944), like other departments of Alsace-Lorraine it has many German speaking inhabitants. Pop. (1946) 622,145.

MOSELLE (Ger. MOSEL; Lat. MOSELLA), river, France and Germany, rising in southeastern Vosges, near Bussang, and flowing 320 miles into the Rhine. It passes Epinal, Toul, Metz and Thionville, forms the Luxembourg-Saar border, then the Luxembourg-German border. Continuing through Rheinland-Pfalz it enters the Rhine at Koblenz. Its affluents include the Meurthe, Saar, and Sûre. Navigable to Frouard (near Nancy) it is paralleled for short distances by the Est and Marne-Rhine canals.

MOSELY COMMISSIONS, two delegations known as the INDUSTRIAL and the EDUCATIONAL, which visited the United States in 1902 and 1903 to study conditions and methods in their respective branches, for comparison with those of Great Britain.

The Mosely Industrial Commission made a tour of the United States from November 1902 to January 1903, to investigate manufacturing, industrial and commercial lines, which in international competition had seriously affected the commerce and free trade policy of Great Britain. It was financed by Alfred Mosely (b. Bristol, England, 1855), a diamond merchant whose relations with American mining and other engineers in South Africa had developed the desire to discover the sources of their success, the comparative causes of Great Britain's industrial decline, and to evolve a plan whereby American methods could be introduced into the United Kingdom for the rehabilitation of its economic and industrial status. A suggestion to invite British trade unions to select a representative from each to form a commission to study American industries and the condition of the workmen was acted upon, most of the unions electing as representative their general secretary. Twenty-three formed the commission and were given a free trip to the states, with expenses paid for nearly three months. Each man was pledged to study conditions carefully and to answer fully on his return a series of tabulated questions.

Mosely and the delegates made a circular tour in which they were afforded every opportunity to inspect some of the largest manufactories in the United States. They visited Niagara, Buffalo, Cleveland, Chicago, Dayton, Pittsburgh, Philadelphia and New York, as one party, while individual members also took trips to other points. The chief results of their observations were published in the *Reports of the Mosely Industrial Commission* (London, April 1903).

Some of the conclusions arrived at were: The American workman for two and one-half days' work receives renumeration equal to that of the British for a week; the American is more temperate than the British; he lives longer; is more thrifty, and after a few years frequently retires with his savings to an easier occupation, usually farming or market-gardening. Labor saving machines were more in evidence in America than in the United Kingdom, but, there was a considerable difference of opinion among the various delegates as to what could be learned from America in their respective trades, for instance, the shipbuilding and bricklaying in England were considered superior to those of America. To the question "Are there greater opportunities for the workingman to rise in America than in England?" "Yes," came as a unanimous answer. The average workman was considered as good in one country as the other, the difference was to be found in conditions. In Great Britain generations of workers toil in a confined area, and have become hidebound by inherited labor traditions; increased production to them does not mean increased wages — hence a lack of incentive. In the United States, the stimulating climate and abundance of undeveloped resources tend to a constant striving for direct results through the simplest means, whence the wonderful development of machinery, manufacturing equipment, output, increased wages, general prosperity and well-being of the American workmen, together with a unity of feeling between employers and employees along the lines of increased production, which is not to be found in England. The organization of capital and labor in the United States produced a great impression on the delegates, and the advantages of the Civic Federation to bring together these two great and active factors in production on all disputed questions, and at the initial stages to avert strikes by arbitration, were fully recognized as those of a model organization worthy of immediate adoption. The freedom accorded to religious belief and the excellent public school education of the States elicited the warmest praise from the commission, the advantage given to all the American youth being fully apparent.

The success of the Industrial Commission led to the organization of the *Mosely Educational Commission* to the United States, October–December 1903, in which 26 prominent British educators took part at the invitation of Mr. Mosely to investigate:

1. The development of individuality in the primary schools.
2. The social and intellectual effects of the wide distribution of secondary education.
3. The effect of specific instruction given (a) in business methods; (b) in applied science.
4. The present state of opinion as to the value of professional and technical instruction of university rank, designed with special reference to the tasks of business life.

As in the work of the Industrial Commission the conclusive deductions drawn were wholly in favor of the system of education in the United States which was described as practical, enlarged, enlightened, up-to-date and scientific. Consult Mosely, 'Reports of the Mosely Educational Commission to the United States of America, October–November 1903' (London 1904).

C. Leonard-Stuart,
Editorial Staff of The Americana.

MOSEN, mō'zĕn, **Julius,** German poet: b. Marieeney, in Vogtland, Saxony, 8 July 1803; d. Oldenburg, 10 Oct. 1867. He was educated in the Plauen Gymnasium, studied law (1822) at Jena, travelled through Italy and then worked for some time under an attorney at Markneukirchen. In 1834 he settled at Dresden, taking up the practice of law, and soon becoming noted as an author. He became (1844) dramaturgist at the Oldenburg Hoftheatre, but incurable sickness greatly deterred his activities after 1848 and he was pensioned in 1850. He first came into prominence through his epic poem 'Das Lied vom Ritter Wahn' (Leipzig 1831), a very ancient Italian legend redressed in a liberal form. His 'Ahasver' (Dresden 1838) contains more of philosophy than poetry; but in his 'Gedichten' (Leipzig 1836; 2d ed., 1843) he shows national radiance in a string of ballads as 'Die letzten zehn vom vierten Regiment,' 'Andreas Hofer,' 'Der Trompeter an der Katzbach,' etc. In narrative form we have the novelle 'Georg Benlot' (Leipzig 1831), 'Bilder im Moose' (ib. 1846). His great ambition was centred in dramatical writing, but these works are too saturated in abstract rhetoric. Of his best might be mentioned 'Cola Rienzi,' 'Die Bräute von Florenz,' 'Wendelin und Helene,' 'Kaiser Otto III,' all of which are to be found in *Theater* (Stuttgart 1842), the latter being the most imposing. His talented work, 'Die Dresdener Gemäldegalerie' (Dresden 1844), should also be quoted. His works in eight volumes has been published under the title 'Sämtliche Werke' (Oldenburg 1863) and a fuller edition, including biography, was published in six volumes by his son (Leipzig 1880). Consult his 'Errinerungen,' extended by Zschommler (Plauen 1893); 'Julius Mosen, eine biographische Skizze' (Oldenburg 1870) is anonymous.

MOSENTHAL, mō'sĕn-täl, **Joseph,** German-American musician: b. Cassel, German, 30 Nov. 1834; d. New York, 6 Jan. 1896. He studied music in Germany and in 1853 removed to the United States where he was organist and choir director of Calvary Church, New York, 1860–87. He conducted the famous Mendelssohn Glee Club in New York in 1867–96 and played the violin in several leading orchestras there. He composed both church and secular music, among which are the psalm 'The Earth is the Lord's' and part songs for 'Thanatopsis,' 'Music of the Sea,' 'Blest Pair of Sirens,' etc.

MOSENTHAL, Salomon Hermann von, German dramatist: b. Cassel, 14 Jan. 1821; d. Vienna, 18 Feb. 1877. He studied at the University of Marburg and in 1851 obtained a position under the Austrian government. His best-known dramas are 'Deborah' (1850); the original of 'Leah the Forsaken' and 'Sonnenwendhof' (1856), which were translated into English, Danish, Hungarian and Italian. He wrote also 'The German Actors' (1863); 'The Mayor of Altenburen' (1868); 'Maryna' (1871); the tragedies 'Düweke' (1860); 'Pietra' (1865), etc.

MOSER, mō'zĕr, **Gustav von,** German dramatist: b. Spandau, Prussia, 11 May 1825; d. 1903. He obtained a military education and after serving in the Prussian army resigned in 1856 to devote himself to literature. He produced more than 100 successful comedies and farcical comedies, sometimes in collaboration; several of his works have been well received in English translations. Among his plays may be named 'Das Stiftungsfest' (1873); 'Ultimo' (1873); 'Der Bibliothekar' (The Private Secretary) (1878); 'Der Veilschenfresser' (1876); 'Krieg im Frieden' (1880). A uniform edition of his plays was published 1873–94 in 22 volumes. Consult the biography by Hans von Moser (Weimar 1908).

MOSER, Johann Jakob, German jurist and publicist: b. Stuttgart, 18 Jan. 1701; d. there, 30 Sept. 1785. He received his education at the University of Tübingen; in 1720 became teacher of law there, and in 1729 was appointed to the full professorship. In 1736 he became a director of the university at Frankfort-on-the-Oder, but in 1739, having fallen into disfavor with Frederick William I, was compelled to resign. He then founded the academy at Hanau for the education of the young nobility in political science; and he suffered imprisonment for five years at the instance of the Duke of Württemberg, his patron. He is credited with being the first to publish a systematic account of European international law. He was a prolific writer, his books numbering over 500, the most important of which are 'Deutsches Staatsrecht' (53 vols., 1737–54, with additions of 2 vols. 1766–75, and 3 vols. 1781–82); 'Lebensgeschichte' (1733). Consult the biography by Wächter (Stuttgart 1885).

MOSER, Justus, German historian and humorous writer: b. Osnabrüch, 14 Dec. 1720; d. there, 8 Jan. 1794. He studied jurisprudence at Jena and Göttingen; in 1747 became attorney for the government, and for 25 years during the minority of Duke Frederick of York acted as his legal adviser, and was afterward appointed a judge. His most important work is 'Osnabrüchische Geschichte' (2 vols., 1768; 3d ed., 1820; Vol. III, edited by Herbert von Bar, 1824). Of his humorous writings perhaps the most striking is 'Harlekin,' in which he attacks hypocrites and pedants of all kinds. He also published some valuable essays on local topics entitled 'Patriotische Phantasien' (4 vols., 1774–86). An edition of his complete works was published by Abeken in 10 volumes (Berlin 1842–43).

MOSES. Hebrew leader and legislator, the story of whose life and work is given with such singular clearness and strength in the Pentateuch, is one of those rare names that have stamped themselves permanently on the world's history, so that we turn again and again to the simple record of his career and achievements with an interest that never lags. With all his Oriental background and the fact that his concern was primarily with his own race to lead them from bondage to freedom, there is so much breadth and suggestiveness in the laws that bear his name, his moral statutes being at the basis of modern civilization, although promulgated 3,000 years ago, that he continues a familiar and fascinating figure to all eyes.

Traditional Data.—The Biblical account, with its rapid, stirring recital, which attains at times a kind of dramatic effectiveness, tells of his birth, how his mother, in dread of Pharoah's mandate which consigned all Hebrew children to be thrown into the Nile, concealed him for three months, then set him in an ark of bulrushes on the river's banks, where Pharoah's daughter discovered him and had him reared as her son (Ex. ii, 1–10). His days of ease were not to last. Not all of Egypt's luxurious life and his own hopes of future power as possible occupant of the throne could dull his innate racial sense of duty. Seeing an Egyptian attacking a Hebrew, he interferes and slays the aggressor, hiding the body in the sand. Then the next day he sees two Hebrews quarreling, and when he tries to separate them, one taunts him with slaying the Egyptian. In fear of further discovery and of death by Pharoah, he escapes to the peninsula of Sinai, dwelling with the priest of Midian, whose daughter he marries. Then follow 40 years as a shepherd, when occurred the episode of the burning bush on Mount Horeb. Now began his mission — it was his task, divinely appointed, to return to Egypt and redeem his brethren from slavery (Ex. iv, 1–9, 20). How he was met and aided by his brother Aaron, how he gained a hearing with his brethren, how Pharoah's heart was hardened against the departure of the Hebrews, until, after a series of successive plagues, the Egyptians in their terror bade the Israelites make every haste to leave, are steps in a thrilling drama that has served as material for preacher, poet and playwright, with its incidents to-day as fresh as when first read or narrated. Now began the long 40 years' march, but the Israelites had not advanced very far, they moved slowly, being accompanied by their wives and children, their flocks and herds, when Pharoah and his army started in pursuit (Ex. xiv, 8–9). How the panic and despair of the people are changed to exultation as the waters recede and Pharoah's hosts are drowned in the Red Sea, while the wanderers are saved, is another of those thrilling episodes immortalized in Miriam's Song of Triumph, that belongs to the highest strains of Hebrew poetry. Then the people are led by Moses through the wilderness to Sinai or Horeb, where he received the Ten Commandments and the Law and God enters into a covenant with Israel (Ex. xix et seq.). After this culminating incident, so vividly related, Moses continues his leadership and amplifies his message from Sinai with many details as to the tabernacle, the priests, the encampments. Cautiously now he marches forward to Kadesh, from which place the spies or scouts were sent to Canaan, the ultima thule of the people's journeyings. How characteristic — they refuse to advance in their alarm at the report of the spies, and were condemned to remain in the desert until that generation had passed away (Num. xiii–xiv). Nothing is extenuated in the flaming record — every act of weakness, of rebellion, of disobedience with its invariable penalty, all are frankly and unflatteringly told. Moses resumes the march eastward, making friends and foes on the journey, but receives warning that he will not be allowed to lead the people across the Jordan as he would die on the eastern side

(Numbers 12). He gathers the tribes in consequence and gives them a farewell address, which is embodied in the book of Deuteronomy. He repeats the Law, adds his wise counsel, warns of the consequences of disloyalty and adjures the people to be faithful with an eloquence and persuasiveness that give his words perennial force. Then, after a final blessing of the multitude, he ascends Mount Nebo to the summit of Pisgah, and dies in his 120th year. The place of his sepulcher is unknown (Deuteronomy 34), doubtless for good reasons as one familiar with the history of similar founders of religions can readily understand.

Character of the Laws.—The open pages of the Pentateuch relate the character of the laws of Moses with a minuteness of detail that leaves little, if anything, untold. The code, embracing 613 statutes, covers the entire requirements of priesthood, community and individual. While his training and early life in Egypt influenced in many ways his legislation, the distinctive features are vital, with their emphasis on a purer and more rational divine belief and their elements of a democracy after which later nations in certain respects have modeled their systems. Despite the elaborate forms of priesthood and sacrifices, concessions to a people not ready for a loftier attitude, from our 20th century point of view, although our later day civilization still needs balance wheels, and holds fast to signs, symbols, forms, ceremonies of its own, the essential truths of the Mosaic laws, its insistence on personal equality and personal morality, cannot be outgrown. Its spirit of broad humanity, its consideration for the old and the young, the slave and the enemy, the fruit tree and the animal creation, its health and food regulations full of suggestions to the modern physician and dietitian, all of these show a wisdom in their author that accounts for his fame and the fact that so many of the Mosaic laws are still observed by the great majority of the people to whose ancestors the code was given.

Moses in the Legends.—It was to be expected that in course of time legends should arise as to the character of Moses and the various episodes in his career. In rabbinical literature, these have assumed a variety, a grandeur and a poetical beauty that account for their hold on the imagination for centuries to our day. To the average English reader Rev. S. Baring Gould's *Legends of the Patriarchs and Prophets* will be found stimulating. Dr. Ginzberg's *Legends of the Jews,* with its exhaustive chapters, will satisfy the more critical reader, although there is no attempt to elaborate the stories which are narrated with sober exactness. If it was denied the people to know his sepulcher and render him worthy post mortem honors, they had full license to draw upon their imagination and adorn the memory of so great a prophet, leader and law-maker by spinning the web of fairy tales in apt Oriental fashion so dear to the Semitic mind and in which the Occidental no less delights even if he assumes a more worldly-wise air. These legends stretch over his entire history from birth to death and seek to interpret in their own imaginative way, which is often far from being forced or unnatural, the scenes and incidents that he encounters, which so readily adapt themselves to the story-teller's mood as well as to the teacher's vision. It is not necessary in the limited space at command to dwell at any length on the mass of legends so quotable and stimulating. The Hellenistic stories of Moses, if more limited, have a quaint interest of their own. The Mohammedan are obviously distortions or exaggerations of the rabbinical, although occasionally the treatment is original. Moses plays a part, too, in apocalyptic literature.

Modern Critical View.—Since Astruc in 1753 published his view of the composite character of the book of Genesis, due, as he stated, to the use by Moses of certain documents in its elaboration, the critics have waged a long continued battle as to the question of authorship, which has its piquant features and is still being contested almost as hotly as a century ago. The fact, too, that a parallel to the story of the birth of Moses and his experience in the bulrushes of the Nile is found in the cuneiform library of Ashurbanipal and told of Saragon, a Babylonian king who ruled, it is said, about 3800 B.C., is not without its suggestions. The etymology of the name Moses, too, has given rise to much speculation, although the Biblical account has still its doughty defenders. However, whatever the criticisms as to name, authorship, date, whatever the differences in details, the prevalent opinion as to the man himself is one and the same, as a great historical figure, who added unity and strength to a nation, after setting it free, and under Providence, shaped its destinies and gave it the essentials of a religious and civil code of laws, which later ages developed.

Bibliography.—Driver, *Introduction to Literature of the Old Testament* (New York 1897); Ginzberg, *Legends of the Jews* (Vols. II and III, Philadelphia 1909–13); Ottley, *A Short History of the Hebrews* (Chap. III, New York 1901); Warrington, George, *When was the Pentateuch Written?* (London and New York).

ABRAM S. ISAACS.

MOSES, Bernard, American historian and political economist: b. Burlington, Conn., Aug. 27, 1846; d. March 4, 1930. After graduating from the University of Michigan in 1870, he went to Europe for further study receiving his Ph.D. from Heidelberg in 1873. In 1875 he became professor of history at Albion College, and in 1876 became professor of history and political economy at the University of California. His more important works were *Politics* (with W. W. Crane); *Federal Government in Switzerland; Democracy and Social Growth in America; Establishment of Spanish Rule in America* (1898), *The Spanish Dependencies in South America* (1914); *The Government of the United States* (1906). These were followed by *Spain's Declining Power in South America, 1730–1806* (1919); *Spanish Colonial History in South America* (1922), and other writings. In March 1900 he was appointed member of the United States Philippine Commission, with which he served for the next three years. He also represented the United States at Pan American congresses.

MOSES, George Higgins, American diplomat and legislator: b. Lubec, Me., Feb. 9, 1869; d. Concord, N. H., Dec. 20, 1944. In 1890 he graduated at Dartmouth College. He was a leading figure in Republican political circles at Concord, N. H., where he became, in 1898, president of the *Monitor and Statesman* Company. During 1909–1912 he was United States minister to Greece and Montenegro. From 1918 until 1933 he was United States senator from New Hampshire; from 1925 he was president pro tempore of the Senate.

MOSHEIM, mōs'hīm, **Johann Lorenz von,** German Protestant theologian: b. Lübeck, Oct. 9, 1694; d. Göttingen, Sept. 9, 1755. He taught at Kiel and Helmstedt prior to 1747, when he became professor and chancellor of the University of Göttingen, which he helped to found. A notable preacher and erudite theologian, he wrote several church histories, among them *Institutiones Historiae Ecclesiasticae* (1755) and *Institutiones Historiae Christianae* (1763).

MOSHER, mō'zhĕr, **Eliza Maria,** American physician: b. Cayuga County, N. Y., Oct. 2, 1846; d. New York City, Oct. 16, 1928. She graduated at the University of Michigan in 1875, studied medicine in Paris during 1879–1880, and was on the staff of the Massachusetts Reformatory for Women until 1883. For the next three years she was professor of physiology at Vassar College, and from 1886 until 1896 she practiced medicine in Brooklyn, N. Y. Thereafter she was professor of hygiene at the University of Michigan until 1902, when she resumed practice in Brooklyn.

MOSKVA, mŏs-kvä', Russia, an affluent of the Oka, a tributary of the Volga. Rising east of Smolensk, it flows through the city of Moscow and joins the Oka near Kolomna after a total course of 310 miles. The Battle of Borodino (q.v.) was fought near its banks.

MOSLEM SECTS. The first great schism in Islam (q.v.) was that which divided the community of believers into two opposing camps: The Sunnites and the Shi'ites. The Sunnites have always constituted the vast majority and are referred to as orthodox. The estimated number of Shi'ites and their offshoots are today some 45 million, about 15 per cent of the Moslem society, with Persia (Iran) and Iraq as their bulwark.

Shi'ites.—The Shi'ite sect did not crystallize until the Ommiad (Umayyad) period (661–750), but the underlying issue goes back to the time of Mohammed (q.v.). On his death in 632 the all-important question arose as to who should succeed him. Those who later became known as Shi'ites (partisans, that is, of Ali) maintained from the beginning that such an important office could not be left to the whims and fancies of the people, and that God had designated through Mohammed a successor (*khalīfah,* caliph) who was none other than Ali, husband of his only surviving daughter, Fatima. They further held that the office of successorship, caliphate, to which the Shi'ites prefer the term imamate, should be hereditary, limited to the progeny of Mohammed. The murder of Ali in 661 and of his two sons and successors al-Hasan (c. 669 and al-Husain (680) did not dampen the zeal of their followers. The three were immediately raised into the rank of martyrs. In their deaths they became more influential than in their lives.

In course of time the Shi'ites became more differentiated from the Sunnites. They rejected the Sunnite books of tradition (*ḥadīth*), differed in matters of law and ceremonies, did not regard participation in public worship as obligatory, and considered pilgrimage to the shrine of Ali, in Najaf, or to that of al-Husain, in Karbala, a permissible substitute for a pilgrimage to Mecca; and to the formula "No god but Allah and Mohammed is the prophet of Allah," they added "and Ali is the vicegerent (*wali*) of Allah." Having been always a minority and often subjected to persecution, they came to believe that it was lawful for a Shi'ite in time of danger to deny his Shi'ism and profess the prevailing faith (*taqīyah,* dissimulation). Shi'ites also consider it lawful to practice temporary marriage (*mut'ah*), which is frowned upon by the Sunnites.

Kharijites.—Another early but small sect which had its origin in a divergent view of the caliphate, which from our point of view is a political rather than theological issue, was the Kharijites (goers-out, seceders). Originally staunch supporters of Ali, the Kharijites broke away from him because he was willing to submit his right to the caliphate, when disputed by his rival Mu'awiyah, to arbitration. An offshoot of this sect survives today in Algeria, Zanzibar, and Oman, where primitive legal and theological views are held and intermarriage with Moslems is forbidden.

Qadarites.—The first important sect in Islam that split on theological or philosophical rather than political grounds was the Qadarites (from *qadar,* power), who maintained that man had power over his own actions. In this they went counter to the orthodox Islamic view of predestination, a corollary of God's almightiness strongly emphasized in the Koran. The Qadarite school of thought arose under the Ommiads, and claimed two of the caliphs as converts to their cause. Their interest in free will and self-determination indicates that the impulse came from contact with Greek Christian thought in Syria. The Qadarites were the precursors of the Mu'tazilites (separatists).

Rationalists.—To the Qadarite doctrine of free will the Mu'tazilites added another rational one, that of the denial of the coexistence with God of such divine attributes as wisdom and power. To the members of this school of thought, the attributes of God were not entities beside God. They further maintained that the Koran was not the "uncreated word of God" but a product of Mohammed's composition under divine influence. Their assertion of the supremacy of reason won them the title of the rationalists of Islam.

At the rise of this school its adherents were treated as heretics by the Sunnites, but when the Caliph al-Ma'mun, in the early 9th century, became himself a Mu'tazilite, its doctrine was made the official creed of the state. Al-Ma'mun even went so far as to establish an inquisition (*miḥnah*), the only one in the history of Islam. Shortly after his time orthodoxy was restored, and the sect has become practically extinct.

Twelvers.—The Shi'ites, as nonconformists, produced the largest number of sects. They first split into two: Twelvers, and Seveners. The Twelvers, also called Imamates, transmit the successorship to Mohammed (imamate) from father to son, beginning with Ali and ending with the 12th imam, Mohammed al-Muntazar (the expected one). In 878, when still a boy, Mohammed supposedly vanished in the mosque of Samarra, Iraq, and has since lived in secret, to appear on the last day as the Mahdi (rightly guided one), a sort of Messiah. Until the present the Mahdi is still in a state of occultation, and his appearance will usher in an era of universal Islam, peace, and prosperity. Since 1502 this Twelver Shi'ah has been established as the state religion of Persia, with the shah as the temporary substitute for the hidden imam. In Syria and Lebanon, a few thousand Shi'ites have

survived under the name Matāwilah (friends, that is, of Ali). In Yemen, they are known as Zaydites, after a great-grandson of Ali. The Zaydites are the nearest Shi'ite faction to the Sunnites.

Seveners.—The main Seveners make the 7th imam, Isma'il (d. 760), their last and greatest one. Hence their other designation, Isma'ilites. To them, the line of "visible imams" ends in this Isma'il. In course of time the Isma'ilites deviated more and more from the body of Islam, and this resulted in a number of extreme sects considered outside the pale of Islam by the orthodox body.

As a measure of safety the Isma'ilites resorted to secrecy in the practice of their faith, and introduced initiatory practices. The number seven assumed sacred importance in their scheme, as it had done in the Pythagorean system. Though secretly organized, they inaugurated one of the most subtle and effective politico-religious propagandas ever witnessed by Islam. As emissaries (sing. *dā'i*) they employed clever teachers disguised as merchants and travelers who covered the entire area from Persia to North Africa.

In Iraq, a group closely allied to the Isma'ilites flourished under the name Qarmatians (Carmathians). The appellation comes from an Aramaic word meaning peasants. These were extreme revolutionists whose violence in the 9th to 11th centuries drenched Iraq and Syria in blood. Another closely related group was organized in northern Persia under the name Neo-Isma'ilites. These are the people known to the West under the name Assassins (*hashshāshīn,* cannabis addicts) and whose activity in the period of the Crusades resulted in the murder of many Frankish leaders. It was at that time that the word assassin was introduced into the European languages. From its birthplace in Alamut, Persia, in 1090, the Assassin movement spread into Syria. Certain elements there, dissatisfied with the local regime, were predisposed to the new doctrine. From his retreat in Syria "the old man of the mountain" terrorized the whole land. Remnants of this sect are found today in Syria, Persia, Afghanistan, and (particularly) in India, where their leader, the Aga Khan, claims descent from Ali through the Iranian founder of the order.

Fatimid Caliphate.—In North Africa, the successful Isma'ili propaganda resulted in the establishment of the caliphate (909–1171) whose members claimed descent from Fatima. This was the only Shi'ite caliphate of importance. From their capital, Cairo, the Fatimids ruled over Syria, and when the Crusaders marched against Palestine that land was a part of their domain. It was one of these caliphs, the fanatical al-Hakim (996–1021), whom the Druzes considered the final incarnation of the deity. Such a concept was a culmination of the extravagant veneration accorded Ali and his descendants by their followers.

Druzes.—The Druzes are so named after a missionary of Persian or Turkish origin, Darazi, who preached the divinity of al-Hakim among the mountaineers of Lebanon, in Syria, where he fell in battle about 1019. Darazi was the first to proclaim the divinity of al-Hakim in Egypt. The Druzes today are confined to Lebanon and Syria. In their theology and cosmogony they have retained many of the original Isma'ili doctrines. They indulge in no propaganda, accept no proselytes, keep their books secret in manuscript form, and divulge their tenets only to the initiated few called *'uqqāl* (wise), as opposed to the mass of their community, termed *juhhāl* (ignorant). They practice monogamy, ignore pilgrimage and the other pillars of Islam, and do not observe regular or congregational prayers. By the orthodox, their doctrines (and those of the Isma'ilites, Qarmatians, and Assassins) are considered extreme heterodoxies.

Nusayris.—Another ultra-Shi'ite sect which has survived in Syria is the Nusayriyah. Under the French mandate created in the 1920's the Nusayris were given a somewhat new name, Alawites (followers of Ali), and organized into a separate state with Laodicea (al-Lādhiqīyah) as capital. The Nusayris take their name from Mohammed ibn-Nusayr, a partisan of the eleventh imam al-Hasan al-Askari (d. 874). They deify Ali, practice the rites of their religion in secret, and retain clear remnants of pre-Islamic pagan beliefs. Both they and the Druzes believe in metempsychosis. Like the Druzes, the Nusayris divide their community into two groups: The multitude of the profane, who are kept in the dark so far as the tenets are concerned; and the chosen few, who are initiated into the mysteries of the cult. There are other minor sects which in their excessive veneration of Ali and his progeny raised these personages into titular deities and endowed them with superhuman power.

Three of the modern Islamic movements deserve special consideration: The Baha'is of Persia, the Wahabis of Arabia, and the Ahmadiyah of India.

Baha'is.—Baha'ism had for a forerunner another Persian sect called Babism. This was founded in 1844–1845 by Mirza Ali Mohammed and his successors, who held to the view of continuous and progressive Divine revelation. It is, therefore, an offshoot of Shi'ism. The founder claimed descent from al-Husain, the Prophet's grandson, and adopted the title of al-Bab (the gate), whence the name of his votaries. He promulgated his mission in Shiraz, where he appeared as a kind of Messiah aiming to establish the supremacy of the imamate Shi'ah over Islam. To this end he revealed a new book abrogating the Koran, and was executed by order of the Persian government at Tabriz in 1850. Some 20,000 of his followers were likewise slaughtered. In 1909 his bodily remains were transported to Haifa, on the Palestine coast.

Thirteen years after the death of al-Bab a disciple of his, another Persian, Bahaullah (splendor of God) by name, was accepted as the manifestation of the Divinity heralded by the Bab. He in turn set forth a new revelation, and addressed a series of official missives to the heads of governments in which he condemned war, preached universal peace and brotherhood, and advocated the adoption of a universal language. Fundamental in his teaching was the idea that God was unknowable except through His manifestations, the prophets, who differed outwardly but in essence were one, revealing one truth. On his death in Acre in 1892 his eldest son, Abbas Effendi, succeeded him under the title Abdul Baha (the slave of al-Baha'). Abbas Effendi resided in Acre and later in Haifa, where he died in 1921. Before World War I he visited the United States, where his followers eventually numbered several thousand, mostly in Chicago and New York.

Ahmadiyah.—Another modernist reformist sect is the Ahmadiyah, which also maintains missionary centers in the United States as well as

Britain. It is so-called after Mirza Ghulam Ahmad (d. 1908), a native of Qadian, in the Punjab. Ahmad began preaching in 1879. He taught that Christ was taken down from the cross while still alive and finally made his way into northern India, where he spent his last days. Ahmad considered himself as the person in whom the double mission of the expected Christian Messiah and Moslem Mahdi were united. He expounded the holy war (*jihād*) as striving after righteousness, a struggle in which weapons are spiritual rather than physical.

Wahabis.—Unlike these two modern movements, Wahabism sought reform by reaction rather than innovation. The founder was Mohammed ibn-Abd-al-Wahab (1703–1791), of Nejd. Unfavorably impressed by the new trends in Islamic thought and practice, ibn-Abd-al-Wahab aimed to restore Islam to the golden age of the Prophet and his early companions by stripping it of all its novel accretions. He rejected consensus of opinion as a source of authority, and condemned music and the wearing of silk and jewelry. By marriage he became allied with the ruling house of Nejd, that of Saud. In the first years of the 19th century the Wahabis had developed enough strength to impose their rule upon central and western Arabia, including the holy cities. After a long eclipse their power was reestablished by 'Abd-al-'Azīz ibn-Saud, who created Saudi Arabia in 1932 and has since been its ruler.

Sufism.—No study of Islamic sects is complete without some consideration of Sufism, which in reality is not a sect but a way of life. The word comes from an Arabic term meaning wool; early Sufis wore the material in imitation of Christian monks. Sufism is mysticism as practiced in Islam. It represents a reaction against the formalism developed in the first centuries of Islam, and is an attempt to seek direct and personal relationship with the deity. Beginning on the ascetic level, Sufism grew into a syncretic system, borrowing elements from Christian, Neo-Platonic, and Buddhist sources. From the ascetic it consequently passed on into the mystic, theosophic, and pantheistic stages.

In the 13th century Sufi fraternities or orders were organized in the different parts of the Moslem world. Earliest among these was the Qadirite, so called after a Persian, Abd-al-Qadir al-Jilani (d. 1166), who preached in Baghdad. This order now claims adherents in most Moslem lands from Algeria in the west to Java in the east. Another order, the Mawlawi, commonly known as that of the whirling dervishes, became especially strong in Ottoman Turkey. The superior of the order enjoyed the privilege of girding each new sultan-caliph with his sword. This order, together with others, was abolished by Mustafa Kemal (Kemal Atatürk).

Senusi.—One of the most recent and interesting brotherhoods is that of the Senusis (Sanusis), founded by an Algerian sheikh in 1837. It is a conservative militant order which had a wide vogue in North Africa and succeeded in establishing a theocratic state in the desert between Tripoli and Egypt. From their headquarters in the oasis of Kufra, the warlike members of this order have caused much trouble to the Italians in Libya, and to other European colonists.

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MOSLER, mōz'lĕr, **Henry,** American genre painter: b. New York, June 6, 1841; d. there, April 21, 1920. He studied under James Henry Beard during 1859–1861, and in 1862–1863 he was art correspondent for *Harper's Weekly* in western campaigns of the American Civil War. The next three years were spent at schools of painting at Düsseldorf and Paris, and in 1874 he returned to Europe, first residing at Munich and from 1877 to 1894 in Paris. His *Le Retour* was the first American picture to be purchased by the French government for the Luxembourg Museum. The Metropolitan Museum of Art, New York, acquired his painting entitled *A Wedding Feast in Brittany;* and the Corcoran Art Gallery, Washington, D.C., his *Saying Grace.* Other paintings by him included *The Lost Cause; Last Sacrament; Spinning Girl; Rainy Day.*

MOSQUE, mŏsk, a Moslem house of prayer. The form of the oldest mosque was that of the Christian basilica which, however, became modified in the progress of Moslem architecture. The famous mosques of Turkey resemble the Byzantine architecture of Constantinople (Istanbul); and certain of those of India, the temples of the Jains. In course of time domes and minarets became emblematic of the more characteristic and ornate examples of Moslem art; but these are not essential, for in poor communities a bare whitewashed room may suffice for the public worship of the faithful. The mosques often include, in a quadrangular area, an immense number of columns arranged in files. In numerous instances these columns are the rich spoils of antique monuments. Mosque architecture possesses no fixed rules, lightness and elegance alone being deemed the fundamental laws of architecture. Mosques contain neither altars, nor paintings, nor images. A great quantity of lamps of various kinds form the principal interior ornament, together with some sentences from the Koran written on the white walls. The buildings are often quadrangular in plan, and have an open interior court, where are fountains for ablutions. In the southeast of the building there is a pulpit for the imām; in the direction in which Mecca lies (the *Qiblah*) there is a niche toward which the faithful look when they engage in prayer. Opposite the pulpit there is a platform surrounded by a parapet, with a desk on which is placed the Koran for the purpose of reading to the congregation. On Fridays the five daily prayers, obligatory on the faithful every day, are recited in the mosque by the whole congregation, together with additional prayers. It is not customary for women to enter the mosques, and when they do they are placed

separately from the males. The chief officer of the mosque is the *nadir,* under whom are two imáms, muezzins who call the people to prayer, etc. These in addition to their religious vocation generally pursue secular callings. It is usual to cover the floor of the mosque with carpets, but there are no seats. On entering a mosque, the faithful remove their shoes. The building is never closed; and while nothing could exceed the devotion of the congregation gathered together in worship, at other times the mosques serve as convenient meeting-places, and in which wayfarers may accommodate themselves. They also serve as schools and seats of learning. Thousands of students are regularly in attendance at the most famous of these, the Azhar Mosque in Cairo. The mosques are maintained for the most part by endowments in land. The finest of the mosques of Constantinople and of the world is that of Saint Sophia, at one time a Christian church. In addition to schools, the imperial mosques have frequently hospitals and kitchens for cooking food for the poor.

MOSQUERA Y ARBOLEDA, mōs-kā'rä ē är-bō-lā'dä, **Tomás Cipriano de,** Colombian politician and President: b. Popayan, 20 Sept. 1798; d. Coconuco, 7 Oct. 1878. After three years of service in the patriot army he was captured by the Spaniards, when he was only 18, but he escaped at Jamaica, returned to the army and in 1829 was made general by Bolivar, who made him also envoy to Peru. After Bolivar's death Mosquera traveled in North America and Europe. He became a senator in 1833; was President of New Granada 1845–49; in 1859 led the federalist revolt against Ospina, adopted a federal constitution by which the name of the country was changed from New Granada to the United States of Colombia, and became dictator of the new federation. His power was checked by a revolt led by Canal, with whom Mosquera in 1862 came to terms. Under the constitution then adopted Mosquera was elected President in 1863 and in 1866; the latter term was cut short by a successful revolution due to the President's arbitrary use of power. He was banished to Lima for four years, but upon his return again entered politics, was governor of Cauca and became a member of Congress. He was strongly anti-clerical; and wrote on the geography of New Granada, and a valuable life of Bolivar (1853).

MOSQUITIA, mōs-kē-tē'ä. See MOSQUITO COAST.

MOSQUITO (diminutive of the Spanish *mosca,* a fly), a name applied to insects of the dipterous family *Culicidæ.* Mosquitoes are cosmopolitan, only a few oceanic islands, deserts and mountain tops being free from them. Frequently they occur in vast swarms, and they abound equally in arctic regions, as Alaska and Greenland, and in the tropical swamps of Africa and South America, while at many intermediate points they are intolerable pests. Vertically they range from the seashore to altitudes of at least 13,000 feet. While many species are local, others are very widely distributed. Typical mosquitoes have the following characteristics: The mouth is provided with a prolonged, suctorial, piercing proboscis; the greater part of the body and head and portions of the wings and legs are covered with scales which determine the color pattern; the complicated venation of the wings is also highly characteristic. These features distinguish mosquitoes from the related midges (*Chironomidæ* and *Cecidomyidæ*) and the black flies (*Simulidæ*); and from the crane-flies (*Tipulidæ*) which inspire most of the stories of gigantic mosquitoes. Not less than 22 genera and 350 species are now known. The species are based largely upon differences in the form and arrangement of the scales and the resulting coloration, the form of the foot-claws, etc.

Development.— The typical life-history of a mosquito is as follows: The eggs are deposited at night in or (rarely) near shallow water, usually fresh but in the case of a few species brackish or salt. After one or a few days they hatch into legless, aquatic larvæ, popularly known from their activity as "wigglers." These have the mouth provided with small jaws for browsing at the bottom, and with brushes of hairs whose movements induce currents in the water and bring to the mouth floating particles or minute plants and animals which serve as food. The thorax is more or less swollen, and the abdomen slender and nine-jointed, with the last, or anal, segment bearing two pairs of leaf-like appendages and a more or less conspicuous fan of spreading hairs. On the dorsum of the eighth segment is a pair of spiracles, or breathing-pores, usually borne at the end of an elongated tube or siphon. By their active wiggling the larvæ come frequently to the surface and breathe, and then sink by gravity lazily to the bottom. After one or more weeks the larvæ molt finally and transform into pupæ, which have the head and thorax closely united, and the latter greatly enlarged, with the form of the future legs and wings apparent. At the tail end is a pair of fin-like expansions; while the respiratory organs, instead of being near the end of the abdomen, have the form of a pair of large mouthed tubes or funnels on the dorsum of the thorax. Like the larvæ the pupæ are active wigglers, but, unlike them, are buoyant and naturally float at the surface with the respiratory funnels uppermost and exposed. When alarmed they display much activity and wiggle violently toward the bottom. The imagoes escape from the pupal investments at the surface, and windrows of cast-off skins are thrown up at the water's edge. The males, which transform first, hover in little clouds and are sought by the females. In the males the antennæ are broad and feather-like, in the females slender and simply hairy. The duration of the period of aquatic life varies with the species and temperature; in our common *Culex pungens* it may be only 10 days, so that many generations may be produced during a favorable season. The winter may be passed in any stage from egg to adult, all of which are extremely resistant to cold, and the aquatic stages capable of withstanding repeated freezing and thawing. The hibernating imagoes, which are found in houses and other sheltered places, may become active on warm days and in the case of *Anopheles,* at least, are chiefly fertilized females. Mosquitoes have many natural enemies. The aquatic stages are preyed upon by carnivorous fishes, water-newts larvæ of dragon-flies and aquatic beetles and leeches. Vast numbers of the flying insects are destroyed by night-hawks and bats, and during

the day they are pounced upon by dragon-flies, hornets and other carnivorous insects, and snapped up by swallows and swifts as they skim the grassy meadows. Of their parasites the recently discovered worm, *Agammomermis culicis,* is considered to exert an important checking influence in some years.

Mosquitoes are weak fliers and usually seek shelter when the wind blows, so that railroad trains, ships and wagons are far more effective than their own wings in accomplishing their dissemination.

Notwithstanding that the chief human interest in mosquitoes arises from their blood-sucking habits, yet the taste for blood is certainly an acquired one and a relatively unimportant factor in the lives of the majority of

FIG. 1.

mosquitoes. The normal food of both sexes of many species, and the only food of the males of nearly all, consists of the juices of flowers, fruits and other plant parts. In a few species a meal of blood by the female seems requisite to the maturation of the eggs, but this is decidedly exceptional. Most of the species are active chiefly at night, but a few, like *Stegomyia fasciata,* in which also both sexes bite, are most vicious during the early afternoon. The bites of all species are not equally irritating, probably the result of dissimilar qualities of the salivary secretion which is poured into the wound to facilitate the blood flow. Ammonia and glycerine allay the irritation. Besides the warm-blooded birds and mammals, mosquitoes attack fishes, frogs, turtles and even other insects.

Until within a few years mosquitoes were regarded merely as intensely annoying pests, but since the definite discovery of their relation to disease-transmission their momentous importance has been recognized. Besides several diseases of the lower animals three serious human maladies — malaria, yellow fever and elephantiasis — have been definitely traced to their agency, and they are suspected of others.

Kinds and Characteristics.— Within the limits of North America nine genera and upward of 30 species are known to occur.

Illustrations are here given of the three varieties which assume importance through their relations to the human race: the *Culex,* or gutter mosquito, the *Anopheles,* or swamp mosquito, and the *Stegomyia,* or cistern mosquito.

Culex pungens prefers the gutter and may be likened to the sparrow among birds; it is noisy and numerous, and always hungry.

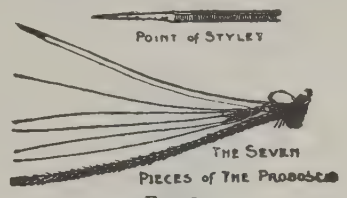

FIG. 2

The male insect (Fig. 1) presents a rather bushy head-dress, by which it may be easily distinguished from the plainer but more dangerous female. Male mosquitoes are not blood-suckers, but vegetarians; for the reason that the male insect cannot pierce the skin and must, therefore, subsist on food more easily obtained.

The feeding organ of the mosquito, called the proboscis, is composed of seven parts (Fig 2), which together form the organ by means of which the blood is reached and through which it is obtained.

In the male insect the stylet, or piercing instrument, is adherent to the neighboring parts and cannot move sufficiently to puncture the skin.

The female insect (Fig. 3) is plain as compared with the male. The palpi, those projections on either side of the central proboscis, are much shorter in the female; and the organs to the outer side, the antennæ, are not as beautifully plumed. The female of the *Culex* is very annoying, but is not known to transmit disease in this country, though it is suspected of conveying dengue fever. In eastern tropical countries a species of the *Culex* is connected with the disease known as elephantiasis.

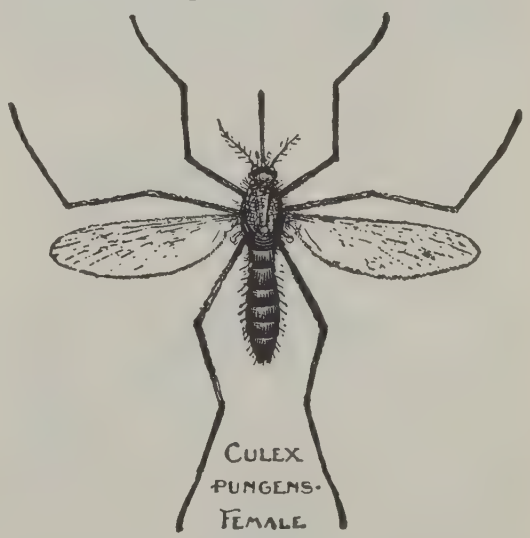

FIG. 3.

The *Anopheles* is the spotted-winged swamp mosquito, responsible for malaria in the human. A peculiarity of this mosquito is its long, thin legs, and the dark spots on the wings are characteristic. The same general difference in the head-dress of the sexes obtains, save that the palpi are about equally long in both, as may be seen by comparing the pictures (Figs. 4 and 5)

The *Stegomyia* is for the South by far the most important mosquito; not because it is most numerous, but because it is the natural conveyer of yellow fever. It has been called

FIG. 4.

the tiger mosquito because of its striped appearance. It is a most beautifully marked mosquito and very dainty. It is essentially a domestic insect and is found only in inhabited localities. It is a day mosquito, and, resting on a dark background, such as a black coat or dress, presents a particularly striking appearance, the white bands on the legs and the peculiar marking of the back easily distinguishing it from any other (Figs. 6 and 6a).

The antennæ of all male mosquitoes are more hairy than those of the female. Some of these hairs respond to sound by a vibratory motion; they are, therefore, auditory. These

FIG. 5.

are the ears of the insect and it is believed that the male flies to the female guided by her song, adjusting the direction of his flight by turning his head until both antennæ are equally affected, when the object of his search is directly in front. The song of the insect is not produced solely by the buzzing of its wings, but also by the vibration of a peculiarly constructed

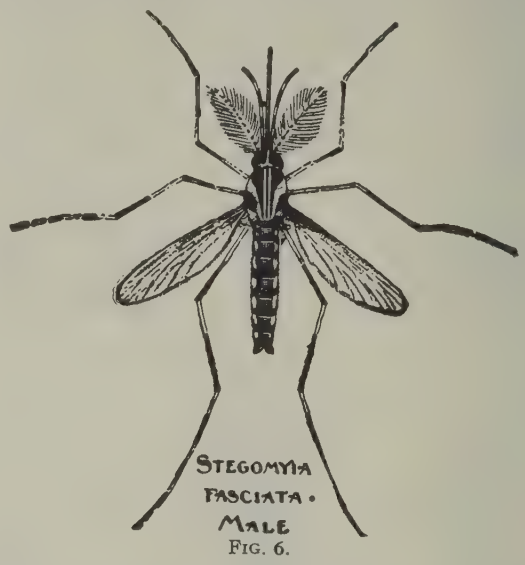

FIG. 6.

chitinous process situated near the breathing apertures along the sides of the insect and set in motion by respiration. This is the famous yellow fever mosquito, which has been the greatest and most persistent enemy the South has

FIG. 6 A

ever had, costing many thousands of lives and many millions of dollars, but which is at last, happily, conquered, if we but use the weapons that have been put in our hands by the patient searchers for truth in the field of science.

FIG. 7.

Mosquitoes cling to surfaces as a cat clings to the bark of a tree. A mosquito cannot rest on a perfectly smooth perpendicular surface; a

fly can. A fly's foot is a sucker; a mosquito's foot is a claw (Fig. 7). Mosquitoes resting upon window panes would seem to deny this, but a window pane, very shortly after a thorough cleaning, may collect enough moisture and dust to form a film over the glass sufficient, though invisible, to afford a firm hold for the insect.

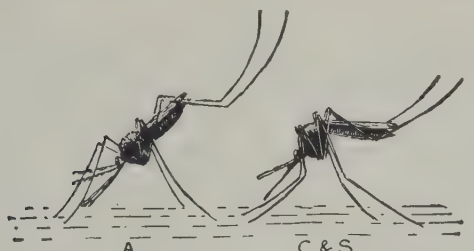

FIG. 8.

The resting position of *Anopheles* is peculiar in that the head, body and tail present a straight line, at an angle with the resting surface, while in the *Culex* and *Stegomyia* the body is bent as you observe in Fig. 8.

The eggs of *C. pungens* (Fig. 9), the gutter mosquito, are cone-shaped and float on end, being glued together in large masses to maintain this position in the water. The number deposited by a single mosquito varies from

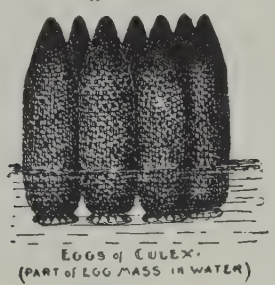

FIG. 9.

50 to 400, and they hatch in from one to three days, varying according to temperature and environment. When a sufficient time has elapsed to complete the hatching process, the larva (Fig. 10) or wiggle tail issues from the shell and begins to feed on the vegetable and animal matter contained in the water.

In its growth the larva sheds its skin several times before the pupal stage is reached — in

FIG. 10.

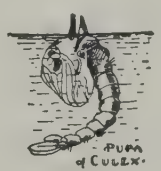

FIG. 11.

from 7 to 10 days. Mosquito wigglers get along apparently without air, when the surface of the water is covered with ice, and it is possible that they get air then, in the same way that fish do. This would account for their not being destroyed by surface freezing of the water. Entomologists must decide whether or not the larvæ have gills or some organ analogous to the gills of the fish. The wigglers of some mosquitoes may be frozen in ice and hibernate until liberated by warmer weather.

The pupal stage in mosquito life corresponds to that of the chrysalis in the transition of a caterpillar into a butterfly (Fig. 11). The pupa does not feed. In about two days it becomes an imago, which is the technical name for the completed insect whose life begins with the ovum or egg.

The shell of the pupa breaks at its highest point and the completed mosquito issues, being supported by the floating shell until its wings spread for flight (Fig. 12).

The kind of mosquito that issues from the shell of the pupa depends of course on the kind of egg which has been deposited and hatched in the water.

The life cycle of *Culex*, the gutter mosquito is from 10 to 15 days. Do not mistake the life

FIG. 12.

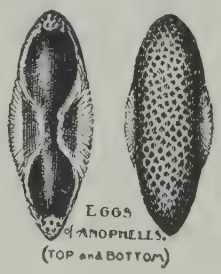

FIG. 13.

cycle for the length of life; mosquitoes may live as adult insects for many months, and some females must hibernate through the winter to furnish eggs for the next summer's supply.

Eggs of *Anopheles* (Fig. 13), the swamp mosquito, are boat-shaped and float singly on the surface of stagnant pools. They are deposited in numbers between 40 and 100. The bottom of the floating egg is marked somewhat like mosquito netting, the pattern being raised. The

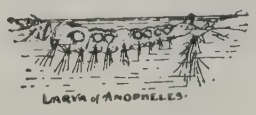

FIG. 14.

FIG. 15.

top of the egg is smooth, black in color and partly covered by a transparent membrane which stands out from the surface of the top and sides, permitting intervening spaces of air, which float the egg like a lifeboat. The egg hatches in from three to four days.

The larva of *Anopheles* (Fig. 14) may be readily distinguished by its position at the surface of the water, as well as by its general appearance, differing from that of either *Culex* or *Stegomyia*. You will observe that the neck of the *Anopheles* larva is very slender, and that the head is turned upon the body. This is because the *Anopheles* larva finds its food on the surface and gathers it by the constant motion of little broom-like processes projecting from the sides of the mouth, and furnished for this purpose.

The breathing tube, you will observe, projects from the back or upper surface of the larva, near the tail end. To get its mouth to the surface while maintaining its position for breathing, requires that the head should be turned half round on the body, an impossible position to any but the thin-necked *Anopheles* larva.

The larva becomes a pupa (Fig. 15) in about 12 days. In about five more days the pupa is a full-grown mosquito.

Eggs of *Stegomyia* (Fig. 16), the yellow fever mosquito, float singly upon the surface of the water and are deposited in numbers varying

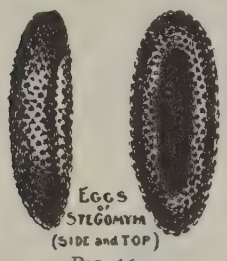

FIG. 16.

FIG. 17.

from 5 to 75. They hatch in from 10 hours to 3 days, according to climatic and other conditions. The shell is marked like mosquito netting, the white pattern being raised and somewhat similar to that of the *Anopheles* egg, and on the sides are air-chambers which float it.

The larva (Fig. 17) is very similar in appearance to that of the *Culex*, and its position in the water is also similar to *Culex* and unlike *Anopheles*.

In about six days the pupa (Fig. 18) develops and in a day or two the mosquito begins its flight.

The larvæ of all mosquitoes have a breathing-tube near the end of the tail and the pupæ have a pair of breathing-tubes projecting from the body near the head.

The insect, both in the larval and the pupal

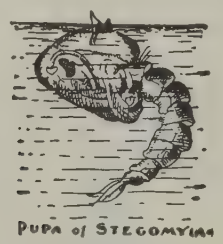

FIG. 18.

stage, requires air, to obtain which the breathing-tubes at frequent intervals protrude from the water surface into the air above.

The life cycle of the different mosquitoes varies, as to duration of the formative periods, according to conditions favoring rapid development; and no hard and fast rules can be laid down as absolute in this regard. It may be said, however, that the cistern mosquito breeds, approximately, in one week, the gutter mosquito in two weeks and the swamp mosquito in three weeks.

Observe how both the larvæ and the pupæ rise to the surface to breathe. This necessity suggested that they could be destroyed by pouring oil on the water surfaces so as to cut off the air. It is estimated that about two tablespoonsful of ordinary kerosene will spread and film the water surface of an average cistern, and the oil will positively not affect the taste or healthfulness of drinking-water. The placing of oil upon drinking-water for the destruction of mosquitoes is not a new idea, for it was suggested as early as 1812 and has been practised for many years.

How Mosquitoes Transmit Disease.

Mosquitoes and Malaria.— Malaria is one of the greatest scourges to which man is subject. Its cause is fully established to be a minute unicellular animal parasite or hæmosporidium of the class *Sporozoa* (q.v.), living within the red blood-corpuscles and introduced by the bite of a mosquito. Each well-marked variety of malaria has its especial causal parasite, which passes through a complicated life-cycle. (See MALARIA). The parasites enter the blood of the mosquito as minute slender sporozoites. When mature the sporozoites are freed into the body-cavity by the rupture of the wall of the sporocyst, when they migrate to the salivary glands, penetrate their walls and reach the proboscis through the salivary duct. When a mosquito harboring the parasites in this stage bites a susceptible human being, some of the spores pass into the blood with the saliva and induce an attack of malaria, mild or severe according to their number and other conditions. The malarial organism once introduced into the human system may continue to multiply indefinitely by the asexual method unless destroyed by drugs or some reaction of the organism, but that it can be transferred naturally to another person only through the intermediation of a mosquito and the intervention of the sexual generation. Properly speaking, man is the intermediate, the mosquito the final or definitive host, though the latter appears to suffer no ill consequences from the presence of the parasite. In pernicious tropical malaria, or æstivo-autumnal fever, the period for the complete development of the characteristic sporozoites (*Laverania malariæ*) in the mosquito is seven or eight days, but owing to the vast number of parasites of different broods present in the blood and their overlapping stages of development the exact time of schizogony is doubtful. Tertian and quartan fevers, the two best differentiated types of mild or benignant malarial fevers, are caused by related parasites known respectively as *Plasmodium vivax* and *P. malariæ*, which differ from *Laverania* chiefly in the replacement of the crescent stage by an immediately spherical gametocyte. Asexual sporulation recurs in the first form at intervals of 48 hours, and in the latter of 72 hours, corresponding with rhythm of the fever's paroxysms. Daily or other intermediate recurrences are due to double or triple infections, in which the different broods sporulate on alternate days or in other combinations.

It was not until 1880 that Laveran, a surgeon in the French army, discovered the amœbulæ in the blood of malarial patients in Algiers; the development of the sexual generation in the mosquito and its relation to Laveran's parasite were traced by Ross in 1897–98, while to the Italian zoologist Grassi is due the first clear demonstration of the effectiveness of preventive measures directed at the mosquito.

Our scientific knowledge of the subject was almost entirely created within the five years subsequent to 1898, and workers in many countries are constantly adding details. That several species of *Anopheles,* and especially *A. maculipennis,* are the chief, and so far as known the sole disseminators of all types of malarial fever, is absolutely and thoroughly demonstrated from every standpoint.

Mosquitoes and Yellow Fever.— In the case of yellow fever our knowledge is in a very different and less satisfactory state. The relation of mosquitoes to this disease was suspected by Dr. Finley as early as 1881, but his theory excited little interest until, upon the occupation of Cuba by the American navy, a Yellow Fever Commission of inquiry, headed by Major Reed, was appointed. By a series of very careful experiments it has been established that mosquitoes are agents in the dispersal of this disease, and at the same time the old view of infection by contact and the old practice of isolation and fumigation for prevention have been nearly repudiated. The particular species of mosquito which transmits yellow fever is *Stegomyia fasciata,* an especially fierce biter in the early afternoon, which is found in the tropical parts of both hemispheres, and in America as far north as Virginia.

The germs of the disease may be taken by the mosquito only during the first three or four days of the fever; after that time the blood of the patient cannot infect the mosquito. The germs require about 12 days to migrate from the stomach of the insect to the salivary glands, from which they may be injected through the mosquito's biting organ into the human blood stream. Mosquitos, after becoming infectious, are capable of inoculating the disease into the human at intervals of three days (period of feeding) for practically an indefinite time.

The adaptation of protective measures to this important discovery renders the prevention or suppression of an epidemic very simple, theoretically. Screening the patient from mosquitoes during the first four days of fever (before the diagnosis), or killing all mosquitoes in the room before the 12th day after their possible infection, will certainly prevent a second case.

Agency in Other Diseases.— Elephantiasis or filariasis, like malaria, results from the presence in the blood of an animal parasite, but one of a very different nature. The adult males and females of the *Filaria,* which is a slender nematode worm, live together in the subcutaneous lymph vessels and produce enormous numbers of living, minute embryos which swarm in the blood, usually passing into the superficial capillaries at night and retreating to the deeper vessels by day. This peculiarity first led Manson to suspect the mosquito as a means of distribution and as a result of his studies and those of Bancroft and others on the *Filariæ* of man and the dog, it is now known that when infected blood is swallowed by *Culex fatigans* and other mosquitoes the embryos pass through certain stages of development within the intestine and malpighian tubules and then migrate through the body-cavity and tissues to the proboscis, from which human infection occurs. About three weeks are required to complete the development within the mosquito, and a year before the worms become sexually mature in the final host. Elephantiasis is a dreadful and prevalent disease in tropical countries, and is frequent in the Southern States, but rare in temperate climates.

The mosquito is suspected of being instrumental in the spread of leprosy and other diseases, and undoubtedly many important discoveries await the investigator in this field.

Restraining Local Pests of Mosquitoes.— The possibility of the control or complete extermination of mosquitoes has received serious attention from zoologists, physicians and sanitary engineers, and is encouraged by local and national governmental grants. Wherever the problems have been carefully considered, as in New Jersey, Long Island, the Connecticut coast and Winchester, Va., in this country, much has been already accomplished toward the mitigation of the pest. As to measures, the complete destruction of all breeding places by the draining of swamps, pools and ditches is the most effective and permanent. This must be supplemented by emptying or suitably protecting by screening against the access of gravid mosquitoes all artificial vessels, such as pails, rain barrels, cisterns, privies and drains, which contain standing water in which mosquitoes may breed. A most effective and simple measure for local application is to pour a small quantity of kerosene upon the surface of the water of possible breeding-places. This spreads as a delicate film which deters the larvæ and pupæ from coming to the surface to breathe, so that they quickly suffocate, and at the same time kills or drives off females which come to lay their eggs. The application should be repeated at intervals of two or three weeks. Small fishes and the other natural enemies named above may be introduced into breeding-places to good purpose. The usual methods of ridding houses of mosquitoes by fumigation with sulphur dioxide gas; of preventing their entrance by thorough screening; and of protecting the person by the application to the skin of oil of citronella and other substances have a certain protective value. The most approved application is a mixture of one ounce each of oil of citronella and spirits of camphor with half an ounce of oil of cedar. The effect will last longer if incorporated with vaseline. It has been shown by the experiments of Grassi and others that this method alone is sufficient to grant immunity from malaria to inhabitants even of such fever-scourged districts as the Campagna of Rome. For the medical treatment of malaria we have a powerful specific in quinine, which is most effective at the time of the paroxysms, when the sporulæ are free in the blood plasma and most susceptible to the action of the drug. See MALARIA.

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MOSQUITO COAST or **MOSQUITIA,** mŭs-kē'tĭ-ȧ, region, Central America, on Caribbean coast, in Colon Department of Honduras and Zelaya Department of Nicaragua, on the east coast. The demarcation line is a cause of dispute between the two Central American countries. About 40 miles wide, bounded by the San Juan River on the south and the Aguan River on the north, the region is largely undeveloped, inhabited mainly by Mosquito Indians, but it contains valuable hardwood, and some stockraising and growing of tropical fruits is carried on.

From 1655–1860 the coast was held by the British. In the 17th century buccaneers issued out from the coast to prey on Spanish shipping. In 1848 the British claimed San Juan del Norte, but the Clayton-Bulwer Treaty (1850, q.v.) checked any claim to Nicaraguan territory by either Great Britain or the United States. The British had also held a protectorate over the Mosquito Indians.

When the coast was ceded to the two countries in 1860, Nicaragua formed an Indian reserve, but after an insurrection in 1894, José Santos Zelaya incorporated the strip as Zelaya Department, and gave the Indians full citizenship rights.

MOSS, Frank, American lawyer: b. Cold Spring, N. Y., March 16, 1860; d. New York, N. Y., June 5, 1920. After studying at the College of the City of New York, Moss was admitted to the New York bar at the age of 21. The Society for the Prevention of Crime retained him as counsel in 1887, and made him a member of its executive board in 1892. He was chosen president of the board of police commissioners in 1897, and served as counsel of the Lexow Investigating Committee in 1897, and the Mazet Investigating Committee in 1899. As assistant district attorney (1909–1914) he was associated with the prosecution of Lieut. Charles Becker for the murder of gambler Herman Rosenthal. He was the author of *The American Metropolis,* 3 vols. (1897).

MOSS, John Calvin, American photoengraver: b. Washington County, Pa., Jan. 5, 1838; d. New York, N. Y., April 8, 1892. An early interest in daguerreotypes led Moss to experiment in engraving by means of photographs. With the help of his wife, Mary Bryant Moss, he established the Photoengraving Company in New York City in 1872, and when he achieved success, set up a larger company, the Moss Engraving Company. Here he trained engravers who became world-famous, and although his methods were later supplanted, he was the first successful commercial photoengraver.

MOSS PINK. See PHLOX.

MOSS TROOPERS, in English history, bands of Royalist supporters (also known as Tories), who, after the Ordinance of Union with England was proclaimed in 1654, attacked Cromwell supporters all over the border between the two countries. They were finally reduced by George Monk (q.v.).

MOSSADEGH, mō-sä-dĕg', **Mohammed,** Iranian statesman: b. Teheran, ?1880. After serving in the Iranian Finance Ministry from 1896 to 1906 he went to Paris to attend the École des Sciences Politiques, then studied law at the universities of Liége and Neuchâtel. Returning home, he became undersecretary of finance (1917); minister of justice (1920), and later the same year governor general of Farsistan. A member of the Majlis which elected Riza Pahlevi hereditary shah in 1925, he subsequently lost royal favor, and was twice imprisoned. Released in 1941, he was elected a deputy to the Majlis in 1944. After the assassination of Premier Ali Razmara in 1951 and resignation of his successor Hussein Ala, Mossadegh, leader of the National Front Party, became premier on April 29, 1951, the day after the Majlis unanimously adopted a bill nationalizing the country's oil resources and expropriating without compensation the Anglo-Iranian Oil Company properties. Operation of the vast oilfields and refineries came to a standstill. After protracted negotiations, a settlement failed. Mossadegh went to the United States to make a personal appeal for financial aid, but President Eisenhower rejected his request. Financial difficulties finally led to his downfall. In August 1953 the shah dismissed Mossadegh, naming Gen. Fazollah Zahedi as premier. When Mossadegh ignored the order, the shah left the country, and royalist troops led by Zahedi seized the power. Mossadegh was sent to prison, tried for treason, and sentenced to three years' imprisonment.

MOSSES, a class, Musci, together with the liverworts, Hepaticae, constituting the Bryophyta, one of the five large groups of land plants. Mosses are worldwide in distribution, and in general inhabit the less favorable areas of this earth. Thus *Andreaea* grows on exposed rocks from the Arctic to the Antarctic; in the tropics on high mountains. Other common rock-inhabiting forms are species of *Ulota, Orthotrichum, Grimmia* and *Hedwigia.* These, with the lichens, initiate succession on stones, and so prepare the way for other plants. In contrast are those mosses which live in the water of running streams, such as *Hygrohypnum dilatatum, Eurhynchium rusciforme,* and especially the conspicuous water mosses in the genus *Fontinalis.* The bog moss, *Sphagnum,* is the pioneer in acid bog succession, although it is often associated with other genera such as *Hypnum.* Still others flourish in swamps, like *Dichelyma* and the tree moss *Climacium,* which is suggestive of ground pine or a cedar tree in miniature. Many mosses, such as species of *Mnium,* form soft green carpets along the shaded banks of streams. Among the most attractive and showiest of all temperate representatives are the mountain fern moss, *Hylocomium splendens,* which forms spreading mats on rocks and decaying logs in mountainous areas and ravines, sometimes glistening in the mist of waterfalls; the common fern moss, *Thuidium delicatulum,* of rich woodlands, its finely branched stems suggestive of delicate fern leaves; and the plume moss, *Ptilium crista-castrensis,* of which the branches, covered with

minute, yellowish-green leaves, form feathery tufts in the cool, moist mountains of Europe, Asia, and North America. Wrapped around the bases of tree trunks the common thelia, *Thelia hirtella,* is often seen. Some species of the conspicuous hair-cap moss, *Polytrichum,* grow in damp places, such as *P. commune,* which may be over a foot high; others, like *P. piliferum,* prefer sandy habitats. Both of these occur across the Northern Hemisphere, and they are abundant in the Southern as well. Nestled in the cracks of city streets, the gray-green plants of the cosmopolitan silvery bryum, *Bryum argenteum,* may occasionally be found. Some mosses characteristically form cushions or tufts, such as the white or pincushion moss, *Leucobryum glaucum,* the widespread broom moss, *Dicranum scoparium,* and its smaller relative, *Dicranella heteromalla;* both of the latter have the leaves facing in one direction, as if brushed. *Nanomitrium,* with stems about one-tenth of a millimeter in height, and *Ephemerum,* about one millimeter high, grow on moist soil, clay and mud, and are among the smallest mosses. The twisted-stalk or cord moss, *Funaria hygrometrica,* and *Ceratodon purpureus,* both of wide distribution, grow on charred wood and bare soil, and then, like birds of passage, disappear when conditions change. Lastly there are *Splachnum,* found especially on the dung of cows, and the modest luminous moss, *Schistostega pennata,* which grows in dim caves in Europe and North America, and by focusing the light upon its chloroplasts, glows like emeralds in twilight. For structure and reproduction of mosses see also PLANTS AND PLANT SCIENCE —*1. Classification.*

EDWIN B. MATZKE.

MOSSES FROM AN OLD MANSE, title of Nathaniel Hawthorne's second collection of tales and sketches (1846). The Old Manse, Hawthorne's Concord home, is described in the opening chapter of the book. The remaining contents include many of Hawthorne's most famous short sketches, such as *The Birth-Mark, Roger Malvin's Burial,* and *The Artist of the Beautiful.* These bear witness to his love of the mysterious and the unusual; and their action passes in a world of unreality, which the genius of the author makes more visible than the world of sense.

MOSSLEY, môs'lĭ, municipal borough, England, in Lancashire, on the Tame River and the Huddersfield Canal. It contains woolen factories and foundries and has among its public buildings a modern Gothic church and a handsome town hall. Pop. (1951) 10,415.

MOSSORO, mo͞o-so͞o-rô', city, Brazil, in the state of Rio Grande do Norte, 150 miles west-northwest of Natal, on the Apodi River. It is a saltworking center, and a livestock and cotton market. Gypsum and marble quarries and manganese deposits are in the vicinity. Pop. (1950) 20,576.

MOST, mōst, **Johann Joseph,** German-American anarchist: b. Augsburg, Bavaria, Feb. 5, 1846; d. Cincinnati, Ohio, March 17, 1906. After working as a bookbinder, he became editor of the *Freie Presse* at Berlin, and in 1874–1878 was a member of the Reichstag for Chemnitz. Expelled from Germany, he went to London, where he founded *Die Freiheit,* an anarchist paper. In 1881 he was imprisoned for printing an article approving of the assassination of the Emperor Alexander II of Russia. Upon his release he came to the United States, and continued *Die Freiheit* in New York. In 1901 he was imprisoned for a seditious editorial on the assassination of President William McKinley.

MOST, môst (Ger. BRUX), city, Czechoslovakia, Province of Bohemia, about 48 miles northwest of Prague, to which it pipes gas from its extensive lignite fields. It is important as a mining, metallurgical, and chemical center, manufactures porcelain, and is a rail junction.

In 1938 it was claimed by Germany as part of the Sudetenland, but after World War II it was returned to the Czechs. During the war the city was badly bombed because of the nearby synthetic fuel plant. Some of its ancient churches survived. Since 1948 its industries have been controlled by the Czechoslovak People's Republic. Pop. (1948) 35,330, including suburbs.

MOSTAGANEM, môs-tà-gà-nĕm', city, Algeria, in the Department of Oran, located on the Gulf of Arzew, and on a branch of the Oran-Algiers Railway. It is situated on a steep cliff 280 feet above the Mediterranean Sea and has a deep-water harbor. The city exports wine, wool, cattle, grain, and figs. It was built on the ruins of an important city of the old Roman period and flourished in the 16th century under the Berbers, but lost its importance until the French in 1833 captured the site and built up its industries. Pop. (1948) 50,403.

MOSTAR, mō'stär, city, Bosnia and Hercegovina, Yugoslavia, former capital of Hercegovina, picturesquely situated along the cliffs in the narrow valley of the Neretva River. It is connected by rail with Sarajevo. Its industries are coal mining, aluminum and tobacco manufacture, and wine culture. It is the seat of a Roman Catholic and a Greek Orthodox bishop. Pop. (1953) 31,608.

MOSUL, mô-so͞ol', city, Iraq, capital of a province of the same name, on the west bank of the Tigris River, 220 miles north-northwest of Baghdad, and on the railroad connecting Baghdad with Syria and Turkey. Across the river is the site of ancient Nineveh, and 16 miles away is Tepe Gawra, the site of other important archaeological finds.

Mosul is an ancient Arabic town, captured by the Moslems in 636 and annexed to the Ottoman Empire in 1638. It was a place of great commercial importance on the caravan route from Persia and a cotton manufacturing center; muslin cloth was named after it. After the breakup of the Ottoman Empire, it was awarded to Iraq by the League of Nations in 1925, and has come into prominence again as a center of the oil industry in Iraq. Pop. (1947) city, 203,273; province, 601,589.

MOSZKOWSKI, môsh-kôf'skē, **Moritz,** Polish composer and pianist: b. Breslau, Germany, Aug. 23, 1854; d. Paris, France, March 9, 1925. After studying at Dresden and Berlin, he began to appear in public at the age of 19, and his success was immediate. He was a talented composer as well as performer; his opera *Boabdil* was presented at Berlin in

1892; his other works include a ballet, *Laurin;* a symphonic poem, *Jeanne d'Arc;* some *Danses espagnoles* for the piano or violin; and the two orchestral series called *Les Nations.*

MOTA-PADILLA, mō'tä pä-dēl'yä, **Matias de la,** Mexican historian: b. Guadalajara, Mexico, 1688; d. 1766. He was a lawyer, and during the latter part of his life a priest. He wrote, among other works, *History of the Conquest of New Galicia* (1870–71).

MOTET, or **MOTETT,** a vocal composition in harmony, set to words generally selected from sacred writings. Like the madrigal, the motet was at first set to words of a profane character, and there are ecclesiastical decrees extant forbidding its use in church.

MOTH, an insect of the order Lepidoptera, in which the wings (and usually other parts of the body) are mostly clothed with scales, which provide the various color patterns. In butterflies, the antennae (feelers) are usually conspicuously enlarged toward the end, and are therefore "clubbed." In moths, the antennae are of varied form, but usually tapering, very rarely swollen toward the tip, frequently feathered or pectinate. When at rest, most moths hold the wings roof-like over the abdomen, but many kinds have folding wings; a few hold them at right angles to the body, while butterflies "sleep" with their wings held closely together over the abdomen. The skippers (butterflies) have the habit of drooping the hind wings while the front wings are parallel or close together. The color of the scales in butterflies is mostly due to the refraction of light, whereas in moths it is mostly owing to pigment; for this reason, the colors of moths fade much more rapidly when they are exposed to light. Another difference lies in the fact that almost all butterflies are diurnal, while the vast majority of moths are nocturnal. Those that fly in the daytime are usually brightly colored, but a small number are dull and unattractive.

Size.—Moths vary in size from tiny nepticulids, with a wing expanse little over one-eighth of an inch, to the giant Atlas moth, in some forms of which the expanse exceeds 10 inches. The majority of moths are small, with a wing expanse of less than one and one-half inches, but it is the larger ones that engage our attention. Most moths are attracted to light, and many of these seem to be dazed by it and fly around aimlessly. This is particularly true of the noctuids or cutworm moths, and has earned for them the name "millers." However, the term is applied to other moths of similar size and habits.

Eggs.—Eggs of moths are generally more or less spherical or oval but there still is great diversity of form: many kinds are flattened on one end and there may be depressions, rings, or tubercles. The eggs may be laid singly, in rough masses or in a regular pattern, and they may have only the protection offered by the shell itself; or they may be covered with a coating secreted by the mother. Sometimes this coating, as in the case of the white marked tussock moth, may consist of a white froth, while, in the well-marked tussock moth, it is composed of hairs held in place by body secretions. The adults of the tent caterpillars lay their eggs about small twigs and cover them with a shellaclike substance to protect them during the winter. Most moths deposit their eggs on the plant upon which the larvae (caterpillars) are to feed, but there are some, such as the gypsy moth (q.v.) that lay them in masses without apparent consideration for the welfare of their offspring: in stone walls, tin cans, or under projecting objects; in fact, anywhere that the moth may find herself at the time that the egg-laying urge comes upon her. Moths with such habits are usually very prolific, and the fact that such insects are successful in their struggle for existence is well exemplified by the destructiveness of this moth in American forests, where natural enemies are few in number. The females of the Psychidae (bagworms) are wingless and never leave the case which they build when young and enlarge as they grow The males mate with the imprisoned female, the eggs are laid, and she shrivels and dies. The newly hatched larvae leave the case and go in search of food, building a case soon after birth.

Larvae.—The larvae, or caterpillars, of moths all conform to the same general pattern, yet they may be greatly modified to fit the varied conditions under which they live. All caterpillars have three pairs of true legs situated on the thorax (the first three segments behind the head), and in general, most of them possess five pairs of prolegs, or stump legs. The three pairs of legs are used both for locomotion and for holding the food and directing it to the mouth; the prolegs are used for locomotion and holding the body in position while the caterpillar eats or rests, or resists attempts of enemies to dislodge it. The number of prolegs may be reduced. In some forms, there are four, three, or two pairs, the more anterior pairs being absent. In the geometrids, or measuring worms, only the two posterior pairs remain, and the caterpillar moves about with a deliberate, hunching motion in which the rear part of the body is carried forward until it almost meets the anchored true legs, then the body is stretched forward to full length, and the process repeated. Because of this habit, the caterpillars are called measuring worms, or inch worms, and many people believe that these caterpillars are just an inch in length. Other caterpillars have acquired rather similar habits, but none of them have developed to quite the stage of perfection attained by the geometrid larvae. Some noctuid larvae are loopers, the most notable being the cabbage looper, a serious pest of that plant.

The larvae of moths have developed various means of protection against their innumerable enemies. Some geometrid larvae cover themselves with bits of leaves, while others attach themselves to twigs or leaves with their prolegs and maintain a rigid position, themselves resembling tiny twigs. They also have the habit of dropping on a silken thread when suddenly disturbed, climbing back to the food plant when the danger is past. Others build communal silken tents in which they rest, coming out to feed, while other kinds feed within the nest, enlarging it as the food supply dwindles. Some cutworms hide in the soil during the day and feed at night. Other caterpillars conceal themselves in the crevices of bark or under debris, while still others, like the horned devil, are provided with horns or projections of various types. They may also resemble bird droppings, or have markings of a nature that blend with the background on which they live. Some hawk moth larvae have mark-

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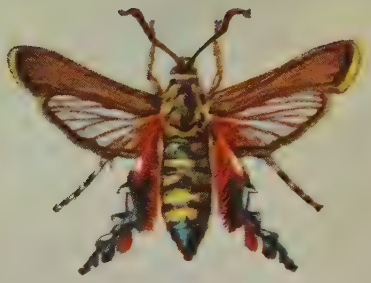


2.

MELITTIA LINDSEYI

3.

SYNTOMEIDA EPILAIS
V JUCUNDISSIMA

4.

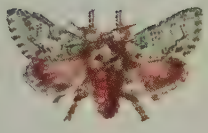
MALACOSOMA AMERICANA

5.

AMPELOECA VERSICOLOR

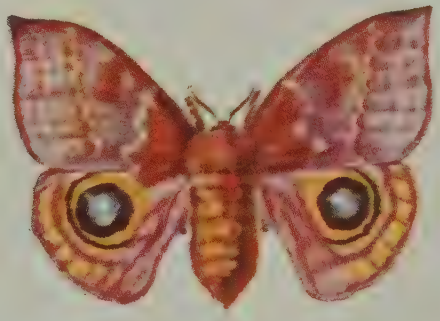
6.

UTETHEISA BELLA



7.

FERALIA JOCOSA

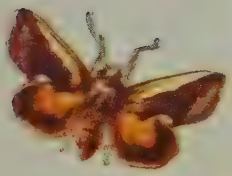


8.

AUTOMERIS IO ♀

9.

EUCLEA CHLORIS



10.

GONODONTA NUTRIX

11.

CATOCALA CARA

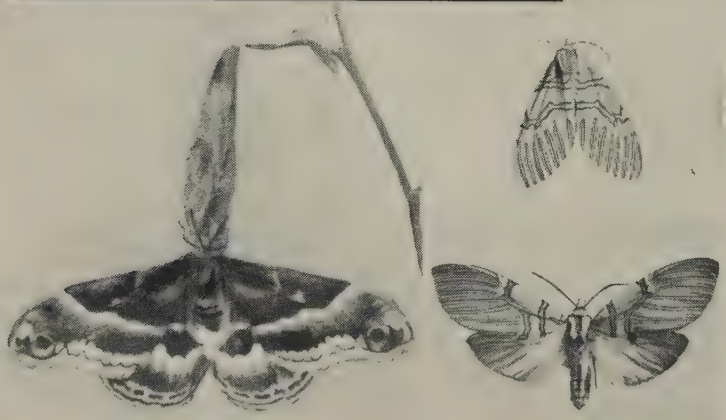
12.

BREPHOS INFANS

ALMA W. FRODERSTROM.

MOTHS: (1) *Portethria dispar*, the gypsy moth. (2) *Melittia lindseyi*, a clear-wing moth. (3) *Syntomeida epilais* var. *jucundissima*, the polka-dot wasp moth. (4) *Malacosoma Americana*, the tent-caterpillar moth. (5) *Ampeloeca versicolor*, a hawk moth. (6) *Utetheisa bella*, the bella moth. (7) *Feralia jocosa*, a noctuidior owlet moth. (8) *Automeris io*, the io moth. (9) *Euclea chloris*, a slug caterpillar moth. (10) *Gonodonta nutrix*, a noctuid or owlet moth. (11) *Catocala cara*, red underwing moth. (12) *Brephos infans*, the infant, one of the geometridae or measuring worms.

MOTHS



1. Typical clothes moth of the family Tinerdae, female and eggs. 2. Cecropia moth, *Samia cecropia*, an American silkworm moth. 3. The *Rhyescyntis*, a large tropical American silkworm moth of the family Saturniidae. 4. The *Heliconisa*, a tropical American moth of the family Saturniidae. Note the transparency of the wings. 5. Imperial moth, *Basilana imperialis*, a large brown and yellow American species. 6. The long-tailed *Copiopterys* moth, of the family Saturniidae, found in tropical America. 7. Promethea moth, *Callosamia promethea*, a large brown-winged American silkworm moth and its cocoon. 8. The hickory tiger moth, *Halisidota caryae*, resting (top) and in flight (bottom).

Illustrations are numbered from left to right, top to bottom

Photographs courtesy of The American Museum of Natural History, N.Y.

ings in front so that they resemble the head of a snake when they assume a certain position. Many others are clothed with poisonous spines or barbed, poisonous hairs. The leaf rollers form cylinders in which to live, while the case-bearers and bagworms build protective coverings. Others mine in leaves or bore into plants.

Pupae.—The pupae are cylindrical, elongate, rounded in front and tapering behind, and show few conspicuous modifications. The pupa may be naked, in a cell in the soil, or may be enclosed in a silken cocoon. The cocoon may be flimsy or of great strength; sometimes it consists of the caterpillar's hairs, held together by silken strands or particles of leaves or debris. In the case of leaf rollers, more silken strands are added to hold the pupa in the rolled leaf. Most pupae are incapable of locomotion, but those of borers (for example, aegeriids and cossids, etc.) work their way to the exit and project from it, as do those of many others that live in concealed places.

Flight.—There is a great difference in the flight of adult moths. The hawk moths are streamlined and very fast flyers, being able to hover in front of flowers while they feed upon the nectar, and they are able to move backwards. The noctuids are practically all strong flyers, but most of the large moths (Cecropia, Polyphemus) and many smaller ones have an undulating flight; the hepialids are very poor fliers. While the females of many moths are wingless, and can only crawl from place to place, the females of some others (for example, the silkworm and the gypsy moth) have wings but are unable to fly.

Beneficial and Injurious Moths.—Many moths are serious pests, but there are a few that are beneficial. The best known of these is the silkworm, *Bombyx mori,* the chief source of commercial silk. Some of its relatives also produce silk, but it is of poorer quality, as is the silk of the Saturniidae. The larvae of some moths are used as food by primitive peoples, and the larvae of the pandora moth, *Coloradia pandora,* a saturniid, feeding on pine in our western mountains, were an important article of diet to Indians of the region. Man has, in a few instances, been able to utilize moths in the destruction of pest plants, a fine example being the introduction of *Cactoblastis cactorum,* into Australia for the control of *Opuntia* cactus. A similar effort in South Africa has proved less successful because some native parasites destroy the larvae. And in the destruction of weeds and unwanted plants, the larvae of many moths are of considerable value.

It is impossible to mention more than a few of the more important pests. Among these are the cigar case-bearer, and the pistol case-bearer, members of the family Coleophoridae, and the leaf miners of the families Gracilariidae and Lyonetiidae, the adults being very small moths. The Tineidae contains the clothes moths, which are so destructive to articles made from wool, fur, and other animal matter. The clearwing moths (Aegeriidae) are all borers in herbaceous and woody plants; the peach borer, currant borer, and squash borer do enormous damage. The Gelecheiidae contain such serious pests as the Angoumois grain moth, the peach twig borer, the potato-tuber moth, and the pink bollworm, a pest of cotton in most places where it is grown. The Oriental peach moth, the pea moth, strawberry leaf folder, grape-berry moth, bud moth, the spruce budworm, fruit-tree leaf roller, and the orange tortrix are members of the Tortricidae (including the Olethreutidae). Many of our most serious agricultural pests belong to the family Pyralidae, now divided into eight families or subfamilies. Some of these are: the European corn borer, the melon worm, the celery leaftier, the meal moth, which feeds on damaged cereals and other seeds; the Oriental rice borer and the sugarcane borer. The larvae of the wax moth and lesser wax moth feed on wax, even in hives containing bees, and often cause serious damage. The worst pests of such things as cereals, flour, nuts, dried fruits, are the Indian-meal moth (*Plodia interpunctella*) and the several species of *Ephestia,* including the Mediterranean flour moth. The best known of the slug moths are the saddleback caterpillar (*Sibine stimulea*), the larvae of which possess stinging hairs. The Noctuidae contain the cutworms and armyworms, as well as many other pests; many of the tiger moths (Arctiidae) are pests of cultivated crops and trees, many being general feeders. The species of *Datana* of the family Notodontidae, and several relatives, are gregarious and frequently injurious; the Lymantriidae contain such injurious forms as the gypsy moth, brown-tail moth, satin moth, and the tussock moths. Several of the Sphingidae (hawk moths) are injurious, the chief offenders being the tomato and tobacco hawk moths, and several species feeding on grapes and apples. The tent caterpillars, of the genus *Malacosoma,* are often destructive to orchard and forest trees in America, while the lackey moth is destructive in Europe; also members of the same family (Lasiocampidae) are the Syrian silkworm and the bibindandy of Madagascar, both important in the silk industry in the regions in which they occur. The io moth (*Automeris io*) is the only giant silkworm in North America that is rather consistently a pest: this occurs chiefly when it feeds on corn, and its stinging spines cause irritation and a nettlelike rash; The Cecropia and Promethea rarely cause serious defoliation of trees or shrubs. See also separate articles on the various families, individual moths, and pests.

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An Introduction to Entomology (Ithaca 1940); Essig, E. O., *College Entomology* (New York 1942); Herms, W. B., *Medical Entomology* (New York 1943); Matheson, R., *Entomology for Introductory Courses* (Ithaca 1944).

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MOTH, Brown-tail (*Nygmia phaeorrhoea*), probably introduced from Europe on nursery stock in the early 1890's, and first discovered in New England in 1897. It has been frequently intercepted on nursery stock since that time, and became established in various sections of New England and the Maritime provinces of Canada. Spraying with arsenicals and the systematic destruction of the "nests" in which the larvae spend the winter, has very greatly reduced its numbers or exterminated it. The adult is pure white with a wing expanse of about 1½ inches, and the broad tip of the abdomen golden brown. Both the adults and larvae are of medical importance because the bodies of both bear minute, barbed poisonous hairs which cause uticaria (brown-tail rash) when they come in contact with the skin. When the moths are numerous, the air-borne hairs cause internal irritation when inhaled. Some related moths are the tussock moths, the gypsy moth (*Liparis dispar*), and the satin moth (*Stilpnotia salicis*), the latter two also of European origin.

MOTH, Gypsy, or Gipsy. See GIPSY-MOTH.

MOTH, Leopard. See LEOPARD MOTH.

MOTHER ANN. See SHAKERS.

MOTHER CAREY'S CHICKEN, any of several small oceanic petrels (q.v.); specifically, in the Mediterranean and Atlantic, the storm-petrel (*Procellaria pelagica*) often seen about ships, especially in wild weather, and looked upon with superstitious dread by sailors. Its manner of paddling along the surface of the waves suggested the name petrel, namely, little Peter (the Apostle), afterward transferred to the whole group; and the "Mother Carey" is supposed to be a queer Anglicization of the Latin *Mater Cara* ("Dear Mother," an appellation of the Virgin). These little petrels are about six inches long, sooty black, with white rumps and a little white on the wings. They breed numerously on all northern coasts, as about Newfoundland, Labrador, North Greenland and the British Isles, wherever suitable places can be found, occupying holes in the face of earth banks, like bank-swallows, and rarely approaching or leaving their nests, each with a single white egg, except at night.

MOTHER OF CITIES, the euphemistic local title for Balkh (q.v.), central Asia.

MOTHER GOOSE'S MELODIES, the well-known collection of nursery rhymes. In 1860 a story was started to the effect that Mother Goose was a Boston woman; and she was identified as Elizabeth Goose, widow of Isaac Vergoose, or Goose, and mother-in-law of Thomas Fleet, a Boston printer, who issued a collection of the *Melodies* in 1719. It is now conceded that *Mother Goose* belongs to French folklore and not to English tradition. Charles Perrault (q.v.), b. Paris, 1628, was the first person to collect, reduce to writing and publish the *Contes de Ma Mère l'Oye,* or *Tales of Mother Goose,* though he did not originate the name; and there is no reason to think that "Mother Goose" was a term ever used in English literature until it was translated from the French equivalent, "Mère l'Oye."

MOTHER-OF-PEARL. Inner coating of shells of many bivalve mollusks, including pearl oysters. It possesses some resemblance to pearls, and has much the same composition. On account of its beautiful iridescence and high polish, mother-of-pearl is largely used in thin sheets to decorate articles of ornament and minor pieces of jewelry. See PEARL.

MOTHER OF PRESIDENTS, in American history, a name given to Virginia because that state has given eight chief executives to the Union, namely: Washington, Jefferson, Madison, Monroe, Harrison, Taylor, Tyler and Wilson.

MOTHER OF STATES. In American history, a name given to Virginia on three counts. First, and most commonly accepted, from the fact that out of the original colony of Virginia as admitted to the Union, there were formed eight other states, Illinois, Indiana, Kentucky, Michigan, Minnesota, Ohio, West Virginia and Wisconsin; second, from Virginia's being the eldest of the 13 colonies; and, third, the early use of the name "Virginia" as embracing England's American territory from Spain's holdings in the south, to those of France in the north, thus making the colony the mother of all the states of the original union, as well as the eight new states already named.

MOTHER'S DAY. The honor of the origination of Mother's Day belongs to Miss Anna Jarvis of Philadelphia. Her mother died in 1906. On Sunday, May 9, 1907, she told a friend whom she had invited to remember with her the anniversary of the death of her mother of her desire to dedicate a day to all mothers. Before the next anniversary came she had interested many individuals and organizations in the observance of the second Sunday in May as Mother's Day. As a result of her efforts, Philadelphia observed the day, May 10, 1908. Miss Jarvis then became the missionary of the idea. She wrote thousands of letters to influential men in all walks of life. She interviewed many public men and pleaded for the observance of the day. Since 1912 the governor of Texas has observed the day by pardoning a number of prisoners on that day. State after state has adopted its observance. In May 1913 Pennsylvania made it a state holiday. On May 10, 1913 a resolution passed the Senate and the House of Representatives to make the second Sunday in May a national holiday, "dedicated to the memory of the best mother in the world, your mother."

By 1911 the observance of Mother's Day had spread to Latin America and the Orient. It is now customary for sons and daughters to wear a pink carnation if their mothers are living, and white if their mothers are dead.

MOTHERWELL, mŭth'ĕr-wĕl, **William,** Scottish poet, journalist, and antiquary: b. Glasgow, Scotland, Oct. 13, 1797; d. there, Nov. 1, 1835. The son of an ironmonger, he went to school in Edinburgh and Paisley, and studied briefly at Glasgow University (1818–1819). While he was sheriff-clerk depute of Renfrewshire (1819–1829), he began collecting ballads. He published collections of songs entitled *The Harp of Renfrewshire* (1819) and *Minstrelsy, Ancient and Modern* (1827), and he collaborated with James Hogg on an edition of Robert Burns' works (1834–1835). His own work includes a collection called *Poems, Narrative and Lyrical* (1832), the most famous of which is *Jeanie Morrison,* a ballad he had sketched at the age of 14. He was editor of the Paisley *Advertiser* (1828–1830) and of the Glasgow *Courier* from 1830.

MOTHERWELL AND WISHAW, wĭsh'ô, burgh, Scotland, located in Lanark County, 11 miles east-southeast of Glasgow. The name "Motherwell" derives from a spring, which in the pre-Reformation era was dedicated to the Virgin Mary and called the Well of our Lady, or Mother's Well. Chief industries include coal mining, iron and steel works, and the manufacturing of heavy machinery and railroad equipment. Motherwell and Wishaw were combined into one burgh in 1920. Pop. (1951) 68,137.

MOTHERWORT, mŭth'ĕr-wûrt, a genus (*Leonurus*) of the mint family (Labiatae). There are about 10 Eurasian species of this plant, three of which have been introduced into North America from Europe. The most common species is *L. cardiaca,* a perennial with a rigid stem up to five feet tall, and pink or white flowers in dense axillary whorls. The upper lip of the corolla is shaggy; the calyx has stiff teeth; and the long-petioled leaves are opposite each other and 3–5 cleft. It was formerly cultivated for alleged medicinal properties, but now it is generally found in waste places.

MOTIF. See LEITMOTIV.

MOTION, mō'shŭn, in legal practice, the written or oral application to a judge or court by a party seeking a ruling in his favor. If the object of the motion may be granted on request and without a hearing, it is a *motion of course,* such as an *ex parte* application. If the applicant is required to notify his adversary, however, it is a *motion on notice.* A motion made on a matter of fact has to be supported by an affidavit that such facts are true. There are also motions *for decree* and *for judgment.*

MOTION, in music, a change of pitch in successive notes either within a single "voice" or part, or between two or more voices considered relative to one another. With respect to the melodic progression of a single voice, *conjunct motion* proceeds by single degrees of the scale, and *disjunct motion* proceeds by leaps of more than a single degree. Several distinctions are made with respect to more than one voice: in *similar motion* the two parts move in the same direction by different intervals; in *parallel motion* they move in the same direction by the same intervals; in *contrary motion* they move in opposite directions; in *oblique motion* one remains stationary while the other moves away from it; and in *mixed motion* several voices move simultaneously in two of these types of motion.

MOTION, in physics. See MECHANICS; RELATIVITY.

MOTION PICTURES. See MOVING PICTURES.

MOTLEY, mŏt'lĭ, **John Lothrop,** American diplomat and historian: b. Dorchester, Mass., April 15, 1814; d. Frampton Court, near Dorchester, England, May 29, 1877. Descended from an old New England family of merchants and clergymen, he graduated from Harvard in 1831 and then attended the universities of Göttingen and Berlin for two years. Returning to Boston, he studied law and dabbled in literature until 1841. In that year he was sent to St. Petersburg (now Leningrad), Russia, as secretary of legation, but after a few months left that position and returned to the United States. His first piece of historical writing—perhaps suggested by his Russian trip—was a long article, nominally a review but really a narrative, on Peter the Great (*North American Review,* October 1845). Soon after this publication he planned to study the history of the Netherlands, and William H. Prescott, then at work on his *History of Philip II,* encouraged him. From 1851 until 1856, Motley did research in Berlin, Dresden, Brussels, and The Hague, and in 1856 *The Rise of the Dutch Republic* was published in three volumes, at the author's expense. Although the reviews of the history were not all favorable, it quickly gained immense popularity, and was subsequently translated into Dutch, French, German, and Russian.

After spending 1856–1857 in the United States, Motley returned to Europe to continue his history of the Netherlands. The *History of the United Netherlands . . .,* covering the late 16th and the 17th centuries, appeared in four volumes, the first two published in 1860, and the last two in 1867. In the intervening years Motley was also active politically. In 1861 he wrote two timely articles for *The Times* (London), in which he explained the causes of the Civil War in America, arguing for the benefit of the English that the United States was not a confederacy and that parts of the Union were not separable. In the same year he became United States minister to Austria, remaining in that position until his resignation in 1867 after charges (which he denied) that he had spoken disrespectfully of President Andrew Johnson. He accepted the post of minister to England in 1869 but was recalled the next year by President Ulysses S. Grant, apparently for political reasons. Motley continued his Dutch history with *The Life and Death of John of Barneveld . . .,* 2 vols. (1874), which covered the Thirty Years' War period; it was not as popular as his previous work, but nevertheless became a major source even for Dutch historians. In all his writing he displays a colorful style, with vivid portraitures and narrative.

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MOTMOT, mŏt′mŏt, the common name of several species of birds of the family Momotidae of tropical America, ranging from Mexico to Argentina, and related to kingfishers, todies, and others in the order Coraciiformes. They are usually found alone or in pairs in forests or thickets, where they nest in holes in trees, rocks, or earthbanks. Their plumage is brilliant, usually greenish with blue, black, and rufous markings. The motmot's most striking characteristic is his racket-shaped tail: in most of the species the two long tail feathers are more or less denuded of vanes on both sides of the shaft, except near the tip. This peculiarity—apparently the result of the bird's habit of gnawing its tail feathers—gives the tail the appearance of a racket, with the denuded shaft as the handle and the vanes at the tip as the netted frame.

MOTOR. See Electric Motors; Internal-Combustion Engine.

MOTOR APHASIA. See Aphasia.

MOTOR AREAS, mō′tĕr ā′rē-ăz, those portions of the brain that control the voluntary muscles. Experiments have shown that if certain areas in one hemisphere of the brain are stimulated electrically, certain parts of the opposite side of the body move. Consequently it has been possible to define general areas of the brain that govern specific sets of voluntary muscles controlling the movement of the body. There seems to be no relationship between the size of the motor area and the size of the corresponding part of the body. Rather, the size of the motor area seems to depend on the precision of movement. For example, the area controlling the lips, whose movements are delicate and complex, is larger than the area controlling the whole trunk. The motor areas are located in the cerebral cortex of the frontal lobe, concentrated in the precentral convolution, which is immediately anterior to the central sulcus (Rolandic fissure). The motor nerve cells of the precentral convolution extend along pyramidal tracts, which cross in the medulla oblongata and terminate at spinal nerve cells whose axones belong to the peripheral nervous system and connect directly to the voluntary muscles. The motor areas, however, must not be identified exactly with the precentral convolution of the cerebral cortex, for movements may be evoked by the stimulation of other cortical areas. In addition, the cerebellum—not the motor cortex—is the primary coordinator of muscular activity. See also Brain, Anatomy of.

MOTOR LAUNCH. See Naval Terms.

MOTOR SHIP, a vessel powered by one or more diesel engines and of sufficient size to be labeled a ship rather than a boat. Sometimes the engine in a motor ship drives the propeller directly, and sometimes the engine generates electricity for the main drive. The initial cost of diesel units is high in comparison with steam-power installations, but operating costs are reduced and cargo space increased in motor ships. The first sizable motor ships were two Russian tankers on the Caspian Sea—the *Delo* and the *Emanuel Nobel.* The Dutch tanker *Vulcanus,* built in 1910, was the first ocean-going motor ship; and the Danish-built cargo ship *Selandia* (1912), 7,500 tons deadweight, was the first to approach the size of a modern motor ship. The Italian Line's *Augustus* (32,650 tons) was the largest motor ship in the world until it was lost in World War II. Between 1950 and 1955 over 100 motor ships of more than 100 tons were built each year in the United States; most of them, however, were under 3,000 tons. Well-known motor ships in the 1950's included the Swedish-American Line's *Gripsholm;* the Italian Line's sister ships, the new *Augustus* and the *Giulio Cesare;* the Cunard Line's *Britannic;* and the Union Castle Line's *Capetown Castle.* The last four, all over 27,000 tons, were among the largest motor ships in the world.

MOTOR TRANSPORTATION, trăns-pôr-tā′shŭn. Freight and passenger services by motor vehicle on public highways typify economic development in 20th century America. The great expansion in motor services was made possible by rapid advances in automotive engineering and in manufacturing processes. Of equal importance has been the development of a nationwide, federally-supported highway system, which gained its primary impetus between 1920 and 1930. Motor truck and bus populations show their greatest rate of growth during this period, with registrations increasing from less than 1 million in 1919 to about 3.6 million in 1930. The depression and World War II slowed the rate of growth between 1931 and 1945, but since then registrations have again grown rapidly, rising from 5.1 million in 1945 to 10.6 million in 1956.

(Top) P.I.E.; (bottom) Fruehauf Trailer Company

Above: Western tractor and reefer. Controlled temperature protects foodstuffs during transit. *Below:* A five-car automobile trailer.

Service Characteristics of Motor Transportation.—The remarkable growth of the motor transportation industry is due principally to its service characteristics. Its speed, convenience, and relative economy have created new types of

transport services and enabled the industry to compete successfully with other transport media.

Motor freight service is speedy because it can adopt flexible schedules and handle small shipments expeditiously. The average truckload shipment is relatively small in comparison with typical rail or barge lots. In 1955 the average carried load on main highways was only 2.5 tons for single unit trucks and 11 tons for tractor-trailer combinations. Small shipments not only avoid time-consuming and complicated handling, but also permit frequent and flexible scheduling, and greater personal attention to the shipper's requirements. Shippers also are attracted to trucking services by the convenience of prompt pickup and delivery, irregular or specialized services, assistance in loading and unloading, and single carrier control.

It is generally agreed that on short hauls actual trucking costs are below those of other media, and these reduced costs are reflected in lower rates. But shippers may also save by eliminating the need for much costly packaging; by obtaining faster turnover and control of inventories; and by receiving loading, unloading, pickup, and delivery service from the motor carrier. These savings and better service at least partially offset even the lower line-haul costs of rail and barge transportation on long hauls.

Public road and street networks give trucks additional service advantages, since they can reach areas not open to competing media and can offer through service without transfer of freight. More than 25,000 cities and towns rely exclusively on motor service.

Because the trucking industry can handle small shipments in great volume at a relatively low cost, motor carriers predominate in the distribution of manufactured goods and most agricultural products, particularly on short hauls. Intercity carriers haul principally finished manufactured goods of relatively high value. Available data also indicate that trucking predominates in the marketing of fruits and vegetables, livestock, and dairy and poultry products.

Motor bus transportation possesses similar service characteristics, which have given it superiority in the movement of relatively small groups of passengers. The motor bus may load or discharge passengers at convenient areas in cities and at nearly any point along its route. Limited capacity permits frequent schedules and service to widely dispersed and sparsely populated areas along the vast highway network. Low fares on buses also appear to attract many travelers.

Local and Intercity Services.—A sharp distinction exists in motor transportation between local and longer-distance services. Local services are generally considered to be those confined to a single city or town or a cluster of contiguous towns and cities. Longer-distance operations are variously described as long-haul, intercity, or over-the-road services.

Local freight and passenger services antedate the motor vehicle, but motor vehicles have made possible a greater extension of such services. Few reliable data exist on the total scope of the local freight delivery industry, but it is generally agreed that it surpasses the longer-haul trucking industry in number of operators, employees, and vehicles. Investment and cost characteristics of local freight service differ from over-the-road trucking. For example, since short hauls make less use of tractor-trailer combinations (which have greater freight capacity), and speeds are slower because of traffic, labor and vehicle ownership costs assume greater importance per service unit than in longer-distance operations.

Local passenger services are divided among transit, charter, and sightseeing operations. The motor bus has displaced the electric railway in all but the very largest cities, and even here the motor bus represents the dynamic element in the industry. Motor buses are installed in the majority of cases when individual rail lines are abandoned or service is extended into new areas. Currently about two thirds of all transit passengers are carried in motor buses.

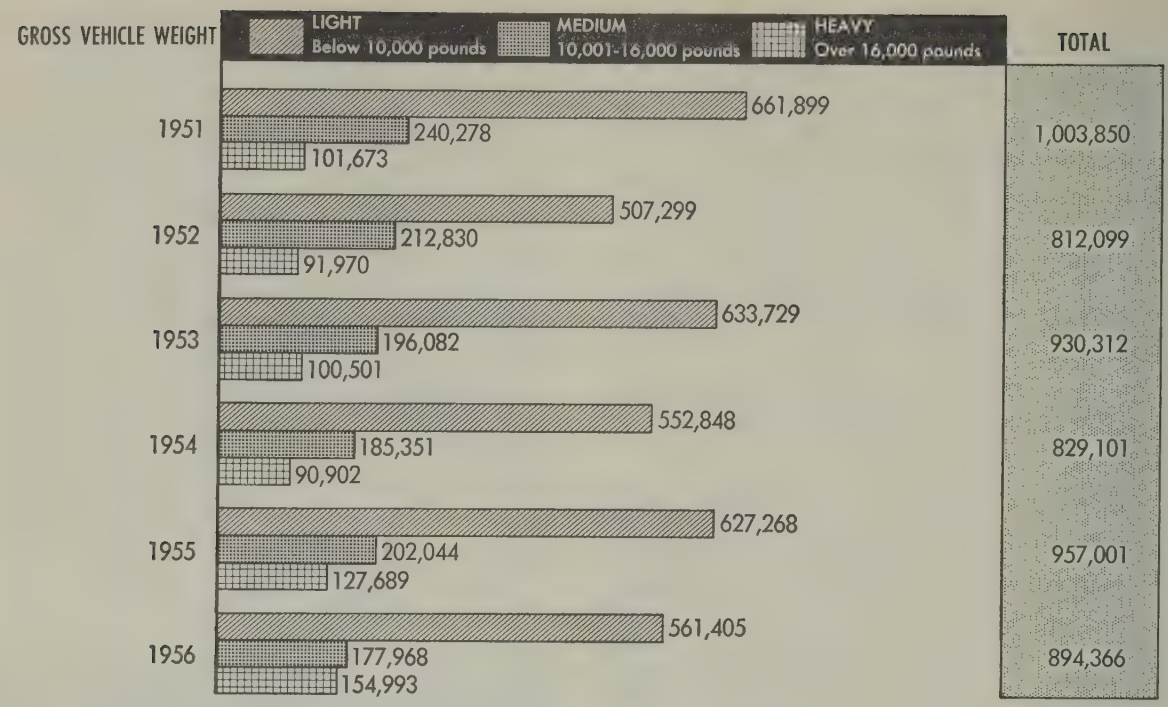
Intercity or over-the-road freight services are also characterized by relatively short hauls, even though individual companies may specialize in long hauls, and some commodities may commonly move thousands of miles to market. The average length of haul by major carriers subject to the regulation of the Interstate Commerce Commission (ICC) was 250 miles in 1955. Hauls tend to be longer in the region west of the Mississippi and in the South (about 300 miles in 1955) than in eastern areas (less than 200 miles in 1955). A

Fifth Avenue Coach Company

First all-American-made double-decker auto bus, 1915.

number of trucking companies maintain regular service from Chicago to West Coast cities. The household goods carriers also engage in extensive long-haul services. Dairy and poultry products are trucked in great quantities from producing areas in the Central states to major cities on both the East and West coasts, and citrus fruits and concentrates are carried from Florida to major consuming points in the Northeast and Middle West.

The average intercity bus trip per passenger is considerably shorter than the typical rail or plane trip. In 1955 the average ride was 63 miles for major carriers as compared with an average of 103 miles per trip for rail coach (excluding commutation travel) and 384 miles for railroad parlor and sleeping car travel. While bus transportation also provides extensive long-distance services between major cities, the considerable amount of travel between nearby communities and points along highways not otherwise serviced by



This table reflects the number of new trucks placed in highway service during each year exclusive of governmental vehicles.

Source, American Trucking Associations, Inc.

NEW TRUCK REGISTRATIONS, 1951–1956, AND GROSS VEHICLE WEIGHTS

public transportation accounts for the low average trip.

Cost Characteristics.—Motor carriers require a relatively low initial investment, and additional investments can easily be adjusted to increases in business and income. Costs increase, however, at an exceedingly high ratio as the number of miles traveled increases, while taxation tends to vary with mileage or volume of business. Finally, there is a high labor cost per unit of traffic.

A motor carrier business may be started with a single vehicle, which is the main investment item. The low capacity of these vehicles makes it possible to adjust the size of the motor fleet to the volume of business. Installment credit makes the capital requirements of the operator even more flexible.

Costs of labor, fuel, lubrication, repair parts, tires, and taxes for typical motor carriers of property approximate 20 times their annual vehicle depreciation, with a somewhat smaller ratio for passenger carriers. When depreciation is computed on a mileage basis, as is appropriate for many over-the-road services, that cost element varies with traffic volume. Mileage depreciation may not be an appropriate measure, however, for many local service operations where considerable time may be spent in terminals or moving slowly in urban traffic. Labor cost as a percentage of total costs or revenues is not comparable among different transport media because of the different operating characteristics such as way maintenance and shop labor on railroads and the cost of loading and unloading vessels. The relatively small capacity of each motor vehicle, however, makes labor requirements per ton or passenger mile greater in motor service than in any other mode of transport.

Like air and water transportation lines, motor carriers are not required to provide or maintain the ways over which they travel, whereas railroads must provide and maintain their own roads and roadbeds. User tax payments in the form of tolls, license fees, and special motor-carrier taxes are generally assessed according to the revenues, mileage, and size of truck. Joint occupancy of highways with private automobiles, which outnumber commercial vehicles about 5 to 1, give motor carriers the additional advantage of sharing the burden of maintaining the roads. Joint use of the highways, however, creates difficulties in determining a fair tax policy for various vehicle classes.

Two complex cost problems exist in the motor carrier industry—capacity costs and return-haul costs. A level of investment in trucks and other facilities must be maintained in order to handle a maximum volume of business. Traffic levels, however, may vary from day to day. For example, in the local motorbus industry such variations are caused by morning and evening rush-hour passengers, and in intercity service by seasonal variations due to such factors as vacation periods or holiday weekends. In the motor-freight industry weekend shutdowns of business and industry, seasonal retail-shopping periods, and the seasonal nature of agricultural production and marketing affect the demand for services.

Round-trip costs are an especially serious problem for the motor carrier because operating costs continue regardless of load. The problem is particularly acute for many owners of private trucks who may have no return freight. Such owners may seek to lease their vehicles to other shippers for utilization of the return capacity.

The variety of motor carrier services complicates the determination of unit costs in spite of the great proportion of costs directly assignable to operations. Identical vehicles may show different

unit-cost factors in such diverse operations as local service, multistop deliveries, or line-haul truckload service. Appropriate cost-accounting systems must therefore be designed for the operating characteristics of the particular trucking business.

Labor Relations.—The motor carrier industry is one of the largest employers in the United States. Trucking employed approximately 6 million in 1955, while the motorbus industry employed an estimated 175,000. Motor carrier labor is strongly unionized, particularly the drivers. Bus drivers belong to the Amalgamated Association of Street, Electric Railway and Motor Coach Employees of America, AFL-CIO. Truck drivers and helpers, both local and intercity, belong to the Teamsters Union, AFL-CIO (International Brotherhood of Teamsters, Chauffeurs, Warehousemen & Helpers of America), one of the strongest sectors of the American labor movement.

Business Organization and Size.—The inherent cost and capital features of the motor transportation industry tend to make it a stronghold of small business. The small business atmosphere even pervades firms that have grown quite large. It is not unusual for a large motor carrier company to be owned by a man who started in business with a single truck. The classification of motor carriers by the ICC is in itself indicative of the small average size of firms. Prior to Jan. 1, 1957, a Class I carrier was defined as one having annual revenues of $200,000 or more in contrast with a Class I railroad which, prior to Jan. 1, 1956, was required to have $1 million or more in annual revenues. A Class II motor carrier was defined as having annual revenues ranging from $50,000 to $200,000, while a Class III carrier had annual revenues under $50,000. Motor classes are now defined as follows: Class I—$1 million or more in revenues; Class II—$200,000 to $1 million; and Class III—less than $200,000. A Class I railway is now required to have $3 million or more in revenues.

There has been a long-term declining trend in the number of motor carriers subject to federal regulation. The ICC reports 18,695 carriers subject to its authority on Dec. 31, 1956. A 1953 special study by the commission showed that it regulated 21,306 motor carriers in 1951, a decrease from slightly less than 28,000 in 1939. Included in the 1951 figure were 1,586 passenger carriers, substantially the same number as in earlier years. About 12 per cent of the freight carriers were in the Class I category, and these carriers earned 79 per cent of the revenues of the regulated trucking industry. In the passenger carrying industry, 19 per cent of the firms were Class I carriers, earning 89 per cent of the revenues.

While the property- and passenger-carrying divisions of the motor transport industry have many common features, each has distinctive business characteristics. Perhaps the most distinctive feature of the motor truck industry has been its dynamic growth and competitive capabilities, in spite of the small average size of firms. The intercity motorbus industry contains larger nationwide organizations and faces more serious competitive problems than the motor freight business.

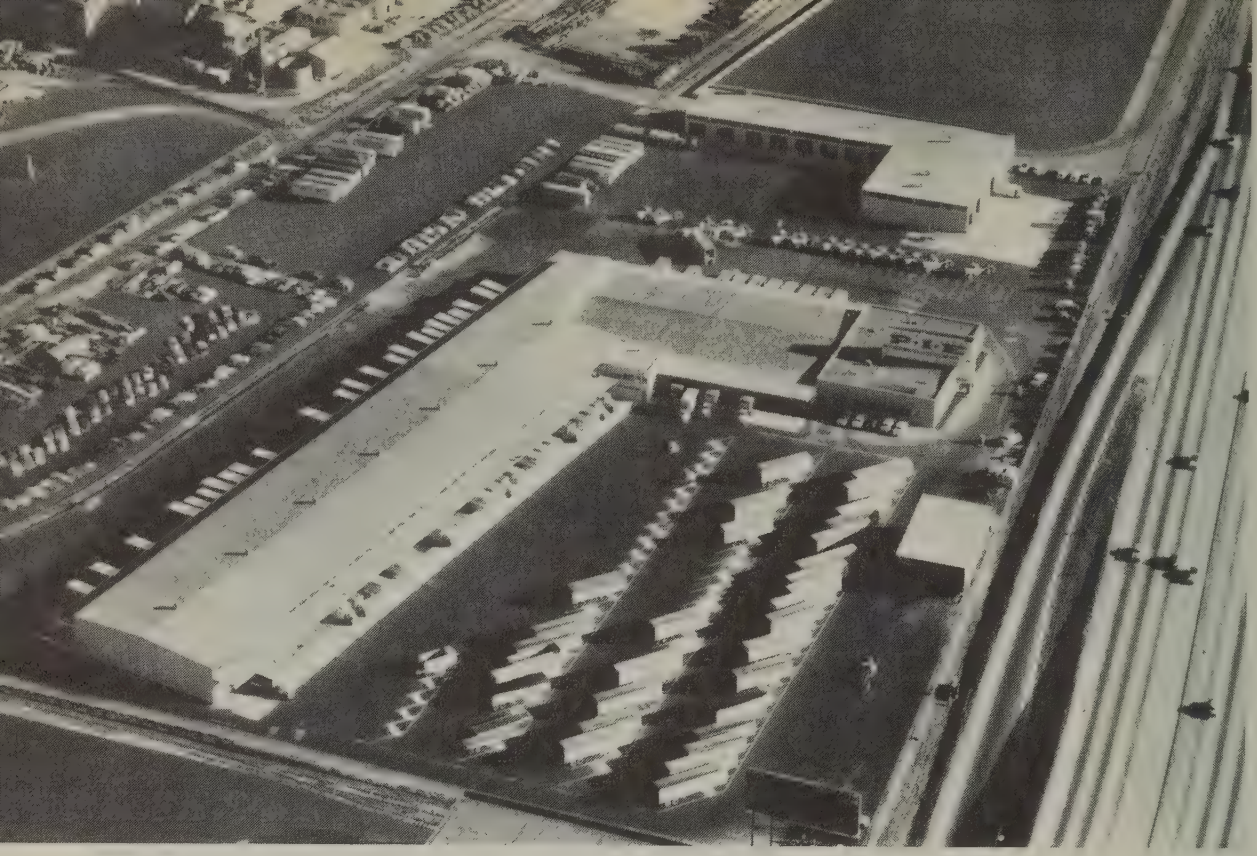
During the past 15 years, large-scale organization and mergers have advanced rapidly in the trucking industry, even though it is still a small-business field by comparison with other industries. Class I intercity carriers grew from 957 in 1939 to 2,026 in 1954 while their revenues increased from $400 million to $3.4 million. Their share of the total regulated trucking revenues increased from 54 to 79 per cent in the same period. In 1954, common carriers of general commodities in the trucking field, each having over $5 million in annual revenues, accounted for 46 per cent of the revenues in that service category. The largest trucking firm in 1955 had revenues of $49.4 million. Mergers proposed may bring forth larger combinations, and there is continuing evidence that a greater concentration of revenues in the Class I category is in prospect.

The American Trucking Associations Inc. (ATA) of Washington, D.C., is the national organization serving the motor freight industry. Organized in 1933 in response to the need for a national organization to develop an industry code for the National Recovery Administration, the ATA is a federation of state trucking associations. The ATA also includes a number of conferences representing specialized services such as common, contract, and local cartage, household goods, and the like.

While there are many hundreds of small carriers in the motorbus industry, two large organizations dominate. The Greyhound Corporation, with 18 operating companies, does business in every state of the Union and in 7 Canadian provinces. Originating as a small company doing business between Chicago and Grand Rapids, Mich., it became in 1925 a $10 million holding company operating 500 buses over 10,000 route miles in the Middle West. Later purchases and consolidations made the company a national organization by 1930, and acquisitions continued; in 1955 the company operated 98,000 miles of route and earned gross revenues of $225 million. Railroads owned stock in many of the earlier Greyhound subsidiaries, in most cases 50 per cent. Since 1950, however, the parent corporation has bought out most of these rail interests. The other leading organization is the National Trailways Bus System, organized in 1936 as a cooperative association of 5 independent companies. By 1955, 41 companies operating 72,000 miles of route in 43 states participated in this association, coordinating their operations and schedules in the Trailways system.

The National Association of Motor Bus Operators (NAMBO) in Washington, D.C., is the national organization for the intercity motorbus industry. Founded in 1925 as a division of the American Automobile Association, the NAMBO assumed its present independent status in 1931. Local bus and transit operators are organized into the American Transit Association of New York, N.Y.

Private and For-Hire Services.—The distinction between for-hire and private service is fundamental to motor transportation. Most important among for-hire services is the *common carrier,* defined by federal regulatory statute as a carrier that holds itself out to the general public to engage in transportation of property or passengers for compensation. Its services are limited only by the character and scope of its facilities and its operating rights. *Private carriers,* on the other hand, are shippers or organizations that fulfill their own transportation needs. *Contract carriers* are for-hire carriers who do not make themselves available to the general public but



P. I. E.

Air view of a large motor freight terminal with facilities for loading and unloading 112 truck trailers at a time.

provide service under individual contracts usually over relatively long periods of time. Such carriers perform functions that are almost identical to private carriage.

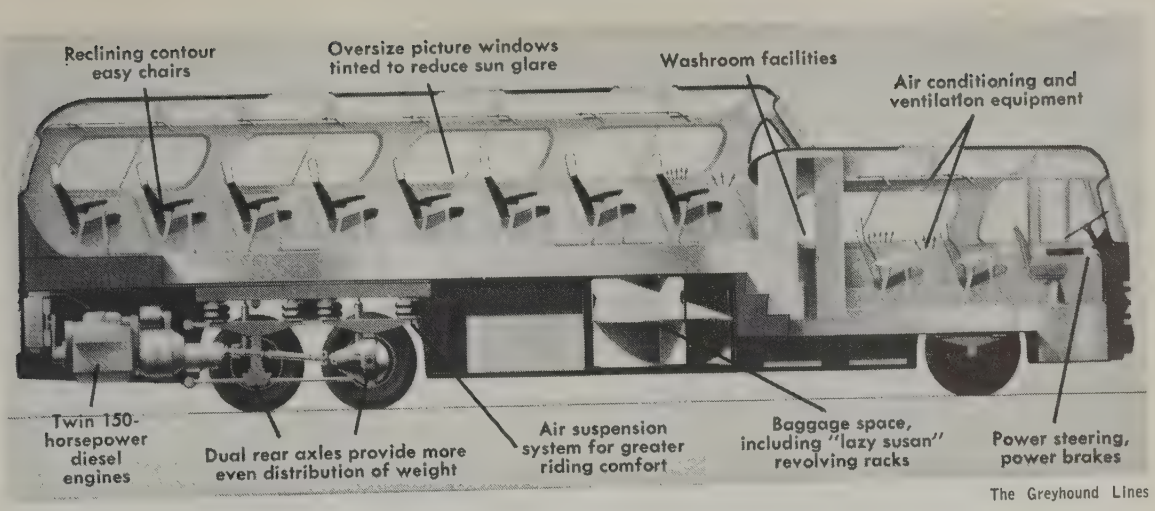
In terms of both vehicles and unit miles of service, private carriage predominates in the motor transportation field. The private truck fleets of firms in such industries as telephone communications, food processing and distribution, and retail delivery far exceed the fleets of the largest common carriers. Although common carriage subject to federal regulation is expanding, it now accounts for less than 30 per cent of the total intercity service measured in ton miles, and appears to be declining relative to all intercity motor freight service since World War II. The use of private trucks is notable in farming. As of 1955, farmers owned 2,750,000 trucks or 27 per cent of total registrations in that year.

In the passenger field, the private automobile accounted for about 88 per cent of intercity passenger miles by all forms of transport in 1955. Buses carried an estimated 4 per cent. Bus companies, while basically common carriers, perform charter and other services that are, in effect, contract carriage. Motor buses are used extensively in transporting children to school. In 1955, 136,847 school buses carried 9 million pupils to school. School bus service is generally supplied by public school districts in their own vehicles or through contracts with private operators. About 70 per cent of all school buses are publicly owned.

Terminals.—The great importance of less-than-truckload shipments in motor freight service makes terminals a necessity. Over 80 per cent of all shipments under 6,000 pounds require terminal handling, and in some regions as high as 60 per cent of the shipments up to 12,000 pounds require this service. The present trend, particularly in the larger cities, is toward terminal buildings especially designed for motor carrier operations, with mechanized equipment and conveyor belts for handling freight. Most terminals are owned or leased by individual trucking companies for their exclusive use, but there is some tendency toward joint use of terminals by noncompeting companies. One of the largest of this type is the Chicago Union Truck Terminal, used by 20 motor carriers. It is privately owned and leased to the carriers. The Port of New York Authority, a public agency, operates two union truck terminals, one in Manhattan, New York City, and one in Newark, N.J.

The problem of terminals is a serious one for the motorbus industry, which has attempted several solutions. In smaller communities most terminal arrangements are of the agency type: a local business, such as a drugstore, or restaurant, provides ticket service at a commission and waiting-room space. In larger cities, individual bus companies prefer to own or lease their own terminals, sometimes in joint occupancy with noncompeting carriers. In some cases joint use of railroad terminals has been arranged. The Port of New York Authority Bus Terminal in central Manhattan is an outstanding example of public ownership of a union bus terminal.

Government Regulation of Motor Services.—The earliest motor carrier regulation was attempted by the states, largely in the period 1920 to 1930. The loose organization of the industry during that period and the resulting competition seem to have been the primary motive for the inception of state regulation. At first the states attempted to regulate interstate motor transportation within their boundaries, but such attempts were overthrown in 1925 by the United States Supreme Court in two key decisions (*Buck* v.


Reclining contour easy chairs
Oversize picture windows tinted to reduce sun glare
Washroom facilities
Air conditioning and ventilation equipment
Twin 150-horsepower diesel engines
Dual rear axles provide more even distribution of weight
Air suspension system for greater riding comfort
Baggage space, including "lazy susan" revolving racks
Power steering, power brakes
The Greyhound Lines

Cutaway drawing showing the comfort and luxury features of a Greyhound "Scenicruiser."

Kuykendall, 267 U.S. 307 and *Bush & Sons Co.* v. *Maloy,* 267 U.S. 317), unless the legislation was for public safety or conservation of the highways. For the next 10 years, state regulatory authorities, railroad interests, and some motor carriers themselves continuously urged Congress to regulate motor transportation. The ICC advocated regulation by the federal government after publishing an investigation of the motor carrier situation in 1928 (*Motor Bus and Motor Truck Operation,* 140 I.C.C. 685, 746). The federal coordinator of transportation made a similar recommendation in 1934. The National Recovery Administration in 1933 set up a motor vehicle code that regulated, to some extent, competition and working conditions.

Actual regulation of interstate motor carriers was achieved in 1935 with the passage of the Motor Carrier Act, incorporated as Part II of the Interstate Commerce Act. With certain major exemptions, all for-hire interstate motor transportation of freight and passengers was made subject to economic and safety regulation of the ICC. Principal exemptions from economic regulation are private carriers and vehicles engaged in interstate movement of unmanufactured agricultural and fisheries products and interstate carriers remaining entirely within a single municipality. All interstate commercial vehicles are subject to ICC safety regulations.

Federal economic regulation, where applicable, is comprehensive. Entry into service is controlled by requiring common carriers to obtain certificates of public convenience and necessity and by requiring contract carriers to obtain permits. In both instances applicants must justify their proposed services formally to the ICC. A common carrier applicant must show that he is fit, willing, and able properly to perform the service proposed and to conform with applicable regulations, and that the service is a matter of public convenience and necessity. A contract carrier applicant must show that he is fit, willing, and able properly to perform the proposed service and conform to applicable regulations and that the service is consistent with public interest and the national transportation policy. The Motor Carrier Act contains a "grandfather" provision under which carriers that provided bona fide services and operated continuously, except in circumstances beyond their control, as of June 1, 1935 for common carriers, and as of July 1, 1935 for contract carriers, could obtain operating authority without further proof of public convenience and necessity, or public interest.

The act further provides that rates of common carriers must be published and adhered to without discrimination. Rates must be just and reasonable and normally can be changed only on 30 days' notice. Shippers and competing carriers may protest rates, and the ICC may suspend their application for a maximum period of seven months. The commission may also specify maximum, minimum, and exact common carrier rates. Motor carriers may but are not required to publish joint rates and through routes with other carriers. Regulation also extends to motor carrier securities, mergers, accounting, financial reporting, and other financial affairs.

The Transportation Act of 1940, in addition to providing minor amendments to the Motor Carrier Act of 1935, combined the regulatory statutes applicable to interstate surface transportation and set forth a national transportation policy to guide the ICC in coordinating the regulation of the competing modes of transportation.

With the ICC's comprehensive authority over major aspects of interstate motor carrier service (including entry into the financial and service structure of the business, and control of rates), it is inevitable that important groups would question certain basic premises of regulatory philosophy. Regulated motor carriers approve the main principles of federal regulation, and confine their major criticism to the wide exemptions allowed agricultural and some other carriers and certain statistical reporting requirements. Critiques of regulatory philosophy have been developed by agricultural interests, certain shippers, congressional and other official federal groups, transportation scholars, and certain sections of the press that favor greater competition.

Subsequent to the passage of the Transportation Act of 1940, published studies in connection with the work of the National Resources Planning Board and the Board of Investigation and Research suggested greater freedom of entry into the business and more liberal regulation of the motor carrier industry. It was alleged that restriction of entry encouraged monopolistic tendencies in a naturally competitive business. A similar concern was voiced in a 1956 report of

the Senate Small Business Committee after hearings held in December 1955.

The report of the Presidential Advisory Committee on Transport Policy and Organization, issued in April 1955, advocated adjustments in federal regulatory philosophy. The Advisory Committee Report was silent on the question of entry restriction, but recommended greater freedom in rate making, stating that the forces of competition offer maximum protection for the public.

Wartime Problems of the Motor Carrier Industry.—During World War II and to some extent during the Korean War, motor transportation was affected by the pre-emption of resources and manpower by the military and mobilization effort. World War II rationing of motor fuels, tires, vehicles, and parts caused a drastic reduction in motor vehicle mileage, particularly among private carriers. Motor common carrier freight traffic increased somewhat, but not in proportion to the expanding market for transportation. The World War II decline in private motor services is indicated by the fact that common carriers during this period hauled approximately one half of all intercity ton miles compared to one third before the war and 28 per cent in 1955. The Korean War did not affect motor carriers so drastically, and they continued to increase their share of the freight market at that time. Their increase, however, might have been greater if vehicles and manpower had been more available.

War crises have brought increased business to motorbus operators due to the restrictions imposed on private automobiles and demands generated by the military. Bus traffic increased over 100 per cent during World War II, but its gains were less substantial during the Korean emergency.

During World War II, motor carriers were governed by the wartime emergency control authorities of the Office of Defense Transportation. A Defense Transport Administration was established during the Korean emergency, and similar controls are planned for future emergencies.

Current Trends and Prospects.—The period since 1950 has witnessed a tremendous growth in motor freight transportation, both in absolute terms and in relation to other transport media. In 1955, 18 per cent of all intercity ton miles were carried in motor vehicles compared to less than 10 per cent before World War II. Much of this growth has been at the expense of the railroads, particularly in the carriage of manufactured goods and agricultural products. Testimony before the Committee on Interstate and Foreign Commerce of the House of Representatives in April 1956 indicated that since 1950 shipper payments for all intercity motor freight, including both for-hire and private carriage, exceeded rail freight revenues. For 1955 it is estimated that motor freight accounted for nearly 60 per cent of combined motor freight payments and rail revenues. By way of contrast, the comparable figure for 1946 was 36 per cent, close to the prewar norm. A further indication of motor carrier growth is seen in a comparison of total revenues of regulated motor carriers (whose traffic is largely manufactured goods) with rail revenues from manufactured goods. On this basis in 1955, the two competing media received equal amounts of revenue as compared with a ratio in favor of the railroads of 70 to 30 in the years immediately before and after World War II.

A contrasting picture is found in the motorbus industry, where passenger volume has declined steadily since 1945, primarily because of the increasing competition of the passenger automobile. In 1955, motorbus passengers were only about half the World War II volume, in spite of the progressive sales efforts of the industry. The industry is attempting to cope with this problem in a variety of ways such as package tours, expanded charter service, expansion of mail and express service, and improvements in passenger comfort.

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MOTORBOATS, mō'tĕr-bōts, water craft smaller than those ordinarily used as cargo ships, and propelled by internal-combustion engines (sometimes by jet engines).

History.—During the 1880's, when the weight of engines in steam launches seemed to bar further development of small power boats, a number of builders in England, France, Germany, and the United States experimented with internal-combustion engines. J. J. R. Hulme of London propelled a launch with gasoline in 1885, and a boat with an engine designed by the German Gottlieb Daimler was launched in 1886. In 1902, attempting greater speed on water, the Englishman Selwyn Francis Edge attained 19 knots with a 66-horsepower engine.

Between the turn of the century and World War I many new types of hull appeared. Designers found that if they could raise the hull partially into the air by the forward propulsion of the boat, the resistance of the water would be decreased. This discovery led to the development of the hydroplane, a boat whose hull shape, coupled with its relationship of power to weight, causes the bow to rise out of the water as the boat gathers speed. Rather than driving through the water, the hull planes over the surface. V-bottoms, round bottoms, catamarans, sea sleds, and a number of designs utilizing washboard bottoms were all tried during this period. The English naval architect Sir John Thornycroft's "skimming boat" *Tadpole* (1909) carried a web under the bow with a heart-shaped plane that lifted the bow from the water. Between 1898 and 1905, the Italian Enrico Forlanini equipped a boat with "ladder foils," and in 1907, Wilbur and Orville Wright experimented with a hydrofoil catamaran.

Marine engines have never been different in principle from internal-combustion engines for automobiles and other purposes. Except for the later air-cooled and outboard motors, they have tended to be of heavier construction, and have taken in water from beneath the hull for cooling, instead of from radiators.

Racing Motorboats.—Since the early 1900's, motorboat racers have pioneered in better engines and in new designs for hulls. In 1903 international competition was first organized when the British newspaper owner Sir Edward Harmsworth offered a cup which has since been called the Harmsworth or British International Trophy. From 1920 to 1956 this trophy was won by boats from the United States. The American Power Boat Association's Gold Cup, first offered in 1904, is a coveted American trophy. World speed records are not set in the Harmsworth and American Gold Cup races because both are held on courses with bends that test the maneuverability of boats and skill of drivers as well as speed. Under the rules of the Union of International Motor Boating, a world record may be set by making two runs of a measured mile and taking the average speed of both.

In 1939, Sir Malcolm Campbell's *Bluebird II* was timed at 141.74 mph. (miles per hour) and established a record that stood for 11 years. The hull of this boat incorporated the three-point (Apel) design, planing on two forward surfaces placed athwartship and a small area at the stern. After World War II, Campbell installed a De Haviland Goblin II jet engine, but found that his craft could not be held on course until full power was developed. In adapting motorboats to jet engines, designers faced a host of new technical problems.

The official world speed record continued to be held by a boat driven by a gasoline engine. Campbell's record was broken in 1950 when *Slo-Mo-Shun IV,* designed by Ted Jones and owned by Stanley Sayres of Seattle, Wash., went 160.3235 mph. In 1952, *Slo-Mo-Shun IV* broke its own record by going 178.497 mph. This craft was designed to avoid cavitation, which is a barrier to the development of greater speeds in propeller-driven craft; this condition occurs when the propellers turn faster than the water can close in on them, so that a partial vacuum is created. Consequently, at high speeds the propeller loses efficiency. Jones met this problem by designing a hydroplane that rode with the propeller half out of the water (prop-riding) so that cavitation was prevented.

Jet-propelled hydroplanes now hold the world's speed records on water. On Loch Ness in 1952 the English sportsman John Cobb was killed just after his jet-driven *Crusader* went 206.89 mph. for one measured mile. After completing this first run, his boat dove to the side and disintegrated. Although Cobb's one run did not constitute an official world's record, he had attained the fastest speed yet recorded on water. Donald Campbell, driving his turbojet hydroplane, *Bluebird,* set official world's records of 202.35 mph. in July 1955 and 216.02 mph. in November 1955. Campbell broke his own record again in September 1956 on Lake Coniston, England, with an average speed of 225.36 mph.

To put motorboat racing economically within the reach of more people, the American Power Boat Association and similar organizations in other countries have drawn up rules defining various classes for competition. Motorboat racing is a thrilling and sometimes dangerous sport, with the light boats bucking wildly in each other's wakes. Spills at high speeds are not uncommon, and the rules in many classes require contestants to wear helmets and life preservers.

Classes come under the general classifications of inboard, outboard, displacement, and hydroplane, and are determined primarily by the engine's piston displacement. The size, cost, and type of hull also are often specified. There are over 35 classes in active competition in the United States. Motor and hull in the tiniest classes may cost under $1,000 while unlimited hydroplanes competing for the Gold Cup may cost $25,000 up.

Naval Motorboats.—During World War I the English designer Sir John Thornycroft invented a mono-step hull for a motor torpedo boat which was found to be faster than either a V-bottom or inverted V-bottom. The motor torpedo boat became technically the most advanced craft powered by internal combustion.

In World War II all the major naval powers had complements of motor torpedo boats, air-sea rescue boats, patrol boats, motor gunboats, and a variety of motor launches and lifeboats. Both Great Britain and the United States developed motor lifeboats that could be dropped into the sea for wrecked airmen. In addition, the United States Coast Guard had a large number of patrol boats, those over 56 feet long rated as cutters, and two types of 38 and 40 feet in length rated as pickets.

(Top) Evinrude Motors; (bottom) Chris Craft

Above: **A 3 horsepower outboard motorboat.** ***Below:*** **A twin engine cruiser accommodating six persons.**

During the 1950's, France, Great Britain, Sweden, the Soviet Union, and the United States all produced motor torpedo boats that are undoubtedly the most powerful motorboats ever built. Most of these craft range between 60 and 100 feet in length, develop from 3,000 to 10,000 horsepower, and are capable of speeds from 35 to upward of 40 knots. They may be equipped with torpedo-launching devices, rocket projectors, small cannon, machine guns, and antiaircraft weapons. The newest American model was characterized by *Jane's Fighting Ships* in 1955 as having "greater displacement, range, fire power and stability" than the World War II PT boats. Unlike the PT boats, which were built of plywood, the newer motor torpedo boats are built of aluminum.

The tactical usefulness of motor torpedo boats (MTB's) was demonstrated during the Battle of Britain in World War II. According to some

naval authorities, the MTB's played a role comparable to that of the Royal Air Force in preventing invasion. The British Admiralty's summary of the war record of small motor craft states that motor torpedo boats, gunboats, and launches fought 782 actions, sank, damaged, or captured more than 500 enemy ships, and lost 176. Great Britain began World War II with 21 motor torpedo boats and ended it with 1,550.

During World War II an improved hydrofoil was developed. In this design, a stilt holds the planing surfaces under the boat so that the forward propulsion of the craft raises the hull completely out of the water. Since the resistance of the hydrofoils is not nearly so great as that of the hull, some designers expect to develop great speeds in hydrofoil boats. The German Navy built several potential motor torpedo boats equipped with hydrofoils but never put them to use.

Motorboating for Pleasure.—After World War II, pleasure boating became a more popular recreation in the United States than it had ever been. According to estimates of the National Association of Engine and Boat Manufacturers, Americans spent $1,250,000 in 1956 for boat equipment, insurance, and the like. It was further estimated that there were 5,971,000 pleasure craft in the United States in 1956, with 28,000,000 persons enjoying recreational boating. This number represented almost 4 times as many persons as in 1945 and more than twice as many as in 1950. Approximately 5 million of these pleasure craft were motorboats, of which about 4.5 million were outboards. The rapid increase was due primarily to the mass production of light, efficient, and relatively inexpensive outboard motors, and of plywood, aluminum, and fiberglass hulls, which lowered the cost of boats considerably and placed them economically within the reach of millions.

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JOHN ASHWORTH.

MOTORCYCLE, mō'tĕr-sī-k'l, a two-wheeled vehicle powered by an internal-combustion engine, usually a gasoline engine. More strictly, models with small wheels are called motor scooters, and models with small, light engines mounted on light frames are called motor bicycles.

The German inventor Gottlieb Daimler (1834–1900), a pioneer in internal-combustion engines, was probably the first to design a practical motorcycle. It was built in 1885 and equipped with an air-cooled benzine engine. By the early 1900's, usable motorcycles were being produced for sale in France, Great Britain, and the United States. At first motorcycling was exclusively the sport of young and athletic men or boys. Since the engine was connected directly to either the front or rear wheel, it was necessary first to run with the machines to turn over and start the engines, and then to spring quickly into the saddles before the vehicles ran away by themselves.

The main stages in the development of the present comparatively docile machine were the placing of the engine in the center of the frame, with care to keep the center of gravity low; the use of an electric ignition instead of the old, sometimes dangerous method of preheating a gas-filled tube with a flame; and the incorporation of a chain transmission through a change-speed gear box. Also, the modern motorcycle generally has a less noisy engine, three speeds, internal expanding brakes, a comfortable saddle, springs in the front fork, and mudguards.

Most motorcycles have air-cooled, one- or two-cylinder engines with aluminum alloy heads and other features of design to achieve maximum power with minimum weight. There have been a few European motorcycles with water-cooled engines, and in the United States four-cylinder motorcycles have been manufactured.

Motorcycles have always been more popular in Europe than in North America. According to the American Motorcycle Association, which makes the rules for races and in general encourages riding on two wheels, there were 412,000 two-wheeled motor vehicles registered in the United States in 1954, almost three times as many as in the 1930's. In the same year, however, there were over 700,000 machines in the British Isles. In Europe, after World War II, motor scooters became popular probably because these vehicles could make their way over bombed-out roads and are much more economical than cars. In the mid-1950's there were more motor scooters than automobiles in Italy.

The United States Army has practically replaced motorcycles with jeeps. There were about 10,000 machines for couriers in World War I, about 5,500 at the beginning of World War II, and in the mid-1950's about 1,000. The United States Army's motorcycles are used only by the military police in traffic control, but other armies still use them for messenger service.

Civilian police in American cities generally use some motorcycles for traffic control. In 1954 a survey in 32 cities of more than 100,000 population by the Traffic Institute of Northwestern University in conjunction with the Traffic Division of the International Association of Chiefs of Police showed that 87 per cent of police departments favored the solo motorcycle for traffic law enforcement for the following reasons: the motorcycle is maneuverable and mobile; it is cheap to operate and maintain; it has a positive psychological effect on the motorist; it is effective in parades, for sports events, and for escort details; and it occupies less space than cruising cars in congested areas.

From its first days the motorcycle has been used for racing, on tracks and cross-country. Every spring the 200-mile national championship races at Daytona Beach, Fla., attract a following from all over the United States. The National Endurance Run in Michigan is famed for the challenging qualities of its course. Other notable races are held at Laconia, N.H., Springfield, Ill., and Catalina Island, Calif. The cross-country courses commonly traverse paths, stream beds, roads that would be impassable to automobiles, and even stringers of abandoned bridges. Every year there are serious accidents in these races, and sometimes fatalities.

On Sept. 6, 1956, at Bonneville Salt Flats, Utah, Jimmy Allen of Fort Worth, Texas, set a new motorcycle world's record of 214.40 mph. (miles per hour), beating the mark of 210 mph. set a month before at the same place by Wilhelm Herz of Germany.

The motorcycling fraternity has always included daring spirits eager to attempt the near impossible with a machine. Hill-climbing contests are generally held on 45° slopes about 100 yards long. From a standing start, competitors mount and try to ride to the top as fast as possible. Often they strip their machines of all surplus parts to reduce weight, even sawing off the cooling fins of the engine. The rear wheels are equipped with chains. Since the earth is soon churned up and softened, the motorcycles slew wildly, and riders are often thrown. Usually the rules require that a thong be attached to the wrist of each rider so that if he is thrown, the thong yanks out of a clip connected with the ignition and "shorts" the engine. Because of this precaution, the motorcycle cannot churn about on top of the rider, or dash into the crowd.

JOHN ASHWORTH.

MOTRIL, mô-trēl′, city, Spain, in the Province of Granada, facing the Mediterranean Sea, which is about two miles distant, and backed by an amphitheater of mountains. The climate is mild, and the area produces potatoes, sugarcane, grain, fruit, wine, and tomatoes. Flour, sugar, and alcohol are manufactured. Pop. (1950) 23,420.

MOTT, mŏt, **Frank Luther,** American journalist, educator, and author: b. Keokuk County, Iowa, April 4, 1886. Graduated from the University of Chicago in 1907, he worked as a journalist for the next 10 years, and in 1921 began to teach at the State University of Iowa, where he was director of the School of Journalism from 1927 to 1942. He then served as dean of the School of Journalism at the University of Missouri until 1951. Mott's *A History of American Magazines,* 3 vols. (1930–38), won the Pulitzer Prize in American History for 1939. He also wrote *Golden Multitudes: the Story of Best Sellers in the United States* (1947); and *American Journalism; a History of Newspapers in the United States Through 260 Years: 1690–1950* (1950).

MOTT, James, American abolitionist: b. North Hempstead, N.Y., June 20, 1788; d. Brooklyn, N.Y., Jan. 26, 1868. He attended and taught at a Quaker boarding school in Nine Partners, N.Y., where he met Lucretian Coffin, whom he married in 1811. In 1810 he went to Philadelphia and entered his future father-in-law's business. He was a stanch friend of William Lloyd Garrison (q.v.), assisted in the organization of the American Anti-Slavery Society in Philadelphia (1833), and with his wife attended the international antislavery convention in London in 1840. He was also a determined supporter of the cause of women's rights, and in 1848 presided over some sessions of the first woman's rights convention at Seneca Falls, N.Y. He took an active part in the estabishment of Swarthmore College (1864).

MOTT, John Raleigh, American religious and social worker: b. Livingston Manor, N.Y., May 25, 1865; d. Orlando, Fla., Jan. 31, 1955. After graduating from Cornell University in 1888, he served as chairman of the executive committee of the Student Volunteer Movement for Foreign Missions until 1920, and as student secretary (until 1915) and then general secretary (until 1931) of the International Committee of the Young Men's Christian Association (YMCA). In 1895, with Karl Fries of Sweden, he organized the World's Student Christian Federation, of which he was general secretary and later chairman until 1928. He also presided over the World Missionary Conference at Edinburgh, Scotland, in 1910, and was chairman of its Continuation Committee (to 1920) and then of the International Missionary Council, which succeeded it, until 1942. In these various capacities, Mott played a leading role in organizing Christian youth and student movements all over the world, especially in the Far East. For his welfare work among Allied troops and prisoners of war during World War I, he was awarded the Distinguished Service Medal by the United States; and for his lifelong service in the cause of international understanding he received the Nobel Peace Prize in 1946 (with Emily Greene Balch). He was honorary president of the World Council of Churches from 1948, and author of many books on religious subjects, including *Liberating the Lay Forces of Christianity* (1932), *Five Decades and a Forward View* (1939), and *The Larger Evangelism* (1944).

MOTT, Lucretia (nee COFFIN), American abolitionist and advocate of woman's rights: b. Nantucket, Mass., Jan. 3, 1793; d. near Philadelphia, Pa., Nov. 11, 1880. At 13 she was sent to the Quaker boarding school at Nine Partners, N.Y., and there met James Mott (q.v.), whom she married in 1811 in Philadelphia. About 1818 she became an acknowledged minister of the Society of Friends and subsequently, with her husband, joined the liberal Hicksite branch of the Quakers after the schism of 1827–1828. She preached widely in the United States on reform subjects, especially slavery and woman's rights, and in 1833 helped found the American Anti-Slavery Society; but at the London world anti-slavery convention of 1840, she and a number of other women from the United States were refused recognition as official delegates. As a result of this discrimination, Mrs. Mott turned actively to the cause of woman's rights and in 1848, with Elizabeth Cady Stanton, organized the convention at Seneca Falls, N.Y., which began the feminist movement in the United States (see FEMINISM). She continued to take an active part in the anti-slavery movement, and from 1850 made her home a refuge for runaway slaves.

MOTT, Valentine, American surgeon: b. Glen Cove, N.Y., Aug. 20, 1785; d. New York, N.Y., April 26, 1865. He received his medical degree from Columbia College (1806) and then studied surgery in London and Edinburgh. In 1811 he became professor of surgery at Columbia, resigning with others in 1826 to found Rutgers Medical College. When this institution closed in 1830, he returned to Columbia, resigning in 1835 because of ill health. After six years' travel in Europe, Africa, and Asia, he joined in founding the medical department at the University of the City of New York (now New York University), and was head of the medical faculty and professor of surgery there from 1841 to 1850. From 1852 until his death he continued teaching, with the rank of professor emeritus, at Columbia.

Mott's reputation as a surgeon derives from his numerous bold and original operations, especially his vascular and osseous surgery. For the first time in medical history, he treated an

aneurysm by ligating the innominate artery only two inches from the heart (1818). Other notable operations include a successful amputation at the hip joint (1824); successful ligature of the common iliac artery for aneurysm (1827); the removal of a right clavicle for malignancy (1828); and development of methods for the treatment of the jaw. He also became an authority on anesthesia in surgery after its introduction in 1846. He annotated and supervised the publication of *New Elements of Operative Surgery,* 3 vols. (1847), translated from the French of Alfred L. A. M. Velpeau; and published *Mott's Cliniques* (1860), an abstract of his later lectures.

MOTTEUX, mô-tû′, **Peter Anthony** (originally Pierre Antoine Motteux), Franco-English translator and author: b. Rouen, France, Feb. 18, 1660; d. London, England, Feb. 18, 1718. The son of a Rouen merchant, he went to England after the revocation of the Edict of Nantes (1685) and soon turned his hand to literature. A number of his plays and operas were produced on the London stage between 1696 and 1708. He is best known for his part in the excellent translation of the works of François Rabelais (2 vols., 1693–94), which includes Sir Thomas Urquhart's rendition of the first three books (edited by Motteux) and his own translation of books 4 and 5; and for his translation (with others) of *The History of the Renowned Don Quixote de la Mancha,* 4 vols. (1700–03).

MOTTISTONE, 1st Baron. See Seely, John Edward Bernard.

MOTTL, môt′l, **Felix,** Austrian composer and conductor: b. near Vienna, Austria, Aug. 24, 1856; d. Munich, Germany, July 2, 1911. He studied at the Vienna Conservatory, and from 1876, when he first took part in the Bayreuth Festival, was known internationally as a leading interpreter of Wagnerian music. From 1881 to 1903 he was conductor of the court opera at Karlsruhe, Baden, and from 1907 of the royal opera at Munich. He wrote three operas (*Agnes Bernauer, Rama,* and *Fürst und Sänger*) and many songs and piano compositions, and edited works by Louis Hector Berlioz, Peter Cornelius, and Johann Sebastian Bach.

MOTYCA. See Modica.

MOUCHEZ, mōō-shĕz′, **Amédée Ernest Barthélémy,** French astronomer: b. Madrid, Spain, Aug. 24, 1821; d. Wissous, France, June 25, 1892. He was educated at the French Naval Academy and remained in the navy until 1878 when he was appointed director of the Paris Observatory. He had previously distinguished himself in coast surveys of Algeria and Brazil as well as in the observation of the transit of Venus in 1874. He bent all his energies to the improvement of the observatory, and was the originator of the international photographic chart of the heavens. In 1880 he was appointed rear admiral. He wrote *La photographie astronomique à l'observatoire de Paris et la carte du ciel* (1887).

MOUFLON, mōōf′lŏn (also Moufflon, Musimon, mŭs′ĭ-mŏn), a wild sheep (*Ovis musimon*) of Corsica and Sardinia, where it wanders about the summits of the mountain ranges in small flocks. It is not certain whether this species ever existed on the mainland, but most naturalists believe that it formerly existed in Spain. The rams are about 2¼ feet tall at the withers. The males have large coiled horns, but the females are hornless. The coat is mainly rust-red above and white on the ventral surfaces. A similar mouflon inhabits Cyprus, and the aoudad (q.v.) of North Africa is often called the "ruffed mouflon."

MOUKDEN. See Mukden.

MOULIN, mōō-lăn′, an almost vertical opening in a glacier through which a stream flowing on the surface of the ice plunges to the bottom and flows on as a subglacial stream.

MOULIN ROUGE, rōōzh (Red Mill), a noted dance hall in Paris on the right bank of the Seine, in the Montmartre district. It replaced the Jardin Mabille (1840–1875) in 1889 as the place known especially for the cancan and other gay dances. The artist Toulouse-Lautrec (q.v.) was one of the dance hall's most famous patrons, and one of his best-known lithographs is entitled *Moulin Rouge: La Goulue.* After a fire in 1915 the Moulin Rouge was converted into a music hall and then into a theater.

MOULINS, mōō-lan′, commune and city, France, capital of the Department of Allier, located in the old Province of Bourbonnais, of which it was once the capital. The city is situated on the right bank of the Allier River, which is spanned here by a beautiful bridge built in the 18th century. Its Gothic cathedral (begun 1468–1508 and completed in the 19th century) contains the famous 15th century triptych of the unidentified maître de Moulins. François Augier's tomb of Duc Henri II de Montmorency (1595–1632), a masterpiece of 17th century sculpture and architecture, is in the chapel of the Lycée. Other famous monuments are the tower of the ruined ducal palace and the Renaissance pavilion of Anne de Beaujeu (1460–1522). Its industries include the manufacture of textiles, iron products, furniture, shoes, hats, and machine tools. Located on the Paris-Lyon-Mediterranean Railway, it is also a rail and commercial center and exports coal, lumber, salt, and cattle. Pop. (1954) city 22,677; commune 24,437.

MOULMEIN, mōōl-mān′, city, Burma, capital of the District of Amherst and the Tenasserim Division of Lower Burma, located on the eastern shore of the Gulf of Martaban, at the mouth of the Salween and the junction of the Gyaing and Ataran rivers, 100 miles southeast of Rangoon. It gained importance as a British administrative center after the conquest of the Tenasserim Division in the first Burmese War (1824–1826). A communications center and port, it has rail connections with Ye and Rangoon, and exports teakwood, rice, and cotton. Principal industries include distilling, shipbuilding, and the working of gold and silver. Pop. (1953) 102,777.

MOULTON, mōl′t'n, **Ellen Louise** (nee Chandler), American poet: b. Pomfret, Conn., April 10, 1835; d. Boston, Mass., Aug. 10, 1908. She was married to William U. Moulton, a Boston publisher, in 1855, and had a wide literary acquaintance both in the United States and in Eng-

land where she spent a part of every year for many seasons. Her weekly receptions both in Boston and London were the resort of many literary and artistic persons. Her lyrics are extremely musical and as a sonneteer she ranks high.

MOULTON, Forest Ray, American astronomer: b. Le Roy, Michigan, April 29, 1872; d. Chicago, Illinois, Dec. 7, 1952. He was graduated in 1894 at Albion College, and took the degree of Ph.D. at the University of Chicago in 1899. He was appointed (1898) associate in astronomy of the University of Chicago, becoming (1900) an instructor, and (1903) assistant professor, associate professor of astronomy (1908) and professor (1912–1927). From 1937–1948, he was administrative secretary of the American Association for the Advancement of Science. Among his many books are *New Methods in Exterior Ballistics* (1926); *Astronomy* (1931); *Consider the Heavens* (1935); *Autobiography of Science* (with J. J. Schifferes, 1945).

MOULTON, Richard Green, Anglo-American educator: b. Preston, England, May 5, 1849; d. England, Aug. 15, 1924. He was graduated from the University of London in 1869 and at Cambridge University in 1874, after which he was associated with the university extension movement of various American and English universities. He was connected with the University of Chicago from its foundation in 1892 until 1919. After 1901 he was professor of literary theory and interpretation and head of the department of general literature. He published *Shakespeare as a Dramatic Thinker* (1907); *The Literary Study of the Bible* (1896); *A Short Introduction to the Literature of the Bible* (1901); *The Modern Reader's Bible* (1895–1907); *World Literature* (1911); *The Modern Study of Literature* (1915).

MOULTRIE, William, mo͞ol'trĭ, American soldier: b. South Carolina, 1731; d. Charleston, S. C., Sept. 27, 1805. He early allied himself with the military forces of the colonies and in the war with the Cherokees in 1761 the confidence of his fellow citizens in his ability was shown by his selection as captain of the body of troops raised to defend the frontier against the Indians. At the outbreak of the American Revolution in 1775 he was appointed colonel of the 2d colonial regiment and he also served as member of the South Carolina provincial congress in that year. He was engaged in the seizure of the public arsenals and the construction of fortifications around Charleston, and in March 1776 was ordered to construct a fort on Sullivan's Island. This he made of the only material at hand, palmetto logs, and when General Lee made an inspection he expressed his disapproval of the work, considering it totally unfit for the purpose of defense and advised its abandonment. Moultrie, however, continued the work and when an attack was made by the British Fleet under Sir Peter Parker the rude fort successfully withstood all assaults and was subsequently named for its brave commander. He was promoted to the rank of brigadier general in recognition of his services and given command of the forces in South Carolina and Georgia. So complete had been the defeat of Parker, however, that Charleston was not again attacked until 1779 when the British availed themselves of the absence of a large share of the Continental force and attacked the town. The return of General Lincoln saved the city, but in the spring of 1780 a third attack by land and sea compelled capitulation. Moultrie was held a prisoner for two years and though offered rank and money to enter the British Army remained loyal to the cause of the colonies. Release came in 1782, when he was exchanged for Burgoyne, and though promoted to the rank of major general it was too late for him again to engage in active service. He was elected governor of South Carolina in 1785 and in 1794, and published in 1802 *Memoirs of the Revolution.*

MOULTRIE, city, Georgia, and Colquitt County seat; altitude 340 feet; near the Ochlockonee River; 125 miles south of Macon; on the Atlanta, Birmingham and Coast, and Georgia and Florida railroads; has a municipal airport. Moultrie is a tobacco market and commercial center, in a section producing cotton, watermelons, and livestock.

Moultrie was incorporated in 1859 and named for Gen. William Moultrie (q.v.) of Revolutionary War fame. It has a city manager. Pop. (1940) 10,147; (1950) 11,639.

MOUND BIRDS. See MEGAPODES.

MOUND BUILDERS AND MOUNDS. In the first half of the 19th century the words "Mound Builders" and mounds came into both scholastic and popular usage to refer to the great number of earth mounds discovered by European settlers in the eastern half of the United States and to their supposed builders. The term "mound" properly applies to intentional constructions, usually of earth, rarely of piled stones, erected according to a preconceived plan. Large accumulations of community refuse, also found in that region, are sometimes referred to as "mounds," but properly are called "kitchen middens."

The Indians of the opening frontier had lost much of their native culture by 1800 and had almost completely given up the practice of mound building, hence it was difficult for early students of antiquities to conceive how these disorganized societies could have provided the religious drive and supported the vast amount of nonproductive labor that must have gone into the construction of the larger earthworks. Authorities such as the Rev. Thaddeus M. Harris, Ephraim George Squier and Edwin Hamilton Davis, and Dr. Joseph Jones postulated that the mounds were constructed by an earlier race with a much higher culture which had been replaced by the more primitive Indians. Popular theories credited the Toltecs or the lost tribes of Israel.

After the Bureau of American Ethnology was established under the direction of the Smithsonian Institution, it undertook an extensive program of mound excavation, directed by Cyrus Thomas in the years 1882 to 1891, principally for the purpose of determining whether the ancestors of the historic Indians or some mysterious vanished race were the builders of the mounds. The conclusion that the structures had been made by the ancestors of the historic Indians was not accepted by all writers on the subject, and the disappearance of the more romantic theory from popular usage has been understandably slow.

The study of the archaeology of the Mississippi Valley has accelerated considerably since

1900, particularly since 1930, and numerous excavations have been made by state and national scientific organizations. Techniques of excavation, analyses of evidence, and interpretations have undergone a parallel development, and archaeologists are now able to estimate the dates of earthworks, relate them to other prehistoric cultural remains, determine their purpose, and trace developments and changes in these old cultural patterns down to the period when the various Indian tribes were first described by European explorers. Recent technical developments have provided the dendrochronological and radiocarbon methods of dating which assist greatly in assigning calendrical dates to the relative chronologies that have been developed from cultural evidence.

CLASSES OF MOUNDS

The majority of the thousands of mounds in eastern North America can be classed in one of two categories of contrasting function, form, and historical origin. These categories have been called "Burial Mounds" and "Temple Mounds." Other categories such as hill-top forts and effigy mounds, while spectacular, are not so important numerically and will be described more briefly.

BURIAL MOUNDS

Origin.—Dome-shaped or conical mounds of earth, more rarely of stone, constructed to cover central burial chambers made of logs or stone, have a general distribution in the northern hemisphere and it appears very likely that the variations of this custom are historically connected. The Egyptian pyramids, developed from earlier tomb types about 2700 B.C., and earth mounds with central stone vaults were built for the heroes of Homeric times on the European mainland. At the close of the Neolithic and in the early Bronze Age (about 2000 B.C.), the custom of burying the dead in stone chambers covered with earth mounds spread from Spain through England and western France into southern Scandinavia. In England such mounds are called "barrows." Similar burial tumuli, termed "Kurgans," were made in central Siberia in the period of the widespread Afansiev and later Andronovo Cultures of the late Neolithic, about 1700–1400 B.C. Burial mounds spread into northern China, and became a prominent mode of burial in the Choo Dynasty, about 1000 B.C.

In both the Old and New Worlds the complex of cultural traits centering around mound building shares the traits of: 1, preserving the remains of the dead—in Asia, by mummification or extracting the viscera and drying; in America, usually by drying or stripping the flesh from the bones; and 2, constructing one or more vaults for the remains at ground level or below the surface, then covering these over with conical or dome-shaped heaps of earth.

North America.—When writers have used the term "Mound Builders," they have usually had in mind first the mounds and complicated earthworks of southern Ohio, sites like the Seip Mound, Turner, the Newark earthworks, or the Hopewell Site. These sites are now assigned to the Hopewell Culture, and Carbon ^{14} time measurements indicate that the culture existed about the time of Christ. Surface remains at Hopewell sites consist of earth embankments forming geometrical figures such as squares, circles, octagons, each covering 20 to 50 acres Several geometrical figures may occur at one site, and sometimes they are connected by extensive parallel earth ridges forming "roadways." Conical burial mounds either accompany these earthworks or occur in isolation. They range from small structures eight feet high and 100 feet in diameter to large mounds 40 feet high. The burials, usually found within log vaults, are accompanied by ornaments made of copper, pearls, bear teeth or mica; pipes carved in the form of animals sitting on platforms; pottery; and tools and weapons of polished and chipped stone.

The Adena Culture of northern Kentucky and the adjacent portion of West Virginia is related to Hopewell. The burial mounds built by the peoples of that culture were frequently large, and the Grave Creek Mound in West Virginia (70 feet high and 300 feet in diameter) is probably the largest of this type ever built in North America.

The Hopewell Culture in a somewhat simplified form is widely distributed through the Mississippi Valley. It is found in western New York State where the mounds are small. Burial mounds of this culture have been investigated in Illinois, in western Michigan and southern Wisconsin. Related remains are found extending up the valley of the Missouri River as far as Kansas City. Through Missouri the mounds tend to be small and the central burial vaults are usually made of stone. Along the Mississippi River, Hopewellian mounds were frequently placed on the edge of the bluffs that border the flood plain.

In the valley of the Tennessee River in northern Alabama, the related culture is known as "Copena." This is characterized by conical mounds of moderate size. Some contain central grave pits lined with colored clay and covered with logs and bark.

In the lower part of the Mississippi Valley the Hopewellian variant is named "Marksville." There the material culture is very similar to Hopewell but is somewhat simpler, and the variety of items made and buried with the dead is not so great. Typical sites range from single conical burial mounds to as many as eight or ten scattered about without any plan of arrangement. The largest of the southern mounds are about 100 feet in diameter at the base and 20 feet high. At several locations, such as at Marksville, Louisiana, and the Spanish Fort Site in Yazoo County in Mississippi, there is a C-shaped earth wall enclosing 10 to 20 acres placed so that the two ends touch a river. These are obviously defensive works in contrast to the apparently ceremonial geometrical earthworks of Ohio. The southern burial mounds contain central log-covered tombs or simply central deposits of bones of the dead. As many as 1,100 skeletons have been recovered from one of these deposits.

About the peripheries of its distribution the custom of building burial mounds, variations on the basic Hopewellian plan, tended to last into later times. Thus it is associated with the Weeden Island Culture of northwest Florida (700–1200 A.D.), and remnants of the custom survive until the beginning of history, about 1700 A.D. for example among the Choctaw of Mississippi. Along the Atlantic Coast and near the Great Lakes the late use of ossuaries, or large burial pits, may be a retention of the central burial vault of the Hopewellian mounds, but there no earth was heaped above the grave.

TEMPLE MOUNDS

The second numerically important category of mounds is rectangular, truncated earth pyramids, constructed to serve as bases for wooden ceremonial buildings—temples and dwellings for important politico-religious leaders Temple mounds are generally found arranged about courts one to two hundred yards in diameter, and the larger and more important tend to be at the western and eastern sides of these courts. Earth ramps with log-faced stairways frequently provided a more accessible approach to the tops of the mounds on the side toward the court. Excavations of these structures have shown that they normally contain a number of superimposed building levels. The ceremonial buildings had been intentionally destroyed at intervals, and before they were replaced a thick capping of earth was added to the entire mound surface. This renewing of the mound was an important part of the Temple Mound complex wherever it is found. Burials were occasionally made in these structures but as a secondary use and not as a primary function.

Origin of Temple Mounds.—Rectangular, flat-topped mounds of similar form, function, and construction are found in the Americas from the central part of Peru to the vicinity of the Great Lakes. The earliest temple mounds in Peru were modest earth structures that seem to date about 700–400 B.C., and from them there developed later large mud-brick pyramids which reached a height of 110 feet. In Middle America the earliest dated pyramidal structures are of about the same time. Stone rubble fill and masonry facings are characteristic. The largest of these, the Pyramid of the Sun at Teotihuacan in Mexico, measures 700 feet on a side at the base and is over 200 feet high.

At the moment there is some question as to the possibility of this temple mound-building complex having been transmitted across the Pacific to Middle America from southern Asia where a similar custom is widely distributed. A number of other cultural traits are involved in the arguments, and the question of prehistoric connections between regions is far from settled.

Temple Mounds in the Mississippi Valley.—The relatively modest earth temple mounds of the eastern United States seem to have derived from Middle America, and first appear in the lower part of the Mississippi Valley in the Troyville cultural stage about 700–900 A.D., after the decline of the major burial mound-building cultures. The temple mound building complex became incorporated into the Mississippian Culture which was developing in the central part of the Mississippi Valley from approximately 900 to 1100 A.D. After 1200 A.D. Indians carrying variations of the Mississippian Culture spread out of the Valley in all directions and their cultural influence, including temple mounds arranged about plazas, is found over a large part of the East. By 1500 this complex had reached the Atlantic Coast in Georgia and South Carolina and was on the Gulf coast of Florida. Westward it diffused into eastern Texas and Nebraska. Northward temple-mound sites are found as far as the Aztalan Site in Wisconsin. To the northeast, it extends into Ohio and eastern Kentucky. Thousands of Mississippian mound groups are found in the region outlined.

The largest pyramidal mound in the Mississippi Valley is Monks Mound near East St. Louis, Illinois. This measures 1,080 by 710 feet at the base and is 100 feet high. It was probably built about 1400–1600 A.D. and at least 60 smaller mounds, ranging up to 30 feet high are found in the bottom lands within a few miles from this largest mound of the Cahokia group. Other well known temple-mound groups are at Etowah, Georgia (highest mound, 61 feet), at Macon, Georgia (in Ocmulgee National Monument), at Moundsville, Alabama (Moundsville State Park), and the Winterville Site near Greenville, Mississippi. Some of these groups, particularly those that date late within the Mississippian Culture period (after c.1450 A.D.) are enclosed by defensive walls made of earth surmounted by a wooden palisade. This is found at such sites as Aztalan, mentioned above, at the Angel Site in southern Indiana, and at the Lake George Site near Holly Bluff, Mississippi.

If the antiquarians of the last century had read more carefully the narratives of the expedition of Hernandez de Soto, who traversed the present states of Florida, Georgia, Alabama, Mississippi, and Arkansas in the years 1541–1543, the question of a lost mound builder race need not have arisen, for these describe temple mounds being used at what must have been very nearly the highest development of Mississippian culture. Between that date and the first effective exploration and settlement of the territory west of the Appalachians about 1700 A.D., there had been a major decimation of Indian populations and disruption of their culture. Only a few tribes, such as the Natchez, Cherokee, and Creeks, retained the use of temple mounds by the beginning of the 18th century.

FORTIFICATIONS AND EFFIGY MOUNDS

Besides the two classes of mounds outlined, there are less numerous constructions which were attributed to the "mound builders." Hilltop fortifications with earth and stone walls are found from Mississippi and Georgia to New York State. They range in date from Hopewellian to Mississippian times. The Fort Ancient Site in Ohio is a well-known structure of this type. It dates in the Hopewell period.

Small mounds constructed in the form of unidentified linear figures, birds, animals, or rarely humans are particularly common in Wisconsin. The people who constructed them also built burial mounds in which the dead were placed in subfloor pits. These constructions predate the Hopewell Culture in Wisconsin.

METHOD OF MOUND CONSTRUCTION

All mounds in North America were constructed by human labor, by people carrying basket or skin loads of soil on their shoulders. Due to differences in color, individual loads frequently can be identified in the process of excavation and these weigh from 40 to 50 pounds. Sometimes the impression of a carrying basket is found enclosing a load of soil.

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MOUND CITY, city, Illinois, seat of Pulaski County, situated at an altitude of 300 feet, on the Ohio River, 6 miles north of Cairo. It has freight service via the Illinois Central and New York Central railroads. The surrounding area produces fruit, vegetables, and cotton, and the city has canneries, lumber mills, and machine shops. Shipyards used during the Civil War are still in operation Near the city is the Mound City National Cemetery, containing the graves of more than 5,600 soldiers and sailors. Incorporated in 1857, Mound City is governed by a mayor and council. Pop. (1950) 2,167.

MOUND CITY GROUP NATIONAL MONUMENT, Ohio, situated on the Scioto River, 4 miles north of Chillicothe. Established in 1923, it contains pre-Columbian Indian burial mounds and covers an area of 57 acres.

MOUNDSVILLE, city, West Virginia, seat of Marshall County, situated at an altitude of 645 feet, on the Ohio River, 12 miles south of Wheeling. It is served by the Baltimore & Ohio Railroad and has a municipal airport. The city is the center of an agricultural and coal-producing region. Its industrial products include glassware, enamelware, cables, toys, brooms, clothing, and refined zinc. Moundsville is the seat of the state penitentiary. It has a city stadium, a public library, and a general hospital. In the center of the city is Grave Creek Mound from which Moundsville derives its name. Two small villages were merged and incorporated in 1865 to form the present city. Government is administered by a mayor and council, and the water supply system is municipally owned. Pop. (1950) 14,772.

MOUNET, mōō-nĕ′, **Jean Sully** (called Jean Mounet-Sully), French tragedian: b. Bergerac, Feb. 27, 1841; d. Paris, March 1, 1916. Because of family opposition, he was not able to enter the Paris Conservatoire until he became of age. In 1868 he received its first prize for tragedy and made a successful appearance at the Odéon. After serving as an officer in the Franco-Prussian War, he returned to the stage, appearing at the Comédie Française in 1872 and becoming a member of its company two years later. His chief successes were in the tragic roles of French classical drama. His most notable achievement was a production of *L'Oedipe roi* at the old Roman theater in Orange in 1888. With Pierre Barbier, he wrote *La Vieillesse de Don Juan* (1906).

His brother, Jean Paul Mounet (1847–1922), was also an actor and taught at the Conservatoire. Among his roles were Hamlet, Othello, and Anthony.

MOUNT, William Sidney, American painter: b. Setauket, N. Y., Nov. 26, 1807; d. Stony Brook, N. Y., Nov. 19, 1868. In 1826-1827 he studied at the National Academy of Design, New York City, of which he became an associate member in 1832. He first aroused interest by his *Christ Raising the Daughter of Jairus* (1828) and by a number of portraits, including studies of Bishop Henry Onderdonk and Daniel Webster. He is best known, however, as one of the founders of American genre painting. Among his realistic studies of American life are *Bargaining for a Horse* (New York Historical Society); *Raffling for the Goose* (Metropolitan Museum of Art, New York); *The Long Story* (Corcoran Gallery, Washington); and *Coming to the Point* (New York Public Library).

MOUNT AIRY, town, North Carolina, situated in Surry County, at an altitude of 1,015 feet, 35 miles northwest of Winston-Salem. There is freight service via the Southern Railway. The town has a large tobacco market and produces furniture, hosiery, clothing, and metal products. One of the largest open-faced granite quarries in the world is located here. First settled in 1860, Mount Airy was incorporated in 1885. It is governed by a mayor and commissioners and owns its water supply system. Pop. (1950) 7,192.

MOUNT ALLISON UNIVERSITY, Sackville, New Brunswick, Canada, a coeducational institution of higher learning affiliated with the United Church of Canada. Chartered in 1853 as Mount Allison Wesley College, it became a university in 1913. It has faculties of arts and science, schools of home economics and of fine and applied arts, and a conservatory of music. In the academic year 1951–1952 it had a faculty of 61 and a full-time student body of 608. The buildings, grounds, and equipment were valued at $2,180,768, and the endowment totaled $1,141,285. There were 67,805 volumes in the library.

MOUNT ATHOS (Hagion Oros), autonomous monastic district, Greece. See Athos.

MOUNT CARMEL, city, Illinois, seat of Wabash County, situated at an altitude of 390 feet, on the Wabash River, 24 miles south-southwest of Vincennes, Ind. It is served by the Southern and the New York Central railroads and has a municipal airport. The city's industrial products include roofing materials, electronic equipment, clothing, and flour, and it has railroad shops. Settled in 1817, Mount Carmel was incorporated as a village in 1824 and as a city in 1865. Government is of the commission type, and the water supply system is municipally owned. Pop. (1950) 8,732.

MOUNT CARMEL, borough, Pennsylvania, situated in Northumberland County, at an altitude of 1,055 feet, 15 miles west-northwest of Pottsville, on the Pennsylvania, the Reading, and the Lehigh Valley railroads. The borough is the trading center for the surrounding anthracite coal region. Its industrial products include clothing, chemicals, cigars, and beer. First settled in 1794, Mount Carmel was incorporated in 1864. Government is administered by a chief burgess and council. Pop. (1950) 14,222.

MOUNT CLEMENS, city, Michigan, seat of Macomb County, situated at an altitude of 600 feet, on the Clinton River near its outlet into Lake St. Clair, and on the Grand Trunk Railway, 20 miles north-northeast of Detroit. The city's industrial products include pottery, cabin cruisers, trailers, automobile parts, farm implements, food products, electric ironers, and electric ranges. Mount Clemens is the seat of Selfridge Air Force Base.

Platted in 1818 by Christian Clemens, for whom it was named, Mount Clemens was incorporated as a village in 1837. For some years its

mainstay was the making of casks for the whalers of New Bedford, Mass. With the decline of whaling, development was at a standstill until 1868, when it was learned that water from local mineral springs had medicinal properties. Since then Mount Clemens has been a popular health resort. It was incorporated as a city in 1879. Government is of the commission type, and the water supply system is publicly owned. Pop. (1950) 17,027.

MOUNT DESERT, island, Maine, situated in Hancock County, off the southeast coast of the state, 40 miles southeast of Bangor. The largest island in Maine, it is about 14 miles long and 8 miles wide and has an area of approximately 100 square miles. It is separated from the mainland by Western Bay, Mount Desert Narrows (spanned by a bridge), and Frenchman Bay. The coastline is very irregular. It is indented on the north by Eastern Bay; on the south by Somes Sound, a fjord which extends for 6 miles into the center of the island; and on the west by Seal Cove and Western Bay. The surface is mountainous, rising to a height of 1,532 feet on Cadillac Mountain. There are several freshwater lakes in the interior. Acadia National Park, established in 1916 and covering 44.6 square miles, lies mainly on Mount Desert (it also includes Schoodic Peninsula on the mainland and part of Isle au Haut). There are five towns on the island: Mount Desert, incorporated in 1789; Bar Harbor, incorporated as Eden in 1796 and renamed in 1918; Cranberry Isles (1830); Tremont (1848); and Southwest Harbor, set off from Tremont in 1905.

The island was visited and named by Samuel de Champlain in 1604. A French colony was established on Somes Sound in 1613. In 1713 the island was ceded to Great Britain, and in 1762 the first permanent settlement was made. Since the late 19th century the island has been a popular summer resort. It was severely damaged by fire in 1947.

MOUNT DORA, town, Florida, situated in Lake County, at an altitude of 105 feet, on Lake Dora and the Atlantic Coast Line Railroad, 26 miles northwest of Orlando. The surrounding area raises citrus fruit, and the town has canneries, packing plants, and box factories. Mount Dora is a popular winter resort. Founded between 1880 and 1883, it was incorporated in 1910. Government is by mayor and council. Pop. (1950) 3,028.

MOUNT EPHRAIM, borough, New Jersey, situated in Camden County, at an altitude of 65 feet, 5 miles south of Camden. It has freight service via the Pennsylvania-Reading Seashore Lines. Settled in the 18th century, it was incorporated in 1926. Pop. (1950) 4,449.

MOUNT FOREST, town, Ontario, Canada, situated in Wellington County, on a branch of the Saugeen River and on the Canadian Pacific and Canadian National railroads, 38 miles northwest of Guelph. Its industrial establishments produce woolen textiles, clothing, agricultural machinery, baskets, and wood products. Pop. (1951) 2,291.

MOUNT HEALTHY, city, Ohio, situated in Hamilton County, 9 miles north of Cincinnati, of which it is a residential and industrial suburb. It produces clothing, brick, flour, dairy products, and tools. Founded in 1817, it is governed by a mayor and council. Pop. (1950) 5,533.

MOUNT HOLLY, unincorporated village, New Jersey, seat of Burlington County, situated at an altitude of 40 feet, on Rancocas Creek and the Pennsylvania Railroad, 18 miles east of Camden. Its industrial establishments produce shoes, children's sweaters, hosiery, upholstery fabrics, and leather goods.

Mount Holly was founded by Quakers in the 17th century. The first settlers were Thomas Rudyard and John Ridges, who purchased the site in 1676. The Friends' Meetinghouse, which has been restored, was built in 1775. The state legislature met here in 1779, and for a brief period the village was the capital of New Jersey. It became the county seat in 1796, and the courthouse, still in use, was built that year. Mount Holly was the home of John Woolman (q.v.), who is commemorated in the John Woolman Memorial Building (1771). Pop. (1950) 8,206.

MOUNT HOLYOKE COLLEGE, a college for women at South Hadley, Mass., founded by Mary Lyon (q.v.). Chartered in 1836, it opened in 1837 as the Mount Holyoke Seminary. The curriculum was gradually enlarged and the entrance requirements raised until a full college course was given, and in 1888 the name was changed to Mount Holyoke Seminary and College. In 1893 the seminary course was dropped, and the present name was adopted. Entrance to the college is by examination and by certificate from approved schools. The degrees of B.A. and M.A. are conferred. The campus includes over 600 acres. The principal buildings are Mary Lyon Hall, which occupies the site of the original building destroyed by fire in 1896; the Dwight Memorial Art Building; Lydia Shattuck Hall, for the chemistry department; the Cornelia Clapp Laboratory, for other sciences; Skinner Recitation Hall; the observatory; the gymnasium; Mary E. Woolley Hall, which contains a large auditorium and offices for college organizations and publications and for the alumnae secretary; and the library, which contained approximately 223,500 volumes in 1952. In that year the endowment of the college amounted to $7,422,038, and the buildings, grounds, and equipment were valued at $8,031,701. Students totaled 1,262 in the academic year 1951–1952, and the faculty numbered 133.

MOUNT JOY, borough, Pennsylvania, situated in Lancaster County, at an altitude of 360 feet, on the Pennsylvania Railroad, 12 miles west-northwest of Lancaster. Its industrial establishments produce shoes, cotton and woolen textiles, iron castings, toys, hardware, boxes, and chocolate. The borough was incorporated in 1851. Pop. (1950) 3,006.

MOUNT KISCO, village, New York, situated in Westchester County, at an altitude of 290 feet, on the New York Central Railroad, 36 miles north-northeast of New York City, of which it is a residential suburb. The village also has factories producing furniture, wood products, and machinery. There is a summer theater. Mount Kisco was incorporated in 1874 and is governed by a mayor and council. The water

supply system is publicly owned. Pop. (1950) 5,907.

MOUNT McKINLEY NATIONAL PARK, Alaska, situated in the Alaska Range, about 120 miles southwest of Fairbanks. It was established on Feb. 26, 1917. The park covers an area of 3,030.2 square miles and includes Mount McKinley (20,300 feet), the highest mountain in North America, and several other peaks. It is thickly wooded with white spruce, white birch, cottonwood, and willow trees. Among the wild animals found in the park are wolves, grizzly bears, white Alaska sheep, caribou, and moose. See also McKINLEY, MOUNT.

MOUNT MARY COLLEGE, Milwaukee, Wis., a Roman Catholic college for women founded in 1872 in Prairie du Chien, Wis., as St. Mary's Institute. It became St. Mary's Academy in 1897 and St. Mary's College and Academy in 1913. The present name was adopted in 1929, when the college was moved to Milwaukee. The degrees of B.A., B.S., and Ph.B. are conferred. The college has a campus of 79 acres and a library with 41,628 volumes (1951). In the academic year 1951–1952 there were 47 full-time faculty members and 606 students.

MOUNT MERCY COLLEGE, Pittsburgh, Pa., a Roman Catholic college for women founded in 1929 and chartered in 1933. The degrees of B.A. and B.S. are conferred. The college has a campus of 13 acres and a library with 30,632 volumes (1952). In the academic year 1951–1952 there were 45 faculty members and 472 students.

MOUNT MORRIS, village, New York, situated in Livingston County, at an altitude of 595 feet, on the Genesee River, 34 miles south-southwest of Rochester. It is served by the Pennsylvania and the Delaware, Lackawanna and Western railroads, and has a municipal airport. The village's industrial establishments produce canned food, condiments, and electrical appliances. Pop. (1950) 3,450.

MOUNT OLIVE, town, North Carolina, situated in Wayne County, at an altitude of 155 feet, on the Atlantic Coast Line Railroad, 14 miles south-southwest of Goldsboro. The surrounding area produces tobacco, cotton, and vegetables, and the town has a large bean market, a pickle cannery, and crate and lumber mills. Mount Olive was founded in 1839–1840. Pop. (1950) 3,732.

MOUNT OLIVER, borough, Pennsylvania, situated in Allegheny County, within the southern part of Pittsburgh. Incorporated in 1892, it is governed by a mayor and council. Pop. (1950) 6,646.

MOUNT PENN, borough, Pennsylvania, situated in Berks County, just southeast of Reading, of which it is a residential suburb. It also has hosiery mills. Mount Penn was laid out in 1884 and incorporated in 1902. Pop. (1950) 3,635.

MOUNT PLEASANT, city, Iowa, seat of Henry County, situated at an altitude of 725 feet, on the Burlington Route, 27 miles west-northwest of Burlington. The manufacture of pens is the city's leading industry. Mount Pleasant is the seat of Iowa Wesleyan College, a coeducational Methodist college founded in 1842; a county soldiers' and sailors' hospital; and a state hospital for the mentally ill. Incorporated in 1842, it is governed by a city manager. The water supply and electric lighting systems and an airport are municipally owned. Pop. (1950) 5,843.

MOUNT PLEASANT, city, Michigan, seat of Isabella County, situated at an altitude of 760 feet, on the Chippewa River and the Ann Arbor and the Chesapeake & Ohio railroads, 45 miles west of Bay City. In an area raising sugar beets, corn, beans, and other farm products, the city has a sugar refinery, a milk condensery, and flour mills. It also has factories making plumbing fixtures and automobile hardware, and it refines oil from nearby wells. Mount Pleasant is the seat of the Central Michigan College of Education (coeducational; 1892) and of a state home and school for feebleminded children. Incorporated as a village in 1875 and as a city in 1889, it has commission government. The water supply system and an airport are municipally owned. Pop. (1950) 11,393.

MOUNT PLEASANT, borough, Pennsylvania, situated in Westmoreland County, at an altitude of 1,105 feet, 30 miles southeast of Pittsburgh. It is served by the Baltimore & Ohio and the Pennsylvania railroads and by All American Airways. The borough is the trading center of a farming and coal-mining area. Its industrial establishments produce coke, cement products, cigars, and metal goods. Mount Pleasant is governed by a mayor and council. Pop. (1950) 5,883.

MOUNT PLEASANT, town, Tennessee, situated in Maury County, at an altitude of 625 feet, on the Louisville & Nashville Railroad, 12 miles west-southwest of Columbia. The surrounding area has phosphate mines and raises tobacco, corn, and wheat. The town's industrial establishments produce chemicals, fertilizer, and clothing. Mount Pleasant has a municipal airport. Pop. (1950) 2,931.

MOUNT PLEASANT, city, Texas, seat of Titus County, situated at an altitude of 395 feet, 55 miles west-southwest of Texarkana. It is served by the St. Louis Southwestern and the Paris & Mt. Pleasant railroads and has a municipal airport. The surrounding area produces cotton, vegetables, corn, lumber, and oil, and the city has oil refineries, milk processing plants, woodworking establishments, and pottery factories. Incorporated in 1900, Mount Pleasant is governed by a city manager and owns its water supply. Pop. (1950) 6,342.

MOUNT PROSPECT, village, Illinois, situated in Cook County, at an altitude of 670 feet, on the Chicago and Northwestern Railway, 20 miles northwest of Chicago, of which it is a residential suburb. The village also has factories producing stapling machines and kitchen equipment. First settled in 1832, Mount Prospect was incorporated in 1917 and is governed by a village president and a board of trustees. Pop. (1950) 4,009.

MOUNT RAINIER, town, Maryland, situated in Prince Georges County, 4 miles northeast of Washington, D.C., of which it is a residential suburb. It is governed by a mayor and council. Pop. (1950) 10,989.

MOUNT RAINIER NATIONAL PARK. See RAINIER, MOUNT.

MOUNT REVELSTOKE NATIONAL PARK, British Columbia, Canada, situated on the west slope of the Selkirk Mountains, 18 miles northeast of Revelstoke. It was established in 1914. The park contains a game sanctuary and is a center of winter sports and summer camping. Its spectacular scenery and profusion of alpine flowers attract many visitors.

MOUNT ROYAL, town, Quebec, Canada, situated on Montreal Island immediately adjoining the cities of Outremont and Montreal, on the northwest side of the height Mount Royal. A tunnel cut through the mountain by the Canadian National Railway Company in 1918 gives the town nine-minute electric railway service to the center of Montreal. There is also freight service via the Canadian Pacific Railway. Mount Royal has industrial establishments producing electrical apparatus, radios, tobacco, and beverages, but it is primarily a residential town. Its streets are attractively landscaped, and many of its buildings are of a local limestone. The park system includes a civic recreation center. Pop. (1951) 11,352.

MOUNT RUSHMORE NATIONAL MEMORIAL. See RUSHMORE, MOUNT.

MOUNT SAINT JOSEPH-ON-THE-OHIO, College of, a Roman Catholic college for women in Mount St. Joseph, Ohio. It was chartered in 1854 and opened in 1907, becoming a four-year college in 1920. The degrees of B.A., B.S., and B.Mus. are conferred. The college has a campus of 30 acres, a 400-acre farm, and a library containing about 30,000 volumes (1952). In that year the grounds, buildings, and equipment were valued at $1,279,726, and the endowment totaled $1,725,000. There were 52 faculty members and 432 students in the 1951–1952 academic year.

MOUNT SAINT MARY'S COLLEGE, Los Angeles, Calif., a Roman Catholic college for women, chartered in 1925. The degrees of B.A., B.S., and B.Mus. are conferred. It has a 54-acre campus and a library containing 32,700 volumes (1952). In that year the buildings, equipment, and grounds were valued at $1,000,000. In the 1951–1952 academic year there were 50 faculty members and 467 students.

MOUNT SAINT MARY'S COLLEGE, Emmitsburg, Md., a Roman Catholic college for men, founded in 1808 and chartered in 1832. The degrees of B.A. and B.S. are conferred. The campus covers 1,300 acres, and the library has 38,000 volumes (1952). In 1951–1952 the college had 25 faculty members and 588 students.

MOUNT SAINT SCHOLASTICA COLLEGE, Atchison, Kans., a Roman Catholic college for women founded as an academy in 1863. It became a junior college in 1924 and a senior college in 1930. The degrees of B.A., B.S., and B.Mus. are conferred. The college has a 62-acre campus and a library containing 31,700 volumes (1952). In the 1951–1952 academic year there were 29 faculty members and 345 students.

MOUNT SAINT VINCENT, College of, New York, N. Y., a Roman Catholic college for women, founded in 1910 and chartered in 1911. The degrees of B.A. and B.S. are conferred. The college has a 96-acre campus and a library containing 25,542 volumes (1952). In that year the grounds, buildings, and equipment were valued at $2,779,510. There were 46 faculty members and 446 students in the 1951–1952 academic year.

MOUNT STERLING, city, Kentucky, seat of Montgomery County, situated at an altitude of 940 feet, on the Chesapeake & Ohio Railroad, 16 miles east-northeast of Winchester. The surrounding area raises livestock, poultry, tobacco, and grain. The city's industrial establishments produce flour, gloves, cotton fabrics, candy, butter, crushed lime, and concrete and lumber products. Mount Sterling was laid out in 1793 and was first called Little Mountain Town. In December 1863 it was taken by Confederate troops. Government is by mayor and council. Pop. (1950) 5,294.

MOUNT UNION, borough, Pennsylvania, situated in Huntingdon County, at an altitude of 600 feet, on the Juniata River, 22 miles southwest of Lewistown. It is served by the Pennsylvania and the East Broad Top railroads and by All American Airways. The borough's industrial establishments produce clothing, bricks, concrete blocks, and creosote. Laid out in 1849, Mount Union was incorporated in 1867. Pop. (1950) 4,690.

MOUNT UNION COLLEGE, Alliance, Ohio, a coeducational college founded in 1846 by the Methodist Church. It was called the Select School until 1849, when it became Mount Union Seminary. In 1858 it was chartered and received its present name. Scio College, of Scio, Ohio, was united with it in 1911. The degrees of B.A., B.S., and B.Mus. are conferred. In the 1951–1952 academic year the college had 49 faculty members and 670 full-time students.

MOUNT VERNON, city, Illinois, seat of Jefferson County, situated at an altitude of 475 feet, 79 miles east-southeast of St. Louis, on the Southern, the Missouri Pacific, the Chicago & Eastern Illinois, and the Louisville & Nashville railroads. There is a municipal airport. The city is the trading center for an area producing oil and raising apples, peaches, and poultry. Its industrial establishments produce freight cars, shoes, stoves and furnaces, hosiery, electrical machinery, clothing, and food products. Mount Vernon has a public library, a general hospital, and a children's home. Settled in 1819 by colonists from Virginia and the Carolinas, it was incorporated in 1837 and chartered as a city in 1872. Government is by mayor and council. Pop. (1950) 15,600.

MOUNT VERNON, city, Indiana, seat of Posey County, situated at an altitude of 375 feet, on the Ohio River near the mouth of the Wabash, 20 miles west-southwest of Evansville. It is

served by the Chicago & Eastern Illinois and the Louisville & Nashville railroads and has a municipal airport. The surrounding area produces oil and raises corn, wheat, hay, and vegetables. The city has machine shops, oil refineries, factories producing handles and farm and mine equipment, and food-processing plants. Settled in 1816, Mount Vernon was incorporated in 1865. Government is by mayor and council. Pop. (1950) 6,150.

MOUNT VERNON, city, New York, situated in Westchester County, at an altitude of 115 feet, on the Bronx and Hutchinson rivers, adjacent to New York City on the northeast. It is served by the New York Central and the New York, New Haven and Hartford railroads. Though primarily a residential suburb of New York City, Mount Vernon has considerable trade and a number of industries. Its chief manufactures are clothing, chemicals, electrical and office equipment, oil burners, weather stripping and metal screens, radio and X-ray equipment, truck bodies, bricks, optical lenses, and air-conditioning equipment. The city's educational and recreational facilities include two senior and four junior high schools, a public library, and several parks, playgrounds, and recreation centers.

In 1642, Anne Hutchinson (q.v.) settled on the site of what later became Eastchester, now part of Mount Vernon. Here in 1643 her house was burned, and she and all her household except her youngest daughter were massacred by the Indians. In 1664, 10 families were transplanted to the site from Fairfield, Conn., by Thomas Pell (who established Pelham Manor), and the village of Eastchester sprang up. Out of the celebrated election held here in 1733, at which Lewis Morris (q.v.) was chosen to represent the town of Eastchester in the Assembly, against the opposition of Governor William Cosby, by whom he had been deposed as chief justice of the province, grew the founding of the New York *Weekly Journal* and the trial of John Peter Zenger (q.v.), by which the principle of the freedom of the press was first established in America. St. Paul's Parish was founded in 1665, and the present St. Paul's Church, made a national historic site in 1943, was begun about 1761, though not completed until 1788. The city of Mount Vernon is largely the outgrowth of a planned community launched here in 1850 by the Home Industrial Association, which had been formed that year by persons of moderate means, then residing in New York City, who sought to escape the high realty values of the metropolis through a program of cooperative home building in this less populous area. It was chartered in 1892. Government is by mayor and council. Pop. (1950) 71,899.

MOUNT VERNON, city, Ohio, seat of Knox County, situated at an altitude of 990 feet, on the Kokosing River and the Pennsylvania and the Baltimore & Ohio railroads, 27 miles south of Mansfield. Its industrial establishments produce cellophane, plate glass, milk bottles, bits for rock drills, fabricated steel, and steam, diesel, and gas engines. Here Daniel Decatur Emmett (q.v.), author of *Dixie,* was born. John Chapman (Johnny Appleseed), in a deed for three lots in Mount Vernon sold in 1828, described himself as "by occupation a gatherer and planter of apple seeds." Mount Vernon was incorporated in 1805. Government is by mayor and council. Pop. (1950) 12,185.

MOUNT VERNON, city, Washington, seat of Skagit County, situated at an altitude of 25 feet, on the Skagit River, 27 miles south-southeast of Bellingham. It is served by the Great Northern Railway and West Coast Airlines. The surrounding area raises peas, poultry, and dairy cattle, and the city has canneries, food-processing plants, and woodworking establishments. Mount Vernon Junior College was established in 1926. Government is by mayor and council. Pop. (1950) 5,230.

MOUNT VERNON, home and burial place of George Washington, Fairfax County, Va., situated on the south bank of the Potomac River and on the Mount Vernon Memorial Highway, about 15 miles below Washington, D.C. The original name of the estate was Little Hunting Plantation, and it contained about 5,000 acres. When the portion known as Hunting Creek came into the possession of Lawrence Washington, half brother of George, in 1743, he changed the name to Mount Vernon, in honor of Admiral Edward Vernon of the British Navy. The main part of the house was built by Lawrence, and a third story and wings were added by George, who inherited the estate two years after Lawrence's death in 1752. After Washington's death in 1799, the house and estate passed to his nephew, Bushrod Washington. The last private owner, John A. Washington, Jr., sold the house and 200 acres of land around it to the Mount Vernon Ladies' Association, which was organized in 1856 and took possession in 1860. Since then the association has restored the house as nearly as possible to its condition during the lifetime of George Washington.

The house stands on a bluff 200 feet above the Potomac. Of wood, painted white, it is three stories high, 96 feet long, and 30 feet deep. A high piazza extends along the front, and the six rooms on the ground floor contain many objects of historical interest connected with the life and times of Washington. In the garden are a number of trees which he planted, and in the coach house is his carriage. Near a wood ravine a short distance from the house is a tomb, a plain brick structure erected between 1831 and 1837, containing the sarcophagi of the president and his wife, Martha.

MOUNTAIN ASH, urban district, Wales, situated in Glamorganshire, on a tributary of the Taff River, 5 miles south of Merthyr Tydfil. The principal industry is coal mining. A musical festival is held annually in the Eisteddfod Hall here. Pop. (1951) 31,528.

MOUNTAIN ASH, the popular name of any of a number of trees or shrubs of the genus *Sorbus.* The European mountain ash or rowan tree (*S. aucuparia*), which grows to a height of 50 feet, has ashlike, pinnate leaves and small, yellowish white flowers, followed by globular, orange-red pomes. Its hard, compact wood is used by cabinetmakers. It is often planted for ornament in the United States. Closely resembling it is the principal North American species, *S. americana,* which grows to a height of 30 feet and ranges from Newfoundland to North Carolina. Another American species, *S. scopulina,* has larger fruit,

MOUNT VERNON

Harris & Ewing

The stately main facade of Mount Vernon, home of George and Martha Washington.

The west front at Mount Vernon.

Ewing Galloway

MOUNT VERNON

Above: The Blue bedroom, furnished in the style of Washington's day, contains many authentic Mount Vernon pieces.

Left: The elegant music room, with the harpsichord Washington imported for his stepdaughter, Nellie Custis.

Below: The kitchen at Mount Vernon, showing the various cooking utensils used in Washington's time. The kitchen is located in an outbuilding connected by colonnade to the mansion.

Photos from Harris & Ewing

and its leaves are more like those of the elder. Both American species are often found as shrubs.

MOUNTAIN BEAVER. See SEWELLEL.

MOUNTAIN BROOK, city, Alabama, situated in Jefferson County, adjacent to the south side of Birmingham, in the north central portion of the state. Incorporated as a city in 1942, Mountain Brook is a residential community, served by two United States highways and a branch of the Louisville & Nashville Railroad. Pop. (1950) 8,359.

MOUNTAIN CLIMBING, a highly active sport, now practiced in all parts of the world. It varies from making gentle ascents on easy terrain to scaling seemingly impossible crags, needles, faces, and peaks, where specialized equipment and techniques are called into play. Even where the mountain itself is comparatively easy, high altitudes, severe climatic conditions, and physical fatigue may complicate the ascent. Experience and judgment are needed to evaluate properly objective dangers, such as rocks falling across otherwise easy routes, avalanches, sudden changes of weather, and lightning.

Equipment.—For all climbing involving technical difficulty, the climber must be shod in special boots. Leather boots with deeply cleated rubber soles have generally replaced the heavily nailed boot used before World War II, as well as, in many cases, the lighter felt or rope-soled *Kletterschuh,* or rock-climbing shoe. A 120-foot nylon rope, 7/16 inch in diameter, is the other essential piece of equipment for climbing of any difficulty at all. Although the rope is occasionally used as a direct climbing aid, its normal function is as a safeguard to the two or three climbers who rope themselves together; if one slips, the others, with the rope well belayed, prevent his falling any great distance. Since the leader on the ascent, or the last man down on the descent, has no rope from above to safeguard him, he may fall double the distance between him and the next man; the best climber, therefore, is always placed in that position.

Rock Climbing.—In rock climbing of any real difficulty the leader climbs upward, grasping handholds mainly for balance and lifting his body mostly with his legs. The other members of the rope team belay or secure the rope, paying it out to the leader as he needs it. The rope may be belayed around the climbers' bodies, on projecting rocks, or by means of pitons. Pitons are steel spikes with an eye, which are driven solidly into a crack in the rock by a piton hammer. A snaplink or *Karabiner* is snapped into the eye of the piton, and the rope in turn is snapped into this. A piton may be on the same level as the belayer, or may be driven part way up a long lead to give the leader protection at a point well above his companions. When he reaches a secure belay point, he belays his second man as the latter climbs up to him. Only on comparatively easy rocks does the whole party climb simultaneously.

Pitons may also be used as a direct aid when holds are too small. In this rope-tension climbing the leader drives a piton as high above him as he can, and attaches the rope to it by means of a snaplink. As he leans out against the tension of the rope firmly held below, his feet adhere even to vertical faces. He climbs slowly upward, while the second man keeps taking in the rope. A stirrup may be hung from a piton to allow a climber to surmount an overhang.

Climbing down may prove to be troublesome because of the difficulty of seeing what lies below; on a steep or overhanging descent it may be necessary to rope down or *rappel.* The middle of the rope is laid over a projecting rock, through a loop or rope or through a piton, and the two ends are allowed to drop. The climber then winds both strands around his body in such a way that he can slide in a sitting position slowly down the rope with complete control. After the last man has descended, the rope is brought down by pulling on one end of it, until it has been pulled over the *rappel* point and drops down.

Snow and Ice Climbing.—Snow and ice climbing may involve travel on a glacier or the ascent of steep slopes and ridges. Under all circumstances the climber must wear dark glasses to avoid snow blindness. The ice ax, which serves here as in other types of terrain as a walking stick and an aid to balance, is essential. On a glacier, especially where crevasses may lie hidden under winter snow, the ice ax is used to probe for crevasses and to test how solid the snow bridges across them are. The ice ax is also driven into the snow or ice to act as a belay point both in crevassed areas and on steep slopes. On steep slopes the leader frequently has to cut steps in the ice or hard snow in order to give good footing. Crampons are an additional aid on hard snow and ice. They are a framework of steel spikes which can be strapped onto the bottom of the boots to give excellent traction. Special ice pitons are also sometimes used.

HISTORY

Europe.—Mont Blanc (15,781 feet), highest of the Alps, was the first mountain to attract climbers. Although the Genevan scientist Horace Bénédict de Saussure offered a prize in 1760 to the first person who would climb the mountain, it was not until 1786 that the physician Michel Gabriel Paccard and the peasant Jacques Balmat reached the summit. De Saussure climbed the peak the following year with Balmat and other guides. In 1800 the Grossglockner and in 1804 the Ortler were climbed. The Swiss brothers Rudolph Johann and Hieronymus Meyer reached the summit of the Jungfrau in 1811, and in 1829 the guides of Franz Joseph Hugi climbed the Finsteraarhorn, the highest peak of the Bernese Oberland.

Climbing, however, remained sporadic until Sir Alfred Wills' ascent of the Wetterhorn in 1854 opened the "golden age" of mountaineering. Peak after peak was conquered, mainly through the efforts of English climbers, who founded the Alpine Club in 1857. The highest summit of Monte Rosa was surmounted in 1855. John Tyndall and his guide, Johann Joseph Bennen, ascended the Weisshorn in 1861. The golden age was brought to a close in 1865 with the tragic ascent of the last of the great Alpine peaks, the Matterhorn, by Edward Whymper and his unfortunate companions. By 1900 nearly every Alpine summit had been climbed. Since then remarkable new routes have been ascended, many of them incredibly difficult.

An English party under Douglas W. Freshfield explored the Caucasus for the first time in 1868 and climbed the east peak of Elbrus and Kazbek. In 1874 F. Crauford Grove, Francis

Walker, Frederick Gardiner, and the Swiss guide Peter Knubel reached the main summit of Elbrus (18,481 feet), the highest point in Europe. In 1888 the remaining principal Caucasian summits, Shkara, Janga-Tau, Koshtan-Tau, Dykh-Tau, and the north peak of Ushba fell to English climbers.

Africa.—Africa's highest summit, Kilimanjaro (19,565 feet), was reached by the Germans Hans Meyer and Ludwig Purtscheller in 1889. More difficult Kenya (17,040 feet) fell to Sir Halford J. Mackinder's party in 1899. In 1906 Prince Luigi Amedeo of Savoy-Aosta, duke of the Abruzzi, managed to ascend Ruwenzori (16,795 feet), although plagued by the incessantly bad weather which had prevented earlier parties from succeeding.

Asia.—The Himalayas have long been the goal of mountaineering expeditions. Shilla (23,050 feet), climbed by surveyors in 1851, held the altitude record for the highest summit yet reached, until Tom G. Longstaff ascended Trisul in 1907 (if W. W. Graham's disputed ascent of 24,002-foot Kabru is not accepted). Lenin Peak (formerly Mount Kaufmann, 23,382 feet) in the Pamirs next held the record after Eugen Allwein, Erwin Schneider, and Karl Wien climbed it in 1928. Jonsong Peak (24,340 feet), climbed by Francis S. Smythe, Gunther O. Dyhrenfurth, and others in 1930, and Kamet (25,447 feet), ascended by Smythe's party in 1931, next held the record. The next year the Americans, Terris Moore and Richard L. Burdsall, narrowly missed the record when they climbed Minya Konka (24,900 feet) in western China. In 1936 Noel E. Odell and H. W. Tilman of the American-British party on Nanda Devi (25,645 feet) achieved the record which was to stand for 14 years. The French Maurice Herzog and Louis Lachenal in 1950 were successful on Annapurna (26,492 feet), and held the record until Sir Edmund P. Hillary and Tenzing Norgay finally reached the crest of Mount Everest (29,028 feet) in 1953.

Early exploration of the Himalayas was carried on mainly by the British: W. W. Graham (1883) in Sikkim and Garhwal, India; Sir William Martin Conway (1892) in the Karakoram Range; Freshfield (1889) around Kanchenjunga. The Americans Dr. and Mrs. William Hunter Workman made six expeditions between 1899 and 1912. K^2 (28,250 feet), second highest mountain in the world, was attacked by the duke of the Abruzzi, who declared it unclimbable. Charles S. Houston and Paul Petzoldt of the 1938 American expedition reached 25,600 feet on K^2 before time and food ran out. Fritz Wiessner and Pasang Dawa Lama got to 27,500 feet in 1939, but unfortunately one American and three Sherpa porters were lost. In 1953 the third American K^2 expedition, led by Dr. Charles S. Houston, after weeks of bad weather, was driven from its camp VIII at the base of the summit pyramid to carry down seriously ill Arthur Gilkey, who was tragically lost during the descent. A strong Italian expedition led by Professor Ardito Desio finally climbed K^2. Following the American route, Achille Compagnoni and Lino Lacedelli reached the summit of K^2 on July 31, 1954. Two Bavarian expeditions led by Paul Bauer in 1929 and 1931, to Kanchenjunga (28,146 feet), third highest mountain in the world, failed on the exceedingly difficult northeast spur; their high point was 25,263 feet. The 1930 Dyhrenfurth expedition to the same mountain failed on the northwest because of avalanches. A British expedition, led by Dr. Charles Evans, successfully ascended the incredibly difficult southwest face of Kanchenjunga from the Yalung Glacier. On successive days, May 25 and 26, 1955, two separate pairs reached the summit. These were George Band with Joseph Brown, and Norman Hardie with H. R. Anthony Streather. Nanga Parbat (26,660 feet) was attacked in 1895 by Alfred F. Mummery, who disappeared with his porters, and in 1932, 1934, 1937, 1938, and 1939 by German expeditions. The lives of 14 climbers and 17 porters were lost on the mountain before Herman Buhl made his successful climb in 1953. The world's fifth and sixth highest peaks have also been ascended. Makalu (27,790 feet) fell to a French party, which made the remarkable achievement of getting to the top all the Frenchmen: Lionel Terray, Jean Couzy, Jean Franco (leader), Guido Magnone, Jean Bouvier, Pierre Leroux, Serge Coupé, and André Vialatte, and the Sherpa Gyalzen in mid-May 1955. Cho Oyu (26,867 feet) was climbed by the ultra-light-weight expedition under the Austrian Dr. Herbert Tichy on Oct. 19, 1954. Dr. Tichy was accompanied on this expedition by Sepp Jochler and the Sherpa Pasang Dawa Lama.

Seven British attacks (1921, 1922, 1924, 1933, 1935, 1936, and 1938) on Mount Everest from the northern Tibetan side all ended in failure. In 1924 Edward F. Norton and Theodore H. Somervell reached over 28,000 feet, a point equaled, but not exceeded, by later climbers on this route. In this same year George Leigh Mallory and Andrew C. Irvine climbed into the mists high on the mountain, never to be seen again. The route to the southern Nepalese side was reconnoitered by American Dr. Charles S. Houston and British H. W. Tilman in 1950. A British expedition under Eric Shipton failed in the Khumbu icefall in 1951. The next year the Swiss successfully pioneered a route over the South Col, and Raymond Lambert and Tenzing reached a point only about 900 feet from the summit. Hillary and Tenzing made the first ascent of Everest on the same route.

South America.—The Ecuadorian Andes received early attention. In 1872 the German Wilhelm Reiss with A. M. Escobar climbed the world's highest active volcano, 19,344-foot Cotopaxi. Eight years later Whymper ascended Chimborazo (20,577 feet) and other nearby peaks. The highest mountain in the Western Hemisphere, Aconcagua (22,835 feet) in Argentina, was unsuccessfully attempted by the German Paul Güssfeldt in 1883. Mattias Zurbriggen of the Edward A. Fitzgerald expedition of 1897 made the first ascent alone. The same expedition also surmounted Tupungato (21,490 feet). Illimani, which rises to an altitude of 21,185 feet above the Bolivian capital of La Paz, was climbed in 1898 by Sir William Martin Conway. Americans have played a part, too, in the conquest of the Andes. In 1908 Miss Annie S. Peck added Huascarán, the highest Peruvian peak (22,205 feet), to her list of first ascents. Three years later Hiram Bingham's Yale Peruvian expedition made the first ascent of Coropuna (21,696 feet). Since World War II Americans have again been active in the Peruvian Andes. James C. Maxwell and David Harrah with a Harvard expedition in 1950 climbed extremely difficult Yerupaja (21,758 feet), and most of the same group joined a small French party to scale 20,550-foot Salcantay in 1952. Fitz Roy, an 11,073-foot sheer

Above: Tenzing Norgay, Mount Everest conqueror, on a ridge at 20,000 feet.

MOUNTAIN CLIMBING

Right: Tenzing Norgay wearing an open circuit oxygen apparatus.

Below: Sir Edmund P. Hillary, after ascent, looks at the still-proud summit of Mount Everest.

(Top and bottom) British Information Services; (right) Associated Press Photo

British Information Services

Above: Camping on Everest; Hillary adjusts one of the tents. *Below:* At an altitude of 20,000 feet a member of the British 1953 Mount Everest Expedition peers into the Pit of Death, "Chrongshay."

Free-Lance Photographers Guild

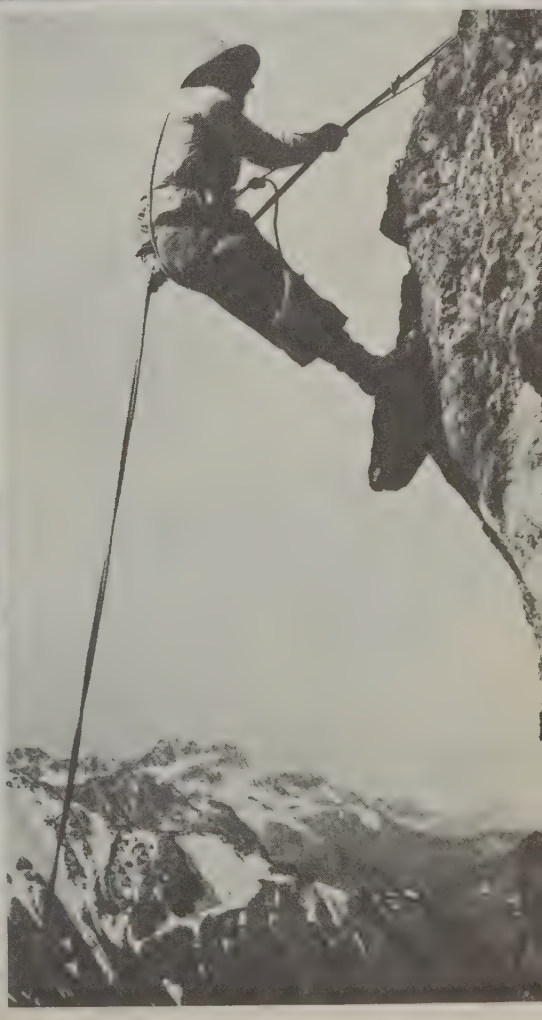
Above: Fitz Roy peak in the Patagonian Andes climbed by a French party in 1952.

MOUNTAIN CLIMBING

Right: A climber in the mountains of Davos, Switzerland.

(Above) Wide World Photos; (below) Associated Press Newsphoto from Wide World; (right) Ewing Galloway

Below: K^2, the world's second highest peak, first climbed in 1954 by an Italian expedition.



Above: Kanchenjunga (28,146 feet), the world's third highest peak, on the Nepal-Sikkim border, seen from a camp of the German expedition at the 21,000-foot level, during their unsuccessful attempt in 1931. *Below:* The Italian expedition training on the Alpine Breithorn glacier for their victorious assault on the second highest peak, K^2, achieved July 31, 1954.

Wide World Photos

spire in Chilean Patagonia, was climbed by the French Lionel Terray and Guido Magnone in the same year.

North America.—Gigantic St. Elias, rising to 18,008 feet from tidewater, was the first peak in Alaska to attract climbers. Israel C. Russell's second expedition in 1891 reached 14,500 feet. The mountain was finally climbed in 1897 by the duke of the Abruzzi on the sixth expedition to the peak. Mount Wrangell (14,005 feet) was ascended in 1908 by Robert Dunn and William Soule, and four years later Miss Dora Keen and G. W. Handy climbed Mount Blackburn (16,140 feet). The highest point in North America, Mount McKinley (20,270 feet), was explored by Dr. Frederick A. Cook of North Pole fame, who falsely claimed to have climbed it in 1906. In 1910 two Alaskan prospectors, Pete Anderson and Billy Taylor, climbed the north peak, some 300 feet lower than the main summit, ascending 9,000 feet from the Muldrow Glacier in one day. Belmore Browne and Herschel C. Parker reached a point only 300 feet from the summit in 1912 before being driven back by storm. The next year Archdeacon Hudson Stuck's party completed the ascent. Since World War II various new routes have been made up Mount McKinley. The highest mountain in Canada, across the border in Yukon Territory, Mount Logan (19,850 feet) fell to a Canadian-American party under the leadership of Capt. Albert H. MacCarthy in 1924. In the 1930's a large number of Alaskan and Yukon peaks were first successfully climbed, many under the leadership of Bradford Washburn, Alaska's leading explorer-mountaineer. These included Mounts Foraker (17,280 feet), Lucania (17,150 feet), Sanford, Crillon, St. Agnes, Hayes, Bona, Fairweather, and Steele. Since World War II most of the other Alaskan and Yukon giants have been climbed, including Mounts King, Vancouver, Hubbard, and Alverstone.

After many unsuccessful earlier attempts the highest of the Canadian Rockies, 12,972-foot Mount Robson, was ascended by William W. Foster and A. H. MacCarthy with the guide Conrad Kain in 1913. This ascent has rarely been repeated. The highest summit of the interior ranges, Mount Sir Sandford (11,590 feet) in the Selkirks, was first climbed in 1912 by Edward W. D. Holway and Howard Palmer, with the Swiss guides Rudolph Aemmer and Edward Feuz. Mount Waddington (13,260 feet), the highest point in the British Columbian Coast Mountains, successfully resisted a dozen serious attempts, until William House and Fritz Wiessner forced their way to the summit of the ice-coated sheer spire in 1936.

Mountain climbing is an important sport in many of the lower ranges of the United States, such as the White and Green Mountains and the Adirondacks of the Northeast. Regions calling for more advanced technique include the Tetons and Wind River Range of Wyoming, the Colorado Rockies, the Cascades and Olympics of the Northwest, and the Sierras of California. Major mountaineering clubs are the American Alpine Club with headquarters in New York, N. Y.; Appalachian Mountain Club, Boston, Mass.; Colorado Mountain Club, Denver, Colo.; Iowa Mountaineers, Iowa City, Iowa; Mazamas, Portland, Oreg.; Mountaineers, Seattle, Wash.; Sierra Club, San Francisco, Calif.; and the Alpine Club of Canada.

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MOUNTAIN GOAT. See ROCKY MOUNTAIN GOAT.

MOUNTAIN GROVE, city, Missouri, in Wright County in the southern part of the state, 55 miles east of Springfield. The city lies in the Ozark Mountains, at an altitude of 1,475 feet, on the St. Louis-San Francisco Railway. The surrounding area is an agricultural and timber region, and Mountain Grove has become a trade center, where dairy produce, lumber, and shoes are manufactured and are also distributed. Pop. (1950) 3,106.

MOUNTAIN LAUREL, a shrub or occasionally a small tree, *Kalmia latifolia,* in the heath family (Ericaceae), also called calico bush and spoonwood. It sometimes attains a height of 40 feet and a diameter of 18 inches near the base, but usually is smaller. The leaves, mostly grouped near the ends of the branches, are alternate, opposite, or in whorls of three, evergreen, leathery, dark green above, lighter below. They are two to four inches long and about one inch wide. The attractive, showy flowers are approximately an inch across, borne on glandular-hairy stalks, and clustered. They are white to pink, with purplish markings inside. The 10 anthers of each flower are inserted in pouches in the fused corolla. If an insect probing for nectar touches the stamens at the base of the filaments when the flowers are mature, the anthers spring free and discharge pollen from the pores by which they open, onto the insect's body; the same effect may be produced by touching the stamens with the point of a pencil. The fruit is a thick-walled, dark, five-celled capsule. A variety of *K. latifolia* with deep pink petals, another with the petals separate, and a third with smaller leaves, have been described. Mountain laurel is native of eastern North America, where it extends from New Brunswick and Ontario to Indiana, and south through the Appalachians to Louisiana and Florida. It grows along rocky stream banks or in gravelly soil, in acid conditions, usually in shade, but also in the open if moisture is sufficient, and at times in swamps. It is often used as an ornamental in eastern North America, more sparingly in Europe. The sheep laurel, *K. angustifolia,* and the swamp laurel, *K. polifolia,* of North America, are related to the mountain laurel, but not the laurel of the classics and of poetry, which is *Laurus nobilis* of the Mediterranean region.

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MOUNTAIN LION, a popular name in the United States for the large American unspotted cat more generally known as puma (q.v.).

MOUNTAIN MEADOWS MASSACRE, the slaughter of a party of California-bound emigrants near Mountain Meadows, Utah, in Washington County, in September 1857. The emigrants, numbering about 137 persons from Arkansas and Missouri, were attacked by a large band of Indians, while encamped at Mountain Meadows. They held their own for three days, when they were promised safe passage by John D. Lee (q.v.), a Mormon elder and settler. Leaving the protection of their wagon barricades, they were treacherously attacked and killed by a party of Indians and whites, under the leadership of Lee. Only 17 small children were spared. The Mormons were generally blamed for the deed, although their leader, Brigham Young, had pledged his people to protect non-Mormons from Indian violence. The actual attack was probably precipitated by the lawless arrogance of the emigrants themselves, although the Mormons' fear of an impending punitive expedition by the federal government may also have been a contributing cause. The case was investigated for many years, and Lee was finally brought to trial in 1875, 18 years after the event. He was convicted and executed (1877), but a number of others accused of complicity went free.

MOUNTAIN MEN, fur trappers and traders who explored the region west of the Rocky Mountains in the 1820's and 1830's. The Western fur trade really began with the St. Louis Missouri Fur Company, chartered in 1809 under the leadership of Manuel Lisa, Pierre and Auguste P. Chouteau, and William Clark of the Lewis and Clark expedition. Later John Jacob Astor's American Fur Company entered the field. The advent of the mountain men, however, began with the company formed in 1822 by William H. Ashley (q.v.), later known as the Rocky Mountain Fur Company. Ashley meant to confine activities to trapping and trading in the familiar area of the Missouri Valley, but competition drove his trappers into the unknown regions of the Rockies, where they were forced into the way of living peculiar to the mountain men. Many of the great trappers were associated with Ashley: James Bridger, Thomas Fitzpatrick, Christopher (Kit) Carson (qq.v.), Henry Fraeb, Jedediah Smith, and the Sublette brothers, William and Milton. These men, singly or in small groups, made the first trails to Oregon and California, and the routes which they followed have become the major highways of today.

There were three types of mountain men: the hired trapper, paid an annual wage by a fur company; the skin trapper, who dealt with a single company; and the free trapper, aristocrat of the trade, who trapped and disposed of his furs as he pleased. The latter was most typical of the true mountain man. Mountain men were of various origins: French, Spanish, and American; but the stringent demands of their existence stamped out all differences, and they became a group apart, more savage than civilized.

The life of the trapper was a hazardous one; his enemies included the land, the Indian, and the rival trapper. The heyday of the Western fur trade was marked by fierce competition, and every means was used to hamper the activities of rival trappers, including the instigation of Indian attacks. The land was strange and hostile, and the trapper moved always deeper into unknown territory in his relentless search for beaver. He fought the Indians and lived with them; he adopted their way of life, their clothing, food, and shelter, and married their women. Men chose this life for adventure, for money, or as a refuge from the law, and their way of life became legendary.

Each spring the trappers gathered at a predestined spot in a mountain valley, usually in Utah or Wyoming. This meeting, known as the trappers' rendezvous, became the characteristic institution of the mountain men. To it came trappers and traders, Indians and white men, and caravans from St. Louis laden with supplies of food and luxuries to trade for furs. There the trapper disposed of his year's haul, and usually spent his earnings in a few days' riotous living, often going into debt for much of his next season's catch.

By 1840 the beaver hat was unfashionable and the price of pelts dropped radically. The fur trade declined, and the trappers became traders, Indian scouts, and guides, leading missionaries and homesteaders over the trails and routes which they had broken. See also the section on *History* in the following articles: MISSOURI; MONTANA; ST. LOUIS; WYOMING.

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MOUNTAIN PROVINCE, province, Philippines, comprising the northern inland section of Luzon Island, between latitudes 16° and 18° N. and longitude 121° E. It is the largest province in Luzon, with an area of 5,458 square miles and a population (1948) of 278,120. The population density is 51.0 persons per square mile. The province lies mostly in mountainous terrain, and includes in its southern area all of the Cordillera Central; in the north are the eastern slopes of the same range. Mountain Province is bounded by the provinces of Cagayan, Isabela, and Nueva Vizcaya on the east, and Abra, the Ilocoas, and La Union on the west. There are many rivers: the Magat forms part of the eastern boundary, and the Chico traverses the eastern and central sections; the Agno and Abra rivers drain the south. The climate is hot and humid, and the temperate zone begins only after an altitude of over 4,000 feet is reached. The highest peaks in the province are Mounts Pulog (9,606 feet), Cauitan (8,427 feet), and Santa Tomas (7,480 feet).

Mountain Province is composed of five subprovinces: Apayao, Benguet, Bontoc, Ifugao, and Kalinga. It has 38 towns, the provincial capital being Bontoc (pop. 1948, 15,005) in Bontoc Subprovince. Baguio (pop. 1952, 31,510), 125 miles northwest of Manila, is the cultural and educational center. It is geographically located in Benguet, but has been removed from provincial jurisdiction, and is administered by the central government, of which it is the summer capital. Baguio has a mean annual temperature of 64.2°F., about 17 degrees cooler than elsewhere in the Philippines, and consequently has become a popular modern resort.

Mountain Province is an important educational center, with 415 elementary, intermediate, and secondary schools, and eight colleges. Economically the most developed area is Benguet in the south. It is also the most densely populated subprovince, with about 106 persons per square mile.

The province is largely inhabited by native tribes of Apayaos, Bontocs, Igorots, Ifugaos, and Kalingas, pagans of Malayan stock, who have de-

veloped an ingenious agricultural and irrigation system, and do very fine metalwork, wood carving and pottery making. The Banaue rice terraces in Ifugao Subprovince are world famous. Built over a period of 1,500 years by the Igorot tribes, they are an astounding feat of engineering. They extend for a distance of 1,200 miles, and rise steplike up the steep mountain sides to a height of 4,000 feet.

Economic Development.—Farming is the dominant occupation. Trinidad Valley in Benguet Subprovince is an important vegetable-growing center, and excellent tobacco is grown in Apayao. The most important crop is rice, but only enough is grown in the province to supply 50 per cent of its needs. About 25 per cent of the rice grown is used in making *tapey* (rice wine). Fruit-growing, cattle-raising, and poultry-raising projects are being systematically encouraged and developed.

Lumbering is an important factor in the economic life of the province. Luxuriant pine forests in Benguet and Apayao supply the nation's building industry with much of its raw material. In 1953 the output of the largest lumber concern ran 500,000 board feet per month, only about 25 per cent of the prewar output, but adequate for current needs.

Mining is another important factor in the province's economy. The largest copper and gold mines in the Far East are located at Mankayan, in Bontoc, about 35 miles north of Baguio. In 1952 the Lepanto-Consolidated produced 12,462 tons of copper, and four mines produced 335,403 ounces of gold and 372,415 ounces of silver.

Resources of water power, largely neglected until recently, are being rapidly developed. The Agno River Project is the biggest source of water power in Luzon. Seven plants, when completed, will develop 430,000 kilowatts, with an energy availability of 1.5 billion kilowatt hours. Six of these, with a total of 355,000 kilowatts, are to be located in Benguet. An earth dam, 450 feet high, is being built at Ambukloa in Benguet, to store 260 million cubic meters of water, and a 75,000-kilowatt power plant, under construction at Ambukloa, was scheduled to be completed in mid-1955. A single circuit 230,000-volt line will transmit inexpensive power to Manila, and a 69,000-volt line will furnish power to Baguio.

Transportation.—A north-south highway connects Mountain Province with Manila, and runs northward through Baguio and Bontoc to Tabuk in Kalinga Subprovince. Two east-west routes connect with neighboring provinces, and a railroad runs to the extreme south. Commercial air services operate between Manila and Baguio only.

History.—The region was not organized politically by the Spaniards until the mid-19th century. Under American rule Mountain Province was organized as a separate province under its present name in 1908; Baguio was incorporated and separated administratively in 1909. In 1920 the number of subprovinces was reduced from seven to five, and by 1939 the various boundaries were fixed at about their present limits.

MOUNTAIN SHEEP, a general term for wild sheep, found in Asia, North America, and a few places in the Mediterranean basin. Mountain sheep are the boldest and most active rock climbers of all land animals except wild goats and ibexes, and wherever found, they inhabit the highest, most rugged places. The haunts of the Rocky Mountain bighorn include not only the highest mountains and wild tracts of badlands, but also the rocky walls of the Grand Canyon of the Colorado. It is not strange, therefore, that the chase of wild sheep is a favorite sport with big-game hunters. The head of an old ram, adorned with massive circling horns, won by dangerous mountain climbing and fair stalking, is a trophy of which any sportsman may be proud.

The wild sheep is generally characterized by its large, spiraling horns, which often reach more than a full circle in old rams, but are much smaller in the ewes. Wild sheep are not wool bearers. Next to the skin is a coat of fine woolly hair, which serves for warmth; through this grows a coat of long, coarse hairs, large in diameter, pithy within, and easily broken, which does duty as a raincoat and gives the animal its distinctive color. In summer or late spring the old pelage is shed, and the new coat is only half an inch in length. At that season the skin is worthless as a trophy. Mountain sheep are at their best in October, November, and December, and should be hunted at no other time. The lambs are born in May, with one or two at a birth. The life span may reach 15 years, but is usually less because of disease and lack of food. Due to the difficulty of keeping captive mountain sheep of any American species alive until they reach full maturity, members of the wild species are unfamiliar to the general public in America.

Asia, Africa, and Europe.—It is probable that the first wild sheep were developed in south central Asia, in the region of the Altai Mountains in western Mongolia. Favorable conditions there have developed the Siberian argali (*Ovis ammon*), whose enormous horns are a wonder to all who behold them. A comparatively short distance southward in Tibet is the Marco Polo sheep (*O. poli*), characterized by the enormous spread of its horns. The longest horn recorded measures 75 inches in length on the great curve. South of the range of *O. poli*, in northern India, occurs the Punjab wild sheep, and the beautiful bharal or blue sheep (*Pseudois nahura*), both of them small species. Outside of Asia in the Eastern Hemisphere there are only two species of wild sheep, the small but handsomely colored mouflon (*O. musimon*) of Corsica and Sardinia, and the large Barbary wild sheep, or aoudad (*Ammotragus lervia*) of the mountains of North Africa. North of the range of the Siberian argali are the Kamchatkan sheep, a species with horns like the North American white sheep, but otherwise strongly resembling the bighorn.

North America.—North America contains a fine series of mountain-sheep species, which almost cover the mountainous regions of Alaska, and extend down the Rocky Mountain system to the region of Lake Santa María (latitude 30°) in northern Mexico. In addition a species known as Nelson's mountain sheep branches off in southwestern Nevada and extends through southern California for two thirds of its length.

There are three conspicuous and well-marked types of North American mountain sheep, as well as three offshoots, as follows:

Types	Offshoots
Bighorn (*O. canadensis*)	Nelson's sheep (*O. nelsoni*) Mexican sheep (*O. mexicanus*)
Black sheep (*O. stonei*)	
White sheep (*O. dalli*)	Fannin's sheep (*O. fannini*)

The total area of North America inhabited by mountain sheep is about 3,500 miles from north to south, and the greatest width from east to west, found in Alaska, is more than 1,000 miles.

Ovis canadensis.—The Rocky Mountain bighorn, known since 1803, is the most widely recognized North American species, all the others being of much more recent appearance. The range of the bighorn extends from latitude 55° and longitude 120° to San Francisco Mountain, Arizona, embracing the whole main range of the Rockies between those points. It also includes the Fraser River country in British Columbia, one locality in northern Washington, two in eastern Oregon, the counties of Custer and Dawson in Montana, the Black Hills and Big Horn Mountains of Wyoming, four localities in Utah, and the Grand Canyon of the Colorado.

The bighorn is the largest and heaviest species of American mountain sheep, and carries the most massive horns. They are largest in the north, maximum development being reached in the main range of the Rocky Mountains in western Alberta. A large ram stands 40 inches in height at the shoulders and weighs about 300 pounds. The horns curve back, out, and up, and show yearly growth rings, which end after 8-10 years. They have been known to reach a length of 49 inches, although over 40 inches is not usual.

Ovis dalli.—The white mountain sheep of Alaska became known in 1884. It inhabits nearly all the mountainous regions of Alaska, except the Alaska Peninsula, the valley of the Kuskokwim, and the lower valley of the Yukon. Until recently it has been quite abundant on the Kenai Peninsula and around the head of Cook Inlet. The animal may be pure white, with a long, abundant winter pelage. It is smaller than the bighorn, and its horns are more slender, never exceeding 15½ inches in circumference. Its northern range extends almost to the Arctic Ocean, and the southern limit is found at latitude 58°.

Ovis stonei.—The black mountain sheep was discovered in 1896 in northern British Columbia, and good specimens may be seen in the museums of New York, Chicago, and Washington. Its size is the same as that of *O. dalli.* The species is characterized by the wide spread of its horns, and the very dark color of its pelage, except for the white of the rump patch and the abdomen. The range of this species is circumscribed to a small area in northern British Columbia.

Offshoots.—Fannin's mountain sheep, often called the "saddle-backed sheep," was discovered on the Klondike River near Dawson, in the Yukon, in 1900. It is an offshoot of the white sheep, and is possibly the result of crossbreeding between that species and the black sheep. Its back, sides, and tail are bluish gray, and a brown band extends down the front of each leg; all other parts of the animal are white, and its horns are like those of the white sheep. Little is known of the range of this species.

The Mexican sheep and Nelson's sheep are both offshoots of the bighorn. They are short-haired and large-horned, and their prevailing color is pale salmon gray.

Wherever they are not fully protected by law, all species of American mountain sheep are hunted and killed, for sport and for food, while overgrazing and disease have further reduced their number. Their extinction can be prevented only by careful protection. The bighorn quickly learns the value of protection, and the herd in Yellowstone National Park has rapidly increased and become so tame that it permits visitors to approach within 30 paces.

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MOUNTAIN SICKNESS, a form of altitude sickness caused by reduced atmospheric pressure, or, more precisely, by reduced partial pressure of oxygen in the lungs, bloodstream, and tissues. It is common in persons reaching altitudes of over 12,000 feet, especially in mountain climbing. Aviators suffer a form of this disorder, but with a reaction quite distinct from mountain sickness. The aviator attains great altitude quickly and effortlessly, while the mountaineer rises slowly, but with extreme physical exertion. (See AVIATION SICKNESS.)

MOUNTAIN VIEW, village, Alaska, located in the Third Judicial Division, in the south central part of the territory. The sixth largest town in Alaska, Mountain View is a suburb of Anchorage. Pop. (1950) 2,880.

MOUNTAIN VIEW, city, California, in Santa Clara County, on San Francisco Bay, 39 miles south of San Francisco, in the west central section of the state, at an altitude of 95 feet. The city is located on a U.S. highway, and is served by the Southern Pacific railway lines. Classed as a residential and semiagricultural community, Mountain View has fruit and vegetable canneries, produces olive oil, and is a printing and publishing center. Mountain View House, a pioneer inn, was formerly a main stop on the San Francisco-San Jose stage coach line. Pop. (1950) 6,563.

MOUNTAINS, the term applied to natural elevations loftier than hills. The distinction is relative, since heights termed mountains in low-lying regions would be lost among the foothills of a more rugged terrain. Single mountains are commonly called *peaks;* connected peaks, a *ridge;* an elongated ridge, a mountain *chain* or *range;* a series of ranges, often roughly parallel, a *system;* while a number of systems may be grouped in a *cordillera.*

Formation.—Mountains have their origin in widespread disturbances in the earth crust. They rear like waves whose movement is measured not in moments but in millions of years. The rigid crust is continually adjusting to an unstable interior whose rock, though solid, is rendered plastic by prolonged heat and pressure. In places the crust bends downward beneath accumulations of sediment or ice; in others, when stretched or worn thin, it bulges from interior pressure. Hence, over weakened areas, it may buckle like a crumpled table cover into great folds and hollows known as *anticlines* and *synclines* to form *fold mountains* like the Appalachians. Thus the region which centers in the Swiss Alps once covered an area perhaps a hundred and fifty miles broader than now. Such global convulsions generate enormous lateral pressures which may fracture the folds and thrust them out over neighboring strata. The Matterhorn, one of the most famous of mountains, was

torn from its original base and borne some 20 miles to be upended as a gigantic rock splinter. Even the Himalayas owe something of their height to encroachments upon the unyielding strata of the Gangetic plain. In crustal breaks where one side drops or the other rises, *fault mountains* may result—common landscape features in Utah and Nevada.

Major systems have risen from elongated troughs in shallow seas called *geosynclines.* Into these troughs sediments from neighboring highlands, gathering for ages, accumulated to a depth of thousands of feet. Gradually the weakened crust gave way beneath that weight, drawing the walls ever closer until they collapsed to fill the trough with huge fragments often tilted in every direction. The Rocky Mountains rose from such a gulf which once partially bisected North America, while the loftiest of all peaks, Everest, is capped with limestone strata laid down long ago in the Tethys Sea, which penetrated far into the Asian continent. Such crustal convulsions, by relieving pressure, also permitted the upwelling of molten matter which sometimes overflowed to form such intrusions of igneous rock as cover extensive areas in our Northwestern states. At other times the crustal strata merely bulged as the molten mass beneath solidified into granite formations known as *batholiths.* Mount Blanc encases such a core, whose roots penetrate far into the earth.

Periods of mountain building were succeeded by prolonged intervals of relative calm, only to be followed by later disturbances to confuse the pattern. Meanwhile, the forces of erosion continuously wore away elevated landscapes, so that the Alps now occupy scarcely a quarter of their original volume, and many peaks are but the roots of more ancient summits. Erosion even created *residual mountains* carved from a loftier terrain which has elsewhere disappeared. Mount Monadnock in New Hampshire is typical of such mountain structure.

Peaks of far different origin are *volcanoes,* mere heaps of volcanic ash or lava. Though frequently isolated, they may appear in chains which reveal arcs of weakness in the earth crust, like the backbone of Java or the Aleutian Islands. Their development is sometimes marked by violent eruptions, such as those of Vesuvius, or the terrific explosions of Krakatau (Krakatoa) in the Sunda Strait, or Mount Katmai in Alaska. They are often symmetrical cones like Fuji (Fujiyama) in Japan.

Elsewhere, mountain peaks present a variety of forms, outlines of rare beauty like the Jungfrau, dizzy shafts like the Muztagh Tower in the Karakorum (Karakoram) Range, rounded domes like Chimborazo, or flat summits like the mesas and buttes of our Western states.

Geological time is marked by periods of semicontinental uplift and mountain building, such as the Laramie and Hercynian revolutions. The Altai ranges of Asia and the eroded peaks of the Brazilian and Australian highlands are immeasurably old. On the other hand, sections of the Himalayas, the Andes, and some Alaskan peaks are in a formative period and still rising. Many mountains rear from the ocean bed. Some are volcanic craters that failed to emerge above the surface. Others form great ranges like the Atlantic Ridge, which stretches north and south for some 10,000 miles from Iceland to latitude 55°S.

Effect on Climate.—Mountains have profoundly influenced global climates. In Asia the Kunlun, the Tien Shan, the Hindu Kush, and other systems, which stretch roughly from west to east, act as barricades against tempering winds and thus subject Siberia to subnormal cold, and India to excessive heat. On the other hand, North American mountain systems, which extend north and south, permit winter blasts to sweep unimpeded from the Arctic to the Gulf of Mexico. The distribution of global moisture is also disturbed so that some regions are deluged by rains, while others become deserts. In India monsoon winds recoil from the impassable ramparts of the Himalayas to flood Assam, while our Southwestern states, now semiarid, were once well watered, until the rise of coastal ranges shut out moisture-laden winds. Even Death Valley was once a lake. Mountains are often called weather breeders, for clouds condense about their summits. Lofty peaks are capped with perpetual snow, even the Ruwenzori Range in equatorial Africa. Such snows, and the resultant glaciers, feed some of the world's great rivers which have their rise in mountain areas. Mountains have developed an alpine flora and fauna. The edelweiss of Switzerland, the cedars of Lebanon, and the giant sequoias of the Sierras are characteristic, as are the chamois of Europe, the yak of high Asia, and the bighorn sheep of North America.

Influence on History and Culture.—Mountains have often determined the trend of human history. They directed the drift of migratory populations from central and western Asia into Europe. Mountain barriers, by isolating the Hellenic states, prevented that racial cohesion which might have made Greece, instead of Rome, the dominant world power. On the other hand, mountains have provided protection, for the Alps were long regarded as the outer walls of Rome. Mountains have always given sanctuary to persecuted minorities; hence, mountaineers are proverbially independent and liberty loving. Mountains have also been prominent in art, literature, and religion. They were the legendary dwelling places of the gods, and such peaks as Olympus in Greece, Horeb in Hebrew tradition, and the lofty summits of the Himalayas became invested with a sacred character.

Mountain scenery is a lure to numberless vacationers, and mountain climbing has become so popular that the conquest of peaks like the Matterhorn, Aconcagua, and Everest have been hailed as landmarks in human achievement. (See Mountain Climbing.) But mountains also have more utilitarian uses. Their slopes provide summer pasturage in regions like the Pyrenees, and many are rich in timber resources. Mountain streams are harnessed to provide water power, which has been aptly termed white coal; and since mountains had their birth in major crustal disturbances, a wealth of mineral deposits has been upchurned: manganese in the Caucasus, silver and copper in the Andes, and platinum in the Urals, to mention just a few outstanding examples. See also Geology; Physiography; Volcano.

The following table is a partial list of the principal mountain peaks in the world. Those marked with an asterisk (*) have separate articles.

Mountain	Country	Height (feet)
*Everest	Nepal-Tibet	29,028
*K^2	Kashmir	28,250
*Kanchenjunga	Nepal-India	28,146
*E^1 (Lhotse)	Nepal-Tibet	27,890

Makalu	Nepal-Tibet	27,790
Cho Oyu	Tibet	26,867
*Dhaulagiri	Nepal	26,810
Nanga Parbat	Kashmir	26,660
Manaslu	Nepal	26,658
Annapurna	Nepal	26,492
Gasherbrum	Kashmir	26,470
Broad Peak	Kashmir	26,400
Gosainthan	Tibet	26,291
Distaghil	Kashmir	25,868
Nanda Devi	India	25,645
Rakaposhi	Kashmir	c.25,550
Kamet	India	25,447
Namcha Barwa	China	25,445
Gurla Mandhata	Tibet	25,355
Ulugh Muztagh	China-Tibet	25,340
Tirich Mir	Pakistan	25,263
Minya Konka	China	24,900
Stalin Peak	USSR	24,590
Pobeda Peak	USSR	24,406
Muztagh Ata	China	24,388
Kabru	India-Nepal	24,002
*Chomo Lhari	Bhutan-Tibet	23,997
Muztagh	China	23,890
Api	Nepal	23,399
Khan Tengri	USSR-China	22,949
*Aconcagua	Argentina	22,835
Ojos del Salado	Argentina-Chile	c.22,550
Huascarán	Peru	22,205
Tocorpuri	Bolivia-Chile	22,162
Llullaillaco	Chile	22,015
Mercedario	Argentina	21,885
Yerupaja	Peru	21,758
Incahuasi	Argentina-Chile	21,720
Coropuna	Peru	21,696
Tupungato	Argentina-Chile	21,490
*Illampu (Sorata)	Bolivia	21,490
El Muerto	Argentina-Chile	21,450
Sajama	Bolivia	21,390
Cachi	Argentina	21,320
Nacimiento	Argentina	21,300
*Illimani	Bolivia	21,185
Antofolla	Argentina	21,100
Bonete	Argentina	21,025
*Chimborazo	Ecuador	20,577
*McKinley	Alaska	20,270
*Logan	Yukon	19,850
*Kilimanjaro	Tanganyika Territory	19,565
*Cotopaxi	Ecuador	19,344
El Misti	Peru	19,166
*Orizaba (Citlaltepetl)	Mexico	18,700
*Demavend	Iran	18,600
Elbrus	USSR	18,481
*Tolima	Colombia	18,438
*St. Elias	Yukon-Alaska	18,008
*Popocatepetl	Mexico	17,887
Ixtaccihuatl	Mexico	17,671
Foraker	Alaska	17,280
Lucania	Yukon	17,150
Dykh-Tau	USSR	17,054
Kenya	Kenya	17,040
*Ararat	Turkey	16,945
*Stanley (Ruwenzori)	Uganda-Belgian Congo	16,795
*Kazbek	USSR	16,541
Steele	Yukon	16,439
Bona	Alaska	16,420
Carstensz	New Guinea	16,400
Sanford	Alaska	16,208
Kluychevskaya	USSR	15,912
*Blanc	France	15,781
Wilhelmina	New Guinea	c.15,585
Ushba	USSR	15,410
Fairweather	Alaska-Canada	15,300
*Rosa	Italy-Switzerland	15,203
Ras Dashan	Ethiopia	15,157
Belukha	USSR	15,157
Markham	Antarctica	15,100
*Matterhorn	Switzerland	14,700
*Whitney	California	14,495
Elbert	Colorado	14,431
*Rainier	Washington	14,408
Harvard	Colorado	14,399
La Plata	Colorado	14,342
*Longs Peak	Colorado	14,255
*Shasta	California	14,162
Old Baldy	Colorado	14,125
*Pikes Peak	Colorado	14,110
*Finsteraarhorn	Switzerland	14,032
Wrangell	Alaska	14,005
Yu Shan	Formosa	c.14,000
*Holy Cross, Mount of the	Colorado	13,986
Humphreys	California	13,972
Guna	Ethiopia	13,881
*Mauna Kea	Hawaii	13,825
Grand Teton	Wyoming	13,766
Cook	Yukon-Alaska	13,760
*Mauna Loa	Hawaii	13,675
Toubkal	Morocco	13,665
*Jungfrau	Switzerland	13,653
*Kinabalu	North Borneo	13,455
Cameroon Mountain	British Cameroons	13,350
Gran Paradiso	Italy	13,323
Victoria	New Guinea	13,240
Robson	British Columbia	12,972
*Ortles (Ortler-Spitze)	Italy	12,792
Grossglockner	Austria	12,460
*Fuji (Fujisan, Fujiyama)	Japan	12,389
*Cook	New Zealand	12,349
Adams	Washington	12,307
Pico de Teide	Tenerife	c.12,200
Semeru	Java	12,060
Mulhacén (Muley-Hacén)	Spain	11,420
Leuser	Sumatra	11,371
*Irazu	Costa Rica	11,260
*Hood	Oregon	11,245
Baker	Washington	10,750
*Etna	Sicily	10,705
*Lassen Peak	California	10,453
Glacier Peak	Washington	10,436
Tina or Loma Tina	Dominican Republic	10,301
*Haleakala	Hawaii	10,025
*Olympus	Greece	9,570
Paricutín	Mexico	8,200
*Parnassus (modern Liákoura)	Greece	8,062
Olympus	Washington	7,954
*Kosciusko	Australia	7,305
*Harney	South Dakota	7,242
Mitchell	North Carolina	6,684
*Clingmans Dome	Tennessee-North Carolina	6,642
*Kilauea	Hawaii	4,000
*Vesuvius	Italy	3,891

Authorities differ regarding the heights of many mountain peaks. The foregoing list has been checked with several authorities. Continuing research may lead to a revision of some of these altitude estimates.

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FERDINAND C. LANE.

MOUNTBATTEN, mount-băt'n, **Louis (Francis Albert Victor Nicholas),** 1ST EARL MOUNTBATTEN OF BURMA (formerly PRINCE LOUIS FRANCIS OF BATTENBERG), British naval leader and statesman: b. Windsor, England, June 25, 1900. The younger son of Prince Louis Alexander of Battenberg, who changed the family name to Mountbatten during World War I, and Princess Victoria, a granddaughter of Queen Victoria, he entered the Royal Navy as a cadet in 1913, and rose through the ranks to the grade of captain in 1937. During World War II he was called from the command of the aircraft carrier *Illustrious* in 1941 to become commodore of combined operations, and from 1942 to 1943 was chief of combined operations in the British forces. During this time he was in charge of the troops known as Commandos, and directed the successful invasion of Madagascar. From 1943 to 1946 he held the supreme allied command in Southeast Asia.

In 1947 Mountbatten was created an earl and appointed viceroy of India, the last to hold that office. He then served as governor general (1947–1948), and was responsible for the transfer of sovereign power from Britain to the national government; he also shared responsibility for the separation of Pakistan from India. Resuming his

naval career, he was made admiral (1953), and in March 1955 was appointed first lord and chief of naval staff, the position which his father had been compelled to resign in 1914 because of his German birth.

MOUNTBATTEN, Louis Alexander, 1st Marquess of Milford Haven. See Battenberg, Prince Louis Alexander.

MOUNTBATTEN, Prince **Philip,** Duke of Edinburgh. See Edinburgh, Duke of.

MOUNTED POLICE, Royal Canadian. See Royal Canadian Mounted Police.

MOURNING BECOMES ELECTRA, a play by Eugene (Gladstone) O'Neill (q.v.), subtitled *A Trilogy in Fourteen Scenes,* published in 1931. The first performance was given at the Guild Theatre in New York City, Oct. 26, 1931; the playing time was six hours with an intermission for dinner following *Homecoming* the first play. The play, with six showings a week, ran for 145 performances and was highly successful. The trilogy includes *Homecoming, The Hunted,* and *The Haunted,* treating the tragic events in the lives of the Mannon family in New England during the Civil War. General Ezra Mannon, who inherited the fortune made by his father in the shipping business, has not yet returned from the war as the play opens. Living in the grim Mannon mansion are his wife, Christine, and his daughter, Lavinia. There is a terrible and obvious enmity existing between the beautiful Christine and Lavinia, her plain, stern daughter. Vinnie is in love with a romantic sea captain, Adam Brant, but comes to despise him when she discovers that not only is he the son of her grandfather's brother and a servant girl, but that he has also become her mother's lover. Made more stern and cruel by her disillusionment, Lavinia seeks to make her mother pay for her actions by turning the family against her. When General Mannon returns, Christine, who has never loved him, poisons him, hoping to escape from the terrible Mannon family with Adam Brant. Orin, Lavinia's brother, returns from the war still deeply fond of his mother. When Vinnie tells him of Christine's unfaithfulness and the suspected murder of General Mannon, which had been made to seem a heart attack, Orin kills Adam Brant, an act which causes Christine to commit suicide. Lavinia, released from the hatred of Christine, becomes more attractive and less stern and plans to marry Peter Niles, a neighbor. Orin, driven almost to madness by the past events, tries to stop Vinnie's marriage and, sensing failure, kills himself. Peter deserts Vinnie, leaving her alone in the Mannon house to let the ghosts hound her . . . "until the curse is paid out and the last Mannon is let die."

Using the Electra story in Greek tragedy as the basis for a modern psychological drama, O'Neill succeeded in approximating the Greek sense of fate. By the interweaving of plot threads it became possible for him to convey to an audience with no belief in supernatural retribution the inexorable ending of a twisted, ghost-ridden family.

MOURNING CLOAK, a butterfly. See Camberwell Beauty.

MOUSE, mous, any of a large number of small rodent mammals of the family Muridae, other members of which are called rats, hamsters, voles, and lemmings. The name is also erroneously used for small forms of some of the other rodent families as, for instance, jumping mouse (Dipodidae) and pocket mouse (Heteromyidae). Usage will here, however, be restricted to the Muridae. This is the largest mammalian family in number of species, several hundred, at least, being recognized. It is also extremely widespread, almost cosmopolitan in distribution as far as wild forms are concerned, and in addition, several species, having become associated with man, are now found everywhere that man has penetrated. Though differing greatly in body size and in the form and size of the ears and limbs, all have hairy bodies and a moderately pointed head. The incisor or front teeth as in all rodents are modified to form gnawing chisels while the canine teeth are absent and the cheek teeth reduced to the three molars above and below. The tail is usually rather long and may be either densely haired or largely covered by scales. Five toes are normally present on each hind foot, but on the front foot the pollex or thumb is greatly reduced.

The classification of the Muridae is by no means settled, but the following major divisions or subfamilies are generally recognized: Cricetinae, Lophiomyinae, Microtinae, Gerbillinae, Murinae, Dendromurinae, Otomyinae, Rhynchomyinae, and Hydromyinae.

The subfamily Cricetinae contains all of the native long-tailed mice of the Western Hemisphere together with a few Eurasian and African forms, most of which are short-tailed and called hamsters. One of the latter, the golden hamster (*Mesocricetus auratus*), has, since 1930, become well known as a pet and laboratory animal. The best known North American forms of small or mouse size are the deer and white-footed mice (*Peromyscus*) represented by numerous species, many of them living in forests and among the commonest of small mammals. Others are the American harvest mice (*Reithrodontomys*), which occur chiefly in fields and marshes, and the grasshopper mice (Onychomys). The latter, occurring in plains and deserts, are unusual both for their relatively short tails and their insect-eating habits. The Cricetinae are represented by a great many forms in South America, where they constitute the only subfamily of mouselike rodents.

The subfamily Lophiomyinae contains a single form, the highly peculiar African maned rat (Lophiomys). The subfamily Microtinae includes the forms known as voles or field mice, and lemmings. They are confined to Eurasia and North America, inhabiting chiefly the cooler regions. Most have quite short necks, ears, and tails, and all have very complex molar teeth.

The subfamily Gerbillinae consists of a number of African and Asiatic species known as gerbils or jirds. All are desert forms, nocturnal in habit, and spending the day in burrows. The hind legs are greatly elongated, the animal hopping rather than running or walking. This type of adaptive modification is repeated in many desert rodents.

The subfamily Murinae includes a tremendous variety of forms, restricted, however, as wild native forms, to the Eastern Hemisphere, where they occur chiefly in tropical regions. All the species of Muridae which have become associated

with man belong to this subfamily, however, and in this way it has become worldwide in distribution. Attention will be confined to the smaller mouse-sized forms. Some species are called field mice in Europe, but are quite distinct from North American voles called field mice. Several forms in southeastern Asia are remarkable in that the hallux or big toe is opposable like that of a monkey, and as a result the hind foot can be used for grasping small branches, enabling the animals to climb about the trees in which they live. The Old World harvest mice (*Micromys*) are somewhat similar, but as a result of their very small size (among the smallest of rodents), are able to climb up grass stems, around which they build small spherical nests. On the other hand, certain Australian forms (*Notomys*) show hopping desert modifications with large ears, a tufted tail, and greatly elongated hind legs and feet.

The best-known mouse and the form to which the name applies in its narrowest sense is the house mouse (*Mus musculus*). As a native wild animal it is confined to Eurasia and northwestern Africa, but has become cosmopolitan by accidental human introduction. As a result, the various stocks show a great deal of variation. Thus, most wild individuals have white bellies, whereas strictly commensal stocks (living in human habitations) have gray bellies. The high degree of variability together with their abundance and ease of capture have caused them to be utilized to a great extent as a pet and laboratory animal (particularly the all-white or albino variety which has arisen under domestication). A great deal of medical and biological research, particularly on methods of inheritance, has been done since 1900 using house mice. As a semiwild or commensal form around houses and other buildings, however, *Mus musculus* is often a serious pest, destroying considerable quantities of stored food and other materials. In many places, on the other hand, house mice have invaded neighboring fields and open country. This has been facilitated by their high reproductive rate, several litters a year being produced by each female.

The subfamily Dendromurinae includes a number of African species known as tree mice and fat mice, most forms living in tropical forest. Some species are eaten by African natives. The subfamily Otomyinae contains only the African swamp rats. The subfamily Rhynchomyinae consists of a single species, the Philippine shrewrat (*Rhynchomys soricoides*), known only from the mountains of Luzon, where it probably feeds on worms and small insects. The fur is very soft and the teeth greatly reduced in size and number. It may be related to certain forms included in the Murinae from the Malay archipelago, particularly Celebes.

The subfamily Hydromyinae contains a number of species from Australia, New Guinea, and the Philippines. Most are called water rats, though some are more or less terrestrial and others are small enough to be called mice. Most of them are, however, aquatic, and show a reduction in the number of molar teeth. See also HAMSTER; LEMMING; RAT; VOLE.

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KARL KOOPMAN.

MOUSE DEER. See CHEVROTAIN.

MOUSEBIRDS, a group of peculiar birds of central Africa, constituting the family Coliidae also known as colies. They are of small size, grayish colors, marked with darker tints and in some species with touches of brighter colors; have finchlike beaks, crests, short weak wings, very long tails and remarkably strong feet. They are active, but fly little, spending their lives mostly in creeping about the branches of trees in a way that with their dun colors strongly suggests the behavior of mice. They are fond of hanging head downward, and at night gather in bands that roost together in hanging postures as closely as they can crowd. Their food consists mainly of fruit; and they place their cupshaped nests in low trees and bushes.

MOUSTERIAN. See STONE AGE—*Mousterian Stage.*

MOUTH, in human anatomy, the oral cavity at the beginning of the alimentary tract. It contains the tongue and the teeth and is the opening through which food is received and through which the voice issues. The mouth receives the secretions of the salivary glands. See also ALIMENTARY TRACT; SALIVARY GLANDS.

MOVING PICTURES. The moving picture, or motion picture, is the most completely explicit of the media of communication which address the eye, primary organ of perception. With its complement of sound and speech it is the most elaborately complete of the arts of recording and expression. Commonly considered apart, it is in fact much akin to all the older arts, which like it have been progressively powered by the development of tools and technologies.

The subject is dealt with in the following pages under four main headings:

The History of Moving Pictures
The Art of the Moving Picture
Documentary Moving Pictures
Educational Films

Other aspects of the subject are discussed in the following articles: CARTOON, ANIMATED; MAKE-UP—*Motion Picture Make-Up,* and *Photographic Make-Up: Amateur and Professional;* PHOTOGRAPHY—*Motion Picture Photography,* and *Visual Education and Documentary Photography.* There are also special sections on the motion picture in the articles on FRANCE, GREAT BRITAIN, and MEXICO.

THE HISTORY OF MOVING PICTURES

In little more than half a century the motion picture has achieved a worldwide dissemination tending to approximate that of printing. Newest of the arts, it is the first and only art to have evolved from the bottom up, born to serve the masses. All the other arts have been handed down from above. The motion picture is so expensive a medium that only mass buying power can afford it.

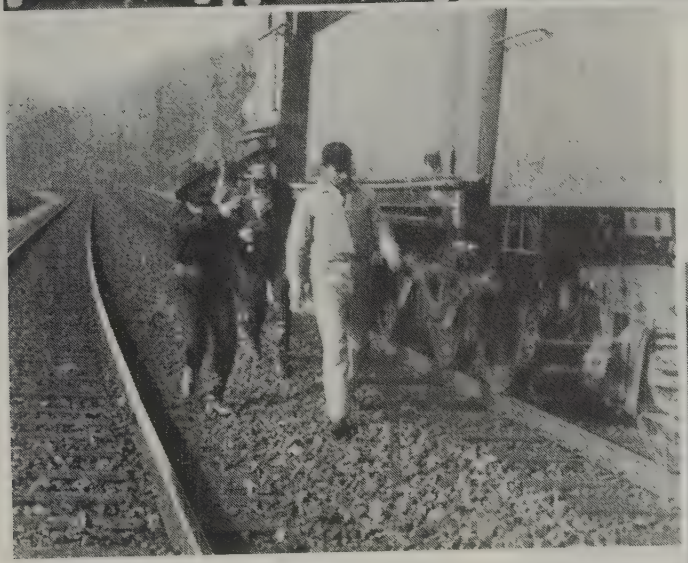
The motion picture has rapidly expanded its dominion in a turbulence of evolutions, characteristic of its intensive history since the last decade of the 19th century. These evolutions involve politico-economic adjustment to a changing, socially disturbed world, and internally the absorption of the electronic developments of applied science. The principal impact of the latter

MOVING PICTURES

Above left: An early film strip made at Thomas A. Edison's laboratory, using the perforated film invented by George Eastman in 1888.

Above: John C. Rice and May Irwin created a sensation in 1896 in the first film kiss.

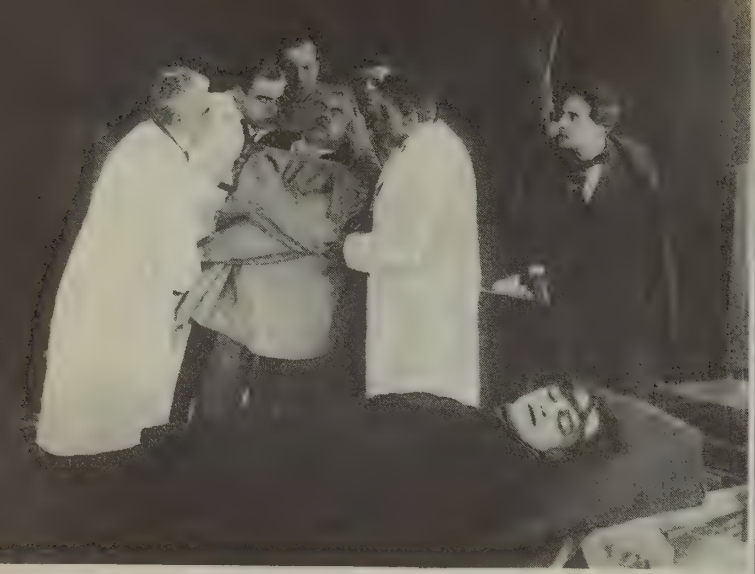
Left: Edwin S. Porter's immensely popular *The Great Train Robbery* (1903) was one of the earliest films to tell a story and to employ the technique of editing.



Right: The great director David Wark Griffith is shown during the shooting of *Intolerance* in 1916. At the camera is G. W. "Billy" Bitzer, and on the left are two of Griffith's stars, Blanche Sweet and Dorothy Gish.

Below: The first motion picture studio in the United States, the "Black Maria," built by Thomas A. Edison at West Orange, N. J. in 1893.

Photos courtesy Museum of Modern Art Film Library



Above: The celebrated German surrealist film *The Cabinet of Dr. Caligari,* produced in 1919 by Decla Bioscop and directed by Robert Wiene.

Above: The Odessa steps massacre scene from Sergei Eisenstein's classic, *Armored Cruiser Potemkin,* produced in 1925.

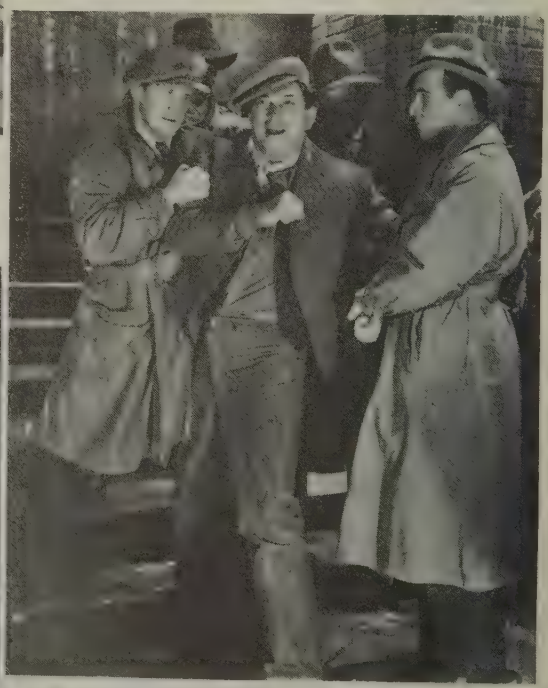
Below: The Blue Angel, directed by Josef von Sternberg, introduced Marlene Dietrich to American audiences. Also starring Emil Jannings, this early sound film was produced in Germany in 1929.

MOVING PICTURES

Above: The screen's master comedian, Charles Chaplin, was his own producer and director in *The Gold Rush* (1925).

Below: Dublin during the Irish Revolution provided the setting for director John Ford's *The Informer,* produced in 1935 and featuring Victor McLaglen.

Photos courtesy Museum of Modern Art Film Library



has been in the area of distribution, with the advent of radiographic broadcasting by television.

Television has given the motion picture the novel quality of simultaneity; the spectator is among those present at the moment of production. It also has the quality of propinquity, push-button convenience; it is the motion picture in the home, as available as running water. It is nonetheless a motion picture.

The introduction of television has inevitably caused disturbance in the production and distribution of the entertainment moving picture, the mass audience product known as the "movie," which requires going out to see. Meanwhile television has derived at least half of its presentations from motion pictures recorded on film.

Early History.—The screen achieves its ocular representations by submitting to the eyes a rapid sequence of instantaneous, or snapshot, records of objects in phases of motion. The modern film presents 24 such phase images, or "frames" on film, per second. Those separate instants, in each of which there is no motion, are synthesized by the organs of sight into an appearance of continuous motion. The eye is not sufficiently acute to discern the lack of actual continuity.

The complex of techniques involved have behind them a long, laborious development of optics, kinetics, and photochemistry. Some of it is far back beyond record, but a relatively recent milestone came with the demonstration of the principle of the magic lantern about 1645, when Athanasius Kircher, German Jesuit and professor of mathematics, demonstrated his Magia Catoptrica, a device for projecting hand-drawn still transparency pictures on a screen in Rome. This was a beginning, but no further significant advance was made until the early decades of the 19th century.

In 1824 Peter Mark Rôget, author of the famous *Thesaurus,* having observed by looking through a Venetian blind that motion could be broken down into a series of separate phases, read a paper on the subject to the Royal Society in London. Others, like Sir John Herschel and Dr. William Henry Fitton, experimented with illusions created by rapid movement of still images, and Michael Faraday carried out investigations in the same area. Then in 1832, Dr. Joseph Antoine Ferdinand Plateau in Belgium and Dr. Simon Ritter von Stampfer in Austria simultaneously brought out devices for viewing pictures in simulated motion, the first "motion picture machines." Improved models of these devices were developed by Baron Franz von Uchatius in Austria, and William George Horner in England.

The pictures used in these machines were drawings. The next great step was the development of photography, which began with the publication of the work of Louis Jacques Mandé Daguerre in France in 1839. The first man known to have used a series of photographs to produce an illusion of movement was Coleman Sellers of Philadelphia, Pa., in 1860. By 1864 Louis Arthur Ducos du Hauron, in France, had set down on paper a substantially complete blueprint of the motion picture as we know it, and in 1870, again in Philadelphia, the first actual projection of a photographic motion picture on a screen was shown by Henry Renno Heyl.

Seven years later, in California, John D. Isaacs, an engineer retained by former governor Leland Stanford, used a battery of cameras to record the phases of motion of a running horse. It was an effective application of snapshot photography to the analysis of motion. The operator of his mechanism was Eadweard Muybridge, a local photographer who had made a previous unsuccessful effort. Muybridge became famous as a photographer, but Isaacs went back to his profession and became chief engineer of the great Harriman railway system. The pictures from California were synthesized into bits of motion in Europe by means of existing mechanisms.

Edison's Contribution.—The great step from the laboratory to the world of everyday application was nearing. In 1887 Thomas A. Edison set himself the task of doing for the eye what his phonograph was already doing for the ear. He arrived at a mechanism but lacked an adequate carrier to feed it with pictorial images. That arrived when George Eastman of Rochester brought forth a new material for the "roller photography" of his Kodak. It was film. Edison got a sample about an inch wide and 50 feet long, for $1.50. In a few weeks his peep-show Kinetoscope, the ancestor of all motion picture mechanisms, was complete and demonstrated in his laboratory. The date was Oct. 6, 1889.

Edison was little impressed. He put the machine in a corner of his library office, and there it stood gathering dust. In 1891 Thomas R. Lombard, a promoter, won Edison's consent to make a battery of ten peep-show machines for exhibition at the Columbian Exposition in Chicago, scheduled for 1892. The fair was a year late, but the Kinetoscopes did not arrive even in 1893. Edison did not care much. He had let his lawyers patent the machine in the United States in 1891. But he refused to spend $150 to patent it abroad. Many historic consequences and sundry piracies grew out of that in years ahead.

At last the Kinetoscope Parlor, with Edison's ten machines, depicting bits of prize fights and fragments of vaudeville acts, was opened at 1155 Broadway in New York City, April 14, 1894. Within months the peep-show Kinetoscope became a leading attraction in the dime-museum and penny-arcade field of showmanship. One such exhibit showing *Dolorita in the Passion Dance,* imported first for the midway of the Chicago fair, brought the films' first touch of censorship when a showing on the boardwalk in Atlantic City, N. J., was suppressed by the police.

Pressure rose rapidly in the trade for a union of the Kinetoscope with the magic lantern. One customer at a time could peer into the Kinetoscope. A magic-lantern exhibition would increase receipts and speed the turnover by entertaining a roomful of spectators simultaneously. Edison's sales department was reluctant, fearing to exhaust the novelty market. Edison himself, no entertainer, was indifferent. Concurrently, however, attempts to duplicate Edison's machine, which lacked the protection of foreign patents, had spread around the world. In the United States, Thomas Armat, of Washington, D.C., a scientifically minded real estate investor, contrived a competent projector known as the Vitascope, using Edison films, which he presented in September 1895 at the Cotton States Exposition in Atlanta, Ga. The showing made no great impression at the time, but it had a highly successful future in store for it.

In France, Louis Lumière, a photographic manufacturer, found the Kinetoscope on display in Paris and set about projection. In England

exploiting importers took the Kinetoscope to Robert W. Paul, a well-known instrument maker, seeking duplicate devices. He too set to work on the problem of projecting films. A Lumière projector, the Cinématographe of historic fame, was the foundation of the French industry. It had its first commercial presentation at the end of 1895. Paul, equally successful in London, built a projector in October 1895 and demonstrated it on Feb. 28, 1896, at the Royal Institution. Named the Theatrograph, Paul's machine went into theater service to set the British development on its way.

The Lumière Cinématographe became important in the dissemination of the motion picture. It was small, portable, and uniquely capable of serving as a camera, a printing machine to make positives for projection, and a projector for public exhibition. Because of its compactness, it attained worldwide popularity.

The Nickelodeon Era.—The impetus which set the new medium of the motion picture on its way in its homeland came from a single Broadway opening, the presentation of Armat's Vitascope projecting Edison films at Koster & Bial's Music Hall in New York's Herald Square, on the evening of April 23, 1896. Thereafter the motion picture, through the Vitascope and sundry imitative devices, went into a variety show career, just as variety was becoming slightly more polite vaudeville. Films also were used as carnival "black tent" attractions and flitting exhibitions in cheap vacant storerooms. This was to last nearly a decade.

Then an Edison cameraman, Edwin S. Porter, who had been an electrician's mate in the United States Navy, ventured into experiment by making a "story picture," *The Great Train Robbery,* in 1903. By 1905 it was a hit of sensational proportions. The story picture gave the screen something to say.

In Pittsburgh, Pa., in 1905, John P. Harris, local showman, had a small idle theater on hand. For lack of other attraction, he gave it a program of motion pictures, at a five-cent admission, and called it the "Nickelodeon." In the autumn he played *The Great Train Robbery* to amazing patronage. The idea hit and imitative nickelodeons swept across the land like fire in prairie grass.

With the arrival of the primitive story picture, motion pictures, up from the penny arcade, had come upon a fecund soil of opportunity the like of which had never been presented to any art before. The United States had long been importing foreign labor from many lands, mostly from the shores of the Mediterranean. The arrivals, too poor to bring with them the arts of their homeland, found nothing but long hours in mines or steel furnaces awaiting them. The movies suddenly delivered for five cents, the cost of a tall glass of beer, entertainment and diverting information about the New World they had come to enjoy. This drew an audience whose buying power provided the foundation of the art. It also ordained the simple success-story message of the movies, which on the whole still stands unchanged.

With the nickelodeon wave the petty tradesmen of the foreign-born workers' quarters became the retail vendors of films. They were pawnbrokers and entrepreneurs from candy shops, fruit stands, bicycle-repair and cobblers' shops, secondhand clothiers, and the like. For about $150 and credit for a month's rent of an idle storeroom, with an arrangement to borrow chairs between funerals from adjacent undertakers, they became exhibitors, showmen. Humble as they were, they were to become the masters of the movies, and some of those who started so remained the masters of the movies on into the mid-century.

The upsurging business brought all manner of confusions, including piracies of product and the larcenous device of making pictures from contra-type negative, known to the trade as "duping," an abbreviation of duplicating. While at first films were purchased outright by exhibitors, very quickly the system of renting by film libraries, or exchanges, arose. There was high disorder, price cutting, duplication of service, and waste in all directions.

Other conflicts also disturbed the scene. There were endless patent infringements, many of them due to imports from Europe where Edison had failed to protect his inventions. Machines from Europe based on the Edison invention were infringements in the United States. There were copies of copies and infringements of infringements. Cutthroat competition developed in all directions.

Legal action was begun by Thomas A. Edison, Inc., against the American Mutoscope and Biograph Company in 1897. The Mutoscope, a card-wheel peep show, and the Biograph, a projector, were based on methods devised by Edison's former assistant, William Kennedy Laurie Dickson. By 1907 Biograph was in financial trouble. The Empire Trust Company of New York sent in Jeremiah J. Kennedy, a consulting engineer and executive, to liquidate the corporation. He chose rather to reform the industry, achieved a peace with Edison, and induced him to license Biograph and six other of the more competent competitors. The eight licensed producers then formed the famed Motion Picture Patents Company and its efficient marketing arm, the General Film Company. It was, during its effective period from 1909 to 1915, a richly profitable monopoly. It was to have been a complete vertical trust from film studio to theater screen, but it did not get so far as the acquisition of theaters.

That proved to be a mistake. The nickelodeon owners, humble though they were, resented their exclusion from the "trust," the focus of their resentment being a weekly license fee which all theaters were required to pay in order to use Motion Picture Patents' projectors or to secure pictures from General Film. This to them was taxation without representation. Led by exchange owner Carl Laemmle and nickelodeon magnate William Fox, they entered production and distribution in competition with the "trust." The Patents Company retaliated with strong-arm raids on their hideaway studios and suits for patent infringement, another mistake. The infringers, who became known as "independents," entered countersuits charging unlawful monopoly. The courts upheld them in the autumn of 1915, though the decision came too late for important effect. The trust had meanwhile committed suicide by its excessive conservatism.

Having achieved monopoly, the "trust" had sought to stabilize the business by enforcing conformity of product. Films were forever to be one reel long, enacted and produced by obscure nonentities; the nickelodeon public deserved no

more. The "independents," closer to their audiences, knew better. Against the strict rule of the "trust" they publicized the names of players and thus released the genie of the star system from its bottle. Furthermore, to distinguish their productions from those of General Film, they expanded footage toward "feature" length.

Feature Films.—The first features came from Europe. There the development of the films followed a more conservative pattern, strongly influenced by the traditions of the stage, and inclined toward the classics and the presentation of spectacles.

By 1912 Adolph Zukor, Hungarian immigrant, up from New York's East Side, who had been successful as a furrier and then as an arcade proprietor and exhibitor, saw that there was an opportunity to make the movies into real theater, providing, like the stage, a full evening's entertainment. He imported a French-made four-reel production presenting the great Sarah Bernhardt in *Queen Elizabeth.* It had little merit but it was a moderate success. It is to be remembered as the first milestone of the modern era, not so much for what it was as for its sequel.

Significant among the features that followed was *Quo Vadis* (1913), more spectacle than drama, produced in Italy with $9,000 put up by George Kleine of Chicago. He was a distributor of foreign films, a powerful figure in the formation of the Patents Company group. In 1914 *Cabiria,* another Italian spectacle, was also shown in the United States.

But greatest of all in impact was *The Birth of a Nation,* completed in 1914–1915, a drama of the sequel to the American Civil War, inspired by the novel *The Clansman.* It was the product of David Wark Griffith, who had been an actor of no special note on the stage. He had come up through picture making for Biograph, and it was he who in 1909 had brought Miss Mary Pickford, age 16, to the screen. *The Birth of a Nation* was his major effort after he left Biograph to align himself with the independents. It cost about $100,000, an enormous gamble for that time, but it returned millions.

Meanwhile the ambitious progress of the art was demanding a more adequate home than the nickelodeon. This demand came to flower at last when the Strand Theatre was opened in New York in 1914, a challenge to the stage on "The Great White Way." It was under the direction of Samuel Lionel Rothafel, in time to emerge in fame as "Roxy." He was of the basic pattern, son of a Stillwater, Minn., showmaker, and by turns a marine with service in the Boxer Rebellion in China, a book agent, a bartender, and at first a very minor exhibitor. He brought to the Strand an atmosphere of propriety and elegance. The Marine Corps had taught him the impressiveness of uniforms, discipline, punctilio, and polished buttons, which his theater and his ushers reflected. The policy was a vast success and set the pattern for top-rank exhibition.

Along with feature-length pictures and elaborate theaters came the era of the great stars of the screen. Most important to be remembered are Mary Pickford, around whom Zukor built his film empire, and Charles Chaplin. Chaplin's star contract, signed in late 1915, for 12 two-reel comedies at a salary of $670,000 for the series, to be delivered in one year, startled the film world and started the great wave of tremendous star salaries.

In the period of the rise of the multiple-reel or feature picture, productions were made around stars and one big name was enough to sell a picture. Concurrently the American industry was enjoying what was tantamount to an automatic monopoly. World War I had forced the closing of most studios overseas and reduced production in Europe to minor propaganda efforts. American films took dominance in the world market then and held it thereafter. Coming out of the melting pot, they were inevitably international merchandise, and they were supported by a greater home market than the films of any foreign land.

The rise of the feature picture and the greater film theater, together with the expanding availability of the automobile, rapidly shrank the number of nickelodeons and strictly neighborhood theaters. A possibly overgenerous estimate claimed that at the peak of the nickelodeon days there had been 28,000 of them in the United States. The theater total by the end of the first decade of the big photoplay was probably between 18,000 and 20,000. Audiences, no longer limited to walking distance, increasingly shopped for their entertainment.

A decade of feature-picture production brought many problems to the trade, and the leading producers began to recognize that they had a common interest in solving them. This led to the employment of Will H. Hays, an able attorney and postmaster general in the cabinet of President Warren G. Harding, to organize and assume the presidency of the Motion Picture Producers and Distributors of America. He took office on March 4, 1922, and for 23 years was known as "the czar of the movies." He was succeeded by Eric A. Johnston, politically active industrialist, in September 1945. Johnston moved his headquarters from New York to Washington and renamed the organization the Motion Picture Association of America.

Color.—Color emerged from experiment half a decade after the dawn of the feature-length drama. It had been on the way from an early day. In 1896, the year the screen was born, experiments in hand-coloring Edison films were made but attracted slight interest.

Photographic color on the screen really began with Charles Urban, an American working in Great Britain. His process, known as Kinemacolor, had its first public demonstration May 1, 1908. It was a two-color process involving filters, one component red-orange, the other blue-green, used on both camera and projector. The greatest Kinemacolor production was a record of the royal visit and durbar at Delhi, a spectacle of vast Indian pomp and splendor, shown with tremendous success in England and on the Continent, starting in May 1912. The leaders of the American film industry, however, discouraged the presentation of Kinemacolor in the United States.

About the same time, an American technician, William VanDoren Kelley, began working on a two-color process by which dyes were applied to emulsions on both sides of the positive prints, substantially Kinemacolor without color filters in the projector. In 1921 his Prizma process was used in the production, in Great Britain, of an ambitious feature, *The Glorious Adventure,* starring Lady Diana Manners, the first all-color drama. The Prizma organization, however, soon collapsed because of financial difficulties.

Meanwhile, in 1915, Dr. Herbert T. Kalmus,

Boston scientist with wide industrial and academic experience, had founded the Technicolor Motion Picture Corporation to pursue researches that he and some associates had initiated. They first pursued the two-color, color-in-the-film method. In 1922 Technicolor appeared on Broadway with *The Toll of the Sea.* The greatest milestone was reached 11 years later with a demonstration three-reel comedy *La Cucaracha* made in a full three-color process. Substantially natural color in complete spectrum had arrived. Technicolor thenceforth developed with a rapidly rising curve, and soon dominated major production, both at home and abroad.

Sound.—While color was becoming firmly established, the more revolutionary feature of sound arrived, bringing recorded music and speech to the screen. Edison had essayed a combination of picture and phonograph in the peep-show period, and about 1912 he had ineffectually presented projection synchronized with the phonograph. But the problem of amplifying the sound sufficiently to fill an auditorium was as yet unsolved.

Explorations in the realm of sound by the Bell Telephone Laboratories in the mid-1920's resulted in a super-phonograph, with electrical recording and amplification of sound, leading to the Vitaphone, synchronized disc and film. It was first presented to the motion picture public by Warner Brothers, entrepreneurs up from the nickelodeon, in a showing of *Don Juan* with John Barrymore in New York, Aug. 6, 1926. The disc recording method soon gave way to sound on film, a method of translating sound waves into electric impulses controlling light impingement on the "sound strip" of the films. It was powered by the photoelectric cell and radio tubes which amplified the sound as the projector amplified the visual image. The Bell Telephone or Western Electric method depended on variation in density, while the rival General Electric system, promoted through the Radio Corporation of America, used a variable area track. The patents were soon pooled and rivalry between the two methods ended. The era of the "talkies" had begun, and the silent picture was driven precipitously from the screen.

By 1953 motion picture technology was making wide use of processes of sound recording on tracks and tapes of magnetized material, and experiments were also being made in the magnetic recording of pictorial images.

Censorship and Government Regulation.—The acquisition of sound by 1928 had sent motion picture production in quest of words to say, which meant turning to the stage. The rise of feature pictures had driven the stage off "the road" and back to metropolitan audiences, especially in New York. As a result the stage had become sophisticated, and the movies, in acquiring stage material, came upon difficulties with their much larger public. Local censorships tightened and national censorship was threatened.

To meet the situation, Martin Quigley, trade journal publisher and eminent Catholic layman, conceived and fostered the Production Code which was adopted by the industry under public relations duress on March 31, 1930, and then quickly forgotten. More protests arose, mainly from church sources. A boycott of the screen was ordered in Philadelphia by Denis Cardinal Dougherty. It cost exhibitors about $200,000 a week at the box office. In November 1933, the Catholic Legion of Decency, whose members pledged to abstain from attending immoral movies, was formed. The motion picture industry, through the dominant trade association, the Motion Picture Producers and Distributors of America, otherwise known as the Hays office, made promises and organized the Production Code Administration to police the product at the source in Hollywood. The code, which was simple and nonsectarian, started functioning officially in July 1934, under the administration of Joseph I. Breen, one-time member of the Quigley staff. The industry was glad to settle for that and found in the code, as an instrument of self-regulation, a foil for the external censorship movement.

The Production Code has remained unchanged since its first formulation. It has sometimes been administered strictly, sometimes with considerable elasticity, but on the whole to the satisfaction of the groups which originally demanded reform. Through the years many complaints have been heard, both within and without the industry, that the code straitjackets the art; that it makes difficult or impossible criticism of the cloth, the bench, the armed services, or the social, economic, and moral status quo; and that it is in effect a worse evil than the legal censorship it was formulated to combat. But no effective public support for such criticism has ever emerged.

There is a long history of censorship. Chicago by city ordinance established censorship under police administration on Nov. 4, 1907. In the same period the movies were under serious attack in New York City and film theaters were ordered closed by Mayor George C. McClellan, Dec. 24, 1908. The People's Institute, supported by the Patents Company, went to the rescue in 1909 with the formation of the National Board of Censorship, renamed the National Board of Review of Motion Pictures in 1915. For a while its findings were enacted into law by some states and communities, but ultimately its legal and social functions were substantially assimilated by the motion pictures' major trade association. The National Board, however, continued to function and publish a magazine, *Films in Review.*

State censorship started in Pennsylvania in 1911, and in various fashions, half a dozen states continue to censor the movies; but in the main, censorship has not been a large influence on the art and industry of the screen.

The Production Code's initial period overlapped with the era of economic revolution which came in with the New Deal and the years of the big depression. Hearings were held in Washington under the NRA leading to the formulation of a Code of Fair Competition, approved by President Franklin D. Roosevelt on Nov. 27, 1933. A code organization was set up by the industry, but it was dissolved when the Supreme Court ruled against the NRA not long after. The next major move came from the Department of Justice, which filed a great antitrust suit in New York against the major concerns in the production-distribution and exhibition fields on July 20, 1938 (*United States* vs. *Paramount Pictures, Inc. et al.*). Specifically, the companies were accused of dominating exhibition through a virtual monopoly ownership of key "first-run" theaters, and of acting in collusion to exploit this advantage.

The case emerged from the United States Supreme Court with a decision against the defend-

ants, May 3, 1948. The suit was remanded to a lower court for action on monopoly practices and divestiture of illegally held theaters. One by one the defendants signed elaborate consent decrees, ending at last in the Loew, Inc., decree of Feb. 7, 1952.

Financial Problems and New Techniques. —The movies, after struggling through the depression years and the expensive development of the sound film medium, as well as the discouragements of the NRA regulation campaign, moved into prosperity again in 1935 and continued to flourish through the earlier years of antitrust disturbance. The trend was upward, but in terms of inflated dollars.

Through the era of swollen payrolls during World War II the films especially prospered. Wartime restrictions on luxury merchandise, motor cars, and gadgets funneled money into the movie box offices. The character of the curve is indicated by two reference points: according to Department of Commerce figures, theater receipts in 1941 were $756,000,000; in 1946 they reached an all-time high of $1,512,000,000, exactly double the earlier figure.

Then came television, released from war controls, and the movie curve began bending downward at an increasing pace. In 1951, at the end of a decade of tall figures, the box office take was $1,166,000,000. According to Bureau of Labor statistics evaluations, those 1951 dollars were worth only $662,754,400 in relation to 1941, a loss for the decade of about 11 per cent.

The movies' first defense move was theater-screen television by coaxial cable, which developed spottily. Concurrently a campaign was conducted to induce the Federal Communications Commission to allot space for theater television in the upper ranges of the broadcast spectrum, but without success.

From 1946 to 1952 about 5,000 United States film theaters closed. About 3,000 outdoor or drive-in theaters opened along the highways to intercept the growing motoring public. Literally thousands of lesser theaters, including drive-ins, kept solvent only by the sale of confectionery, popcorn, and the like.

Despite all disclaimers the most immediate problem was to meet television competition. There was a vast stirring of interest when Cinerama, which had been years on the way in the laboratory, arrived with an opening at the Broadway Theatre in New York City, Sept. 30, 1952. It involved the use of three cameras and three projectors filling a tremendous concave screen. The great curved screen, tending to enclose the audience, gave an illusion of stereoscopy attributed to peripheral vision across the wide optical angle of 142° Individual theater equipment costs were about $100,000. Cinerama seemed and was in fact not directly relevant to the patterns of the narrative art of the drama; it began as sheer spectacle. But in terms of screen geometry, Cinerama made home television screens seem as puny as tintypes. (See also CINERAMA.)

Meanwhile stereoscopic experiments and explorations aimed at putting three-dimensional illusion on the screen, by various devices of separately recording right- and left-eye images, had also been on the way for many years. A plastic material known as Polaroid with a capacity for plane-polarizing light had been brought forth two decades earlier, and it provided a facile method of presenting stereoscopic pictures which, however, required Polaroid spectacles for viewing. This technique was demonstrated in an industrial picture produced by John A. Norling, cinematographic expert, at the New York World's Fair (1939–1940). It was effective, but the industry was unmoved. Meanwhile other kindred processes were evolved but drew little attention. Then, in 1952, one of the Polaroid three-dimensional processes, trade-named Natural Vision, presented an otherwise unimpressive picture of African atmosphere entitled *Bwana Devil,* at a Hollywood theater, Nov. 27, 1952. Though received with critical hostility, it drew remarkable public attention.

Local public acceptance sent the initially skeptical movie makers in pursuit of various stereoscopic processes, nearly all derivatives of the Polaroid technique. Inevitably also they looked for new applications of the wide-screen Cinerama.

Most conspicuous of the wide-screen methods was announced by Twentieth Century-Fox Film Corporation in Hollywood, under a succession of names becoming eventually CinemaScope. It was an optical invention, originated years before in France, for recording the motion picture in a distorted negative image, crowded into a single 35 millimeter film, which in turn expanded to normal width on the theater screen. It was the most ambitious of all the new screen techniques. Early in 1953 it achieved trade demonstration, and its sponsors made an investment of about $4,000,000 in a CinemaScope version of the religious novel *The Robe* which had been in inventory for a decade. In six months, CinemaScope had become by far the dominant new technique. (See also CINEMASCOPE.)

TERRY RAMSAYE.

THE ART OF THE MOVING PICTURE

The film medium, "child of the laboratory and the machine," was not regarded at the time of its invention as a potential art form but as a mechanical means of reproducing works of art in the traditional media, especially the stage. Thomas A. Edison, who devised moving pictures as a complement to his phonograph, saw no further into the future of his invention than that. The ability of the film to copy the stage cheaply and disseminate copies widely and in great numbers was early apprehended, and in 1907 a company called the Film d'Art was founded in France, designed to record the performances of the Comédie Française and other eminent troupes. Joseph Jefferson, Sarah Bernhardt, Benoît Constant Coquelin, Jean Mounet-Sully, Mme. Réjane (Gabrielle Charlotte Réju), and Eleanora Duse acted for the early cameras, and Bernhardt heads the list of those who believed that the film was to be "my one chance of immortality." But, ironically, the preservation of these records has weakened reputations which might have taken their places beside the legends of Edwin Thomas Booth and Sarah Siddons. Lacking the voice, these literal photographs preserve, not the glamour of Bernhardt or the art of Duse, but the thin shadow of extinct celebrity.

This was dimly perceived even at the time. Contemporary opinion still held, what Marcel Pagnol believed as late as 1930, that "the cinema is destined to be a printing press for the drama." But the actual makers of early films—obscure, unlettered men mostly, not bound by aesthetic tradition—soon found that to make, without

sound, a faithful record of a stage performance at proscenium distance from the action, resulted in nothing that would move an audience. Preeminently led by David Wark Griffith, they experimented toward the development of a purely visual narrative technique. They began to move the camera in close for intimate scenes and to draw it back for broad effects; to begin and end scenes in the middle of the action; and to interrupt a scene in order to introduce complementary or contrasting events occurring at a distance or at another time. A host of camera tricks, many of them discovered before 1900, were by 1912 being used as dramatic devices—the "fade," the "dissolve," "slow-motion," "stop-motion." Most important, the film makers, also by 1912, had begun to realize that they did not really "make" their films until the moment arrived when they composed all these lengths of film, taken at different times and places and at varying distances from the action, into a unified and shapely whole.

D. W. Griffith.—Since the devices described above include all the essential features of the art of the moving picture, it can be said that the elements of the art were formulated in the first decade and a half of the 20th century—but formulated in the unknown studios and shown in the shunned darkness of the nickelodeons. What was happening burst upon world consciousness with the release in 1915 of D. W. Griffith's *The Birth of a Nation.* Many factors contributed to the extraordinary success of this film, but one of its leading accomplishments was certainly the fact that it convinced the educated classes that the motion picture was not, as they had thought, merely a mechanical copy of the stage but a new, unexplored medium. With few resemblances to the theater, with some to the episodic novel, but with strong affinities to musical structure, the form of this film deeply impressed its public. Gilbert Seldes said of it, "*The Birth of a Nation* is a single picture, a unit, just as a symphony is a unit, the parts growing out of each other, growing greater because of their relation to each other . . . A dominant tone is given to the entire picture, and the subsidiary episodes are played in related keys. The cutting is perfectly done, so that interest is always kept in an episode for itself, then dispersed or concentrated elsewhere, to return to the first episode for its relation to all the others: it is cinematic counterpoint." The use of musical terms is significant. Through this film it became apparent that whatever else the moving picture might be, it was a "composition." Griffith had not only directed the action and cinematography of *The Birth of a Nation,* not only pieced it together himself in the cutting room; he had actually invented it. Elements of his story he took from two novels, but he worked without a script, arranging and accommodating the parts to each other and to the whole as he went along. (Griffith rehearsed each of his pictures in their entirety before they went before the cameras; these rehearsals constituted the actual "writing" of his films; he never, when working independently, used any form of script.) It was clear from his example that the dominant artistic intelligence in the making of a film is that of the director, who is not only the director of the actors, as on the stage, but the dramaturgist as well.

Seldes' description of *The Birth of a Nation* was written 14 years after its release. That no one knew how to describe it at the time is evidenced by the newspaper critics' use of such terms as "display" and "spectacle," obviously without being satisfied with any of them. To their assistance came a group of poets, critics, scholars, and journalists who, it suddenly appeared, had been haunting the despised nickelodeons for years. Élie Faure had published *The Art of Cineplastics* in 1912 and (Nicholas) Vachel Lindsay *The Art of the Moving Picture* in 1915. These eminent intellectuals were infatuated with the possibilities of what had been considered a plebeian, if not a pariah, medium. They were also aware that neither they nor any of their contemporaries had yet plucked out the heart of its mystery. They were not content with Faure's noun "cineplastics" nor with the National Board of Review's adjective "cinegraphic." They cautiously ventured that the medium of the moving picture appeared to be light and that its form seemed to derive from the rhythm of the varying speeds at which individual shots were passed across the screen. For the moment they said no more, but watched the rapidly developing medium for signs and portents. Meanwhile—joined in America by Seldes, in England by Iris Barry, in France by Guillaume Apollinaire—this first group of film aesthetes defended the popular art from superficial criticism: that it was vulgar, that it was mass-produced and produced for the masses, that it was machine-made. They found its vulgarity vital. They saw in the peculiar relation between the popular film and its vast audience a recrudescence of the folk art of the Middle Ages. They rejected the notion that the film was too mechanical and commercial. "Films are made by men, not machines or corporations," was the answer of Iris Barry to such critics.

The German School.—There matters rested until the appearance in 1919 of *The Cabinet of Dr. Caligari.* This famous film with its painted backdrops was redolent of the traditional arts and of art itself, and its striking use of light and shade gave credence to the belief that the film in its essential nature was a "light-play" (the German word for movie became *Lichtspiel*). Indeed, might not films be considered to be "painting in motion?" The time was ripe to think so. Léopold Survage had designed a "motion painting" as early as 1913, and cubist painters longed to add the dimension of time to their designs. In Germany and in France in the early 1920's, a film *avant-garde* sprang up composed of Hans Richter, Viking Eggeling, Francis Picabia, Fernand Léger, Man Ray, and others. Dadaist, cubist, abstract, surrealist films poured forth profusely for a while. Cheaply and obscurely made, unseen by the mass audience, they exerted little influence on professional film making but greatly affected the attitude of European and American intellectuals toward the film medium. Because they mirrored the ferment then boiling in the older arts, they had the double advantage of seeming modern while remaining comfortably traditional, inasmuch as they derived from well-known cultural movements. These films and the men who made them were leading the medium toward one of its two possible extremes: the "animated" picture, a closed world of its own. Such a film is a design recorded exactly as imagined and executed by its creator. This conception was entirely agreeable to the taste and experience of the painters who

Above: David O. Selznick was producer of the monumental screen version of Margaret Mitchell's Civil War novel *Gone With the Wind.* Filmed in Technicolor in 1939, it featured Clark Gable and Vivien Leigh.

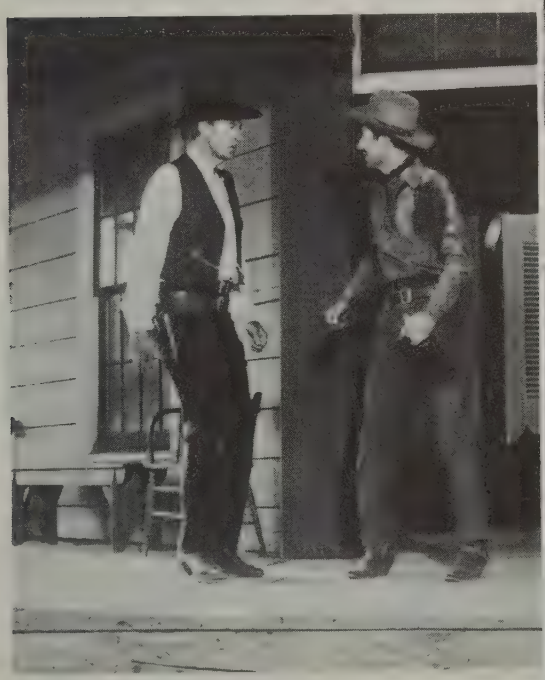
MOVING PICTURES

Above: The successful English adaptation of Shakespeare's *Henry V* appeared in 1945. Sir Laurence Olivier produced and directed the film and played the title role.

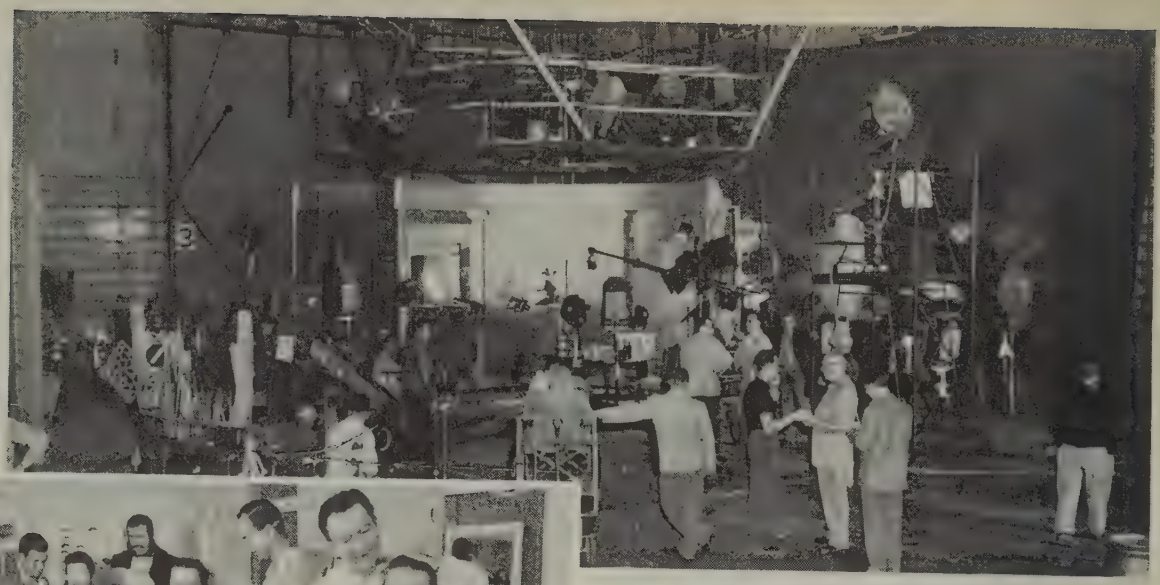
Below: Under Fred Zinneman's direction, the Western *High Noon* achieved a peak of dramatic tension. The film was produced by Stanley Kramer in 1952, with Gary Cooper in the leading role.

(Below) courtesy United Artists; (bottom right) Mayer-Burstyn; (others) Museum of Modern Art Film Library

Above: The Lost Weekend, directed by Billy Wilder in 1945 and starring Ray Milland, was an honest and realistic treatment of the problem of alcoholism.



Below: Culminating the emergence of Italian film art after World War II was *The Bicycle Thief* (1948), produced and directed by Vittorio De Sica and acted by a cast of nonprofessionals.



MOVING PICTURES

Above: An interior set on one of the stages of a studio lot.

Left: In the studio make-up department, members of a men's chorus are readied for a production number in a musical film.

Below: The studio sound department. At the rear is the magnetic sound printer, which transcribes stereophonic sound from a master print onto four separate CinemaScope films.

Above: A section of the scenic art department, where set designs, backdrops, and models for backdrops are painted.

Below: A CinemaScope film is projected on the screen in the re-recording room as the various sound tracks—music, voice, and sound effects—are "mixed" and recorded on one 4-track master print.

Courtesy 20th Century-Fox Studios

constituted this first cinematic "School of Paris," as it is to most of their descendants, the present-day film *avant-gardists* in the United States and Europe. But it seemed to leave something out of account, specifically the basic craft of film, photography itself, which in this context is reduced to the mechanical recording function it had earlier when people thought the film was properly a copy of the stage. But photography, as a medium, appears to make demands and have affinities of its own, which will be referred to below.

The influence of *Caligari* also led to another closed world, the much admired world of the German studio films of the 1920's. It was a world from which reality was rigorously excluded, but in which the aspect of reality was reproduced with a minute fidelity and skill at which film makers elsewhere marveled. The master spirit of this world was Carl Mayer, a screen writer who had never written in any other medium and the author of a long succession of famous films, beginning with *Caligari* and including *New Year's Eve, The Last Laugh,* and *Tartuffe*. Mayer dominated the films he wrote. His aim was unity of time, place, and action to heighten intensity; he pursued it by constructing in the studio vast sets through which the camera continually moved, and even flew. The moving camera, invented at least as early as 1914, had been used only occasionally. Now, Mayer discarded the American editing system with its terse assembly of many shots taken from different angles, and substituted a new, centralized and unified structure in which "cuts" were few, "takes" long, and the moving camera itself the principal stylistic feature. The result was a screen world which, like the films of the *avant-gardists,* approached "animated painting."

The American film industry, deeply impressed by German studio craftsmanship, used the moving camera to excess after 1927, and imported to Hollywood the directors Ernst Lubitsch and Fred W. Murnau, the producer Erich Pommer, Carl Mayer himself, and others. They introduced a certain sophistication of content into American films, and one American director, Josef von Sternberg, showed himself heavily under the German influence in his use of light and of the moving camera. But for the most part leading directors of the silent period (Henry King, Herbert Brenon, John S. Robertson, King Vidor, John Ford) continued and refined the editing tradition established by Griffith.

Chaplin and Others.—After Griffith, the leading creative spirit in the American film was Charles Chaplin. Known to and loved by more human beings than any other entertainer in history, he speedily achieved the capital power to produce his own films as he liked, being at once author, director, and editor as well as star. His drama *A Woman of Paris* (1923), which he wrote and directed but in which he appeared only briefly, showed his mastery of all the means of cinema, but the majority of his films, centering around the figure of "Charlie," deliberately utilize only a small segment of the total area of cinematographic means. In these films the camera is used almost solely to isolate and observe the movements and gestures of a single figure. Since Chaplin alone among film artists has controlled his own films from nearly the beginning of his career to its mature stage, it is possible to follow not only his technical and stylistic development but also the evolution of his viewpoint, from an early brutality and sentimentality through indignant social criticism to a Sophoclean irony and serenity.

Mack Sennett, Chaplin's mentor, also fathered a vein of screen comedy which used movie magic to further slapstick, and which at its best rose to irony and satire, and even to metaphysics. His principal disciples were Buster Keaton, "Fatty" Arbuckle, Harry Langdon, and Harold Lloyd, with W. C. Fields, the Marx Brothers, and Bing Crosby and Bob Hope as latter-day descendants. The enduring quality of many of their films, especially Keaton's, emphasizes how often the best screen work has come from popular entertainers unconscious of any mission other than to please, rather than from those who sought to uplift the movies or to use them as a belt line for the transmission of aesthetic values originating elsewhere.

Chaplin and Griffith aside, the only American director to approach complete control over the form and content of his films was Erich von Stroheim, though his attempts to achieve autonomy against the grain of the industry's organization eventually cost him his position as a leading director. Analyzing and then reassembling the visual elements of his films into a mosaic of detail, he strove to confer on the film the scope and psychological penetration of the novel; two of his films, the famous *Greed* (1924) and *The Wedding March* (1928), were completed in more than 40 reels. Such extravagance (more of running time than of production cost) caused his employers to remove him from control and to cut down the films to normal length. Even in this fragmentary form, these films are numbered among the masterworks of the medium.

Montage.—Rhythm, which the pioneer aesthetes had declared to be the basis of film form, was for many years neglected in film theory (though not in practice) in every film-making country except the Soviet Union. There, under state control and for political reasons, theories and experiments likely to result in more effective films were long encouraged, and a young generation of film makers set out to understand and master the medium. Sergei Mikhailovitch Eisenstein and Vsevolod Illarionovich Pudovkin in particular studied the films of all the world, but especially American films and most intensively the films of D. W. Griffith. From their study and resulting practice emerged the first fully reasoned aesthetic theory of the film medium.

They derived it principally from Griffith's *Intolerance* (1916), which Terry Ramsaye called "the only film fugue." *Intolerance* simultaneously told four stories from four different historic epochs, cutting from one to another as the progress of each demanded, and culminating in a quadruple climax in which "history itself seems to pour like a cataract across the screen." This was indeed "cinematic counterpoint," the most advanced example yet known, and too advanced for the public of 1916. Its specific revelation to the Soviet cinematographers was that the film director, as editor, could be a master juggler of time and space, juxtaposing any or all of the elements of the visible universe to produce contrast, comparison, or parallel as demanded by the theme. Pudovkin wrote, "Editing is the creative force of filmic reality," and he and his colleagues set to work to outline as precisely as possible the theory of montage.

Montage theory (the selection, cutting, and piecing together as a consecutive whole of the separate shots taken in the making of a film) asserts that everything recorded on film is but raw material for editing. Human beings are required to "behave" rather than to "act" for the camera, and are chosen rather for physical appearance than for professional skill (the "theory of typage"); their performances are actually the creation of the director-editor. All material is shot looking forward to the cutting bench, and there the creative act of film making takes place. In editing, the shots are joined together in a manner determined not by their content or narrative value, but according to a preconceived editorial pattern designed to achieve rhythmic effect. Such effects are to be secured "metrically"; sequences composed of very short shots will produce excitement or suspense; a succession of long-held shots will yield a mood of melancholy or repose; the two rhythms may also be alternated or modified to any desired degree. Montage theory holds that the assault of these measured rhythms upon human reflexes produces emotional and intellectual reactions almost independently of content.

The first fruit of the montage theory was S. M. Eisenstein's *Armored Cruiser Potemkin* (1925), with its famous Odessa steps massacre, a sequence which seemed final proof of all the assertions made about montage. After Carl Mayer saw *Potemkin,* he concluded that the German studio style he had labored to create was a blind alley, a misguided attempt to synthesize theater and painting, and that this "inspired newsreel," as *Potemkin* was often called, held the key to the future of the medium. His response was widely shared. Georg Wilhelm Pabst, who dominated the German film in the second half of the 1920's, based *The Joyless Street* (1925) and *The Love of Jeanne Ney* (1927) on montage. Film enthusiasts throughout the world saw montage as the organization and rationalization of those purely cinematic qualities which had been dimly perceived in the earlier work of Griffith and von Stroheim. The arrival in western Europe and the United States of further Soviet films—Eisenstein's *Ten Days That Shook the World* (1928), Pudovkin's *Mother* (1926), and *The End of St. Petersburg* (1927), Alexander Dovzhenko's *Arsenal* (1929)—seemed to confirm the hypothesis that montage could tell any story, dramatize any theme. The basis of film form was thought to be established.

Sound.—At this juncture the sound film arrived. Since at the beginning it was impossible either to move the camera or to edit the sound track with any freedom, the film returned to its ancient bondage to the theater and simply photographed innumerable stage plays. The art of the moving picture as an independent and unique medium seemed lost. But in 1928, before they had themselves seen a talking picture, Eisenstein and Pudovkin in a famous "manifesto" predicted that montage would apply to the sound film exactly as it had to the silent. Once the sound track could be cut (as soon it could be), dialogue, music, and "natural" sound were to be recorded and edited in counterpoint to one another as well as to the visual sequences. Sound would not reflect the visual image, nor need it have a visible source; its use would be determined thematically.

Even before it appeared, the principles enunciated in this manifesto were being applied in virtually every film-making country by veteran directors who refused to abandon the hard-won flexibility of the film and return to stage methods. King Vidor's *Hallelujah!* (1929) restored mobility to the camera and conferred it upon the microphone. Josef von Sternberg's *Morocco* (1930) reduced dialogue to a subsidiary narrative function. Particularly, the work of René Clair in *Sous les Toits de Paris* (1930), *Le Million* (1930), and *A Nous la Liberté* (1931) brilliantly revealed the potentialities of sound-image counterpoint. Since the early days of sound, complex audio-visual editing patterns have been achieved by directors working all over the world—in Lewis Milestone's *All Quiet on the Western Front* (1930), Pabst's *Kameradschaft* (1931), Fritz Lang's *M* (1932), and *Fury* (1936), Ernst Lubitsch's *The Man I Killed* (1932), John Ford's *Young Mr. Lincoln* (1939) and *The Grapes of Wrath* (1940), Frank Capra's *American Madness* (1932) and *Mr. Deeds Goes to Town* (1936), Julien Duvivier's *Poil de Carotte* (1932), Carl Theodor Dreyer's *Day of Wrath* (1944), Vincente Minelli's *The Clock* (1945), John Huston's *The Maltese Falcon* (1941) and *The Treasure of the Sierra Madre* (1947), and Fred Zinnemann's *High Noon* (1951). Since World War II the "neorealist" Italian film school has demonstrated mastery of all the discoveries of the pioneers of silence and sound in the world-famous productions *Open City* (1945), by Roberto Rosselini, and *Bicycle Thief* (1949), by Vittorio de Sica, as did the Japanese *Rashomon* (1951), directed by Akira Kurosawa.

If the progress of film experiment, investigation, and theory has been more arduous in the 25 years since the coming of sound than in the preceding quarter century, there have been various reasons. Dialogue films must be produced from a detailed script. This enables complete studio control over the work of the director on the set and in the cutting room, and leaves little freedom for improvisation. Sound also introduced as a dominant member of the production team the professional writer, whose experience lay only in literary creation. He tended to make dialogue the chief expressive factor, at the expense of photographic and structural considerations. This trend in recent years has somewhat reversed itself as writers such as Nunnally Johnson and Charles Brackett have themselves become directors or producers. Many other factors have entered into a seeming diminution of the "film sense" in both film makers and film enthusiasts. In the Soviet Union, montage, in spite of its evident resemblance in some respects to the Marxist theory of dialectics, was rejected as "too intellectual" at a Soviet cinematographic congress in 1935 which followed by a few months the writers' congress at which "Socialist realism" was proclaimed as the future governing principle of all art in the USSR. Socialist realism in Soviet film practice meant a wholesale return to the methods of the theater. Eisenstein and Pudovkin began directing stagy and even operatic films, and Eisenstein in his published writings systematically amended his early theories of montage in the hope of discovering hidden resemblances between the editing principle of film and the structural characteristics of the novel, poetry, and painting. The impulse to discover such resemblances has indeed dominated much of cinematic cerebration since the advent of

sound, as the impulse to explore and isolate the unique properties of the medium was paramount in the preceding era. In part this derives from the long-lived persistence of the genteel tradition, especially in the United States. French films of the 1930's were largely theatrical in style, as were British films of a later date, and these uneasy compromises between stage and screen won the approbation of the educated classes, more so perhaps in the United States than in Europe. While it is possible to produce evidence that Bing Crosby's and Bob Hope's *The Road to Zanzibar* (1941) is aesthetically superior to Raimu's *The Baker's Wife* (1938), the point little impresses a public more interested in "mature content" than in formal aesthetics, and in any case unable to associate aesthetics with the popular commercial product. The "art house" audience apparently prefers filmed Shakespeare and films about painting and music—films "about," rather than films as such. As against this, there is a considerable and growing non-theatrical audience, mostly young, organized into film societies, which reveres the primitives and classics of the art and probes their cinematic qualities with almost academic zeal.

Finally, the introduction of the wide screen, like all previous mechanical additions to the art with the exception of color, has temporarily thrown the moving picture back once more into the shadow of the stage. Since on the wide screen the eye must be led from one point of interest to the next, the temptation is great to lead it by the plotting of "business," as in the theater. Stylized backgrounds as in *Caligari*, the moving camera, and long takes with few cuts have also been revived. There are signs that this relapse may be as short-lived as that which attended sound.

Reference has been made to the "animated" picture as one extreme of cinematography's spectrum. No second artist of the stature and popularity of Walt Disney has yet appeared in this field. The other extreme of cinema's possibilities lies in the recording of unrehearsed events by the camera. One school of theory, adhered to by many photographers, holds that photography in its still largely unknown nature "likes" the actual rather than the arranged; that any art so completely based on photography as cinema must take this into account; and that the cinema at its purest is therefore in very large part an art of observation. The leading exponent of this conception of the motion picture was Robert Flaherty. As compared with the editing principle and the sound track, little experiment with moving photography has yet been carried out. What work has so far been done has occurred largely in the field of documentary moving pictures.

RICHARD GRIFFITH.

DOCUMENTARY MOVING PICTURES

The documentary film deals with facts and seeks to provide the spectator with information. This "film of fact" records historic and newsworthy events; preserves the customs, manners, and appearances of societies; explains and teaches scientific discoveries; and expresses controversial opinions—private and public.

Beginnings.—The earliest motion pictures made in France and England from 1895 were pictorial journalism. Itinerant photographers captured exotic scenes, and these fact films were eagerly sought after by audiences at home. In time the photographers recorded news events with a degree of regularity; these films came to be known as newsreels (*actualités*), and were first produced commercially in 1909 by Charles Pathé and Léon Franconi, in France and the United States. Previously, the Edison Company had photographed President William McKinley's inauguration in 1896. In the next few years cameramen shot miscellaneous footage in millions of feet covering such subjects as the Jeffries-Corbett prizefight, an Easter parade on Fifth Avenue, New York, the San Francisco, California, earthquake and fire, the first flight by Wilbur Wright in France, Theodore Roosevelt, and some of the exploits of Harry Houdini.

When the narrative film became the feature of the theater program, the fact film was relegated to the single reel, or to semifactual and factual features, in some of which history was re-created as well as recorded. One such short fact film was *The Horse in Action,* produced by the Pathé Company around 1911. Still a remarkable work, the film demonstrated the movements of the horse at normal and at one eighth of normal speed. An American group a little later documented the life of a typical family of Blackfoot Indians in Montana, and the communal life of birds that nested on an isolated island off the South African coast.

By 1922, the young Soviet Union had developed a powerful propaganda arm through the use of documentary film called Kino-Eye. Directed and edited by Dziga Vertov, Kino-Eye applied the peculiar resources of the cinema to develop an international film language capable of recording social and political events, and expressing approximate sensory experiences to give spectators a sense of actuality.

The Work of Robert J. Flaherty.—Robert J. Flaherty (1884–1951), an American-born and Canadian-trained mineralogical explorer, is identified as "the father of the documentary film." From 1910 to 1920, Flaherty led expeditions into the sub-Arctic regions of eastern Canada. Not satisfied simply to record his experiences of life among the Eskimos on photographs, Flaherty learned the technique of motion pictures in order that he might return to Hudson Bay and make a full film on the life of an Eskimo family. The fur merchants, Revillon Frères, whose trading posts dotted the north country, gave him financial support on condition that the completed film carry their name as its sponsor. Thus was the first sponsored documentary film born. *Nanook of the North* (1920–1921) was a saga of a primitive people's fight for existence against the pitiless weather of the sub-Arctic.

In Samoa in 1926, Flaherty produced *Moana,* recording the ritualistic practice of the tattoo and other features of island life. Subsequently, in a short unhappy association with Fred W. Murnau, a renowned German director, Flaherty participated in producing a commercially distorted motion picture of a South Sea idyl, *Tabu* (1930). In 1933–1934 Flaherty went to a rocky island off the Irish coast where he beautifully dramatized the eternal conflict of man against the sea in *Man of Aran.* After a visit to India where he produced another commercial film, *Elephant Boy* (1937), a cinematic retreat from the uncompromising standards he had previously set for himself, Flaherty entered the service of the United States Department of Agriculture

(1939–1942) for which he directed *The Land,* a study of soil erosion and the dislocation of farmers by the machine. After World War II Flaherty obtained funds from the Standard Oil Company to make a romanticized feature documentary on the life of the people of the Louisiana bayou country, *Louisiana Story* (1948).

In the 1920's, films of realism were being produced all over Europe. In France, Alberto Cavalcanti caught the essential quality of metropolitan life in his film on Paris called *Rien que les heures;* others, Jean Painlevé and Jean Benoît-Lévy, for example, produced brilliant educational and nature shorts totaling hundreds of titles. Walther Ruttmann composed another "city symphony" in *Berlin* (1927), in which the actuality of city life, the contrasts of rich and poor, took on the drama of fiction.

Joris Ivens and Others.—In Joris Ivens, the world documentary movement found powerful leadership. A free-lance global cameraman-director, his work from 1927, in his native Holland, showed strong social awareness. *The Bridge* (1927) was a simple, nondramatic portrait of a Rotterdam bridge. Another of his early films was *Rain* (1929), a sort of tone poem, in which he captured the quality of a short rainstorm in the city. Later, Ivens made films for a few industrial firms in Holland. In 1932 he went to the USSR where he produced *Komsomol,* a political film that searched for contrasts in the cultural life of German and Soviet youth. With Henri Storck, a Belgian collaborator, Ivens turned his camera on the *Borinage* (1933), depicting the misery of the miners with whom the artist Vincent van Gogh had spent some of his unhappy youth. Next he directed *New Earth* (1934), a story of the dyking of the Zuider Zee, and *The Spanish Earth* (1937), a deeply felt reportage of the Civil War in Spain as seen through the eyes of the common people. This latter film he made in association with the American novelist, Ernest Hemingway. In the years to 1950, Ivens made trips throughout the world to areas of social unrest—China, Indonesia, eastern Europe—recording current history and using the motion picture as a social weapon.

In Mexico, the distinguished American still photographer, Paul Strand, found financing and governmental support for producing a classic example of the documentary, *The Wave* (1934–1935). Magnificently photographed and brilliantly scored, this featurette related a tale of the economic exploitation and revolt of a village of poor fishermen.

In England, meanwhile, film makers, scientists, poets, and teachers organized themselves into a British documentary film movement. Under the leadership of an ex-minister and publicist, John Grierson, the group produced a hundred subjects delineating the England of the transitional 1930's. Supported by industrial sponsorship and government subsidy, technicians of the highest caliber were trained, and their work influenced the incipient fact-film productions of the United States, France, and Canada. Their films covered a wide range of subjects: the work of North Sea herring fishermen, a naval survey of the Labrador coast, the survival of English village handicrafts, the social implications of the British Broadcasting Corporation (BBC), the romance of the mails, and the Ceylon tea crop.

The New Deal Era.—Concurrently, an independent American school grew out of the federal government's spectacular use of the film to rally public support for its programs of reforestation, hydroelectric power development, scientific agriculture, and human rehabilitation in the 1930's.

Pare Lorentz, a former magazine critic, in two brilliantly expressive contributions produced the most impressive work of the early New Deal film era: *The Plow That Broke the Plains* (1936), documenting the waste and exploitation of the Great Plains area which, through the overcultivation of wheat crops after World War I, had been transformed into a desert waste; and *The River* (1937), which warned of the reckless cultivation of cotton in the Mississippi River Valley, resulting in awful human and economic waste.

Out of these lyrical beginnings, Lorentz and others like Ralph Steiner, Willard van Dyke, and Alexander Hammid composed a whole series of celebrated sociological films under public and private subsidies. Probably the foremost of these latter-day essays, *The City* (1939), was a survey of community life in America, from the New England township of yesterday and the unplanned metropolis of today to the planned model city of tomorrow, decentralized and beautiful. Then came Van Dyke's *Valley Town* (1940), a view of technological unemployment in a Pennsylvania steel town; and Lorentz's *The Fight for Life* (1941), a compassionate study of poverty and the inadequate maternity care available to modern slum dwellers.

In Germany, the Nazi woman technician and ex-actress Leni Riefenstahl directed a spectacular series of pictures of the 1936 Olympic Games in Berlin. As the Germans prepared for war, Miss Riefenstahl prepared propaganda films of high brilliance to inspire their friends and terrorize their enemies: for instance, *The Triumph of the Will* (1934–1936), in which the Nazi Party functionaries were introduced to the German people; and *The Baptism of Fire* (1940), an account, of doubtful veracity, of the Nazi conquest of Poland, several versions of which were prepared and shown to officials of other governments to impress them with the irresistible might of Hitler's legions and the folly of opposing the Teutonic "wave of the future."

World War II.—A stream of documentaries flashed on the screens of the Allies from 1940 throughout World War II. Britain, under direct air attack, produced a group of outstanding films that related the human side of life during the blitz: *They Also Serve* (1940), concerning the courage of the average housewife in England; *Target for Tonight* (1941), a thrilling account of the defense of London in the blitz; and *Desert Victory* (1942–1943), a dramatic record of the British 8th Army's triumphant pursuit of Gen. Erwin Rommel's Afrika Korps across 1,300 miles of desert.

Col. Frank Capra, who had been a prominent Hollywood director, produced a series of imaginative and accurate counter-propaganda films for the United States War Department (1943–1945), realizing that good soldiers and citizens of a democracy must know and understand the nature of the enemy and the facts behind the conflict. From this premise films emerged with a most comprehensive grasp of the documentary idea, including *Prelude to War, The Nazis Strike, Divide and Conquer, The Battle of Brit-*

ain, The Battle of China, The Battle of Russia, and *War Comes to America.*

As the war reached a conclusion, an Anglo-American group produced *The True Glory* (1945), an eloquent testimony to the Allied armies that fought the war side by side. The film recorded their voices and, in millions of feet photographed by combat cameramen of the United States, Canada, France, Great Britain, Czechoslovakia, Poland, Belgium, and the Netherlands, depicted their victories and heroism.

In 1943 the Soviets made available their coverage of *One Day of War,* in which hundreds of Russian cameramen photographed happenings in a single day along their far-flung war front. *The Story of Stalingrad* was released for exhibition abroad after the war.

Postwar Period.—Even before the death of President Franklin D. Roosevelt, the United States Congress canceled major film subsidies; the balance of production underwritten by the government during the Truman administration consisted largely of films whose purpose was to interpret American political and economic policy to nations participating in foreign-aid programs.

With the formation of the United Nations, film production was blueprinted into the plan for its international information services, first under the direction of the French film maker Jean Benoît-Lévy. Unquestionably, the most distinguished documentary sponsored by UNESCO, a U.N. agency, was the joint effort by the British craftsmen Paul Rotha and Basil Wright, *World Without End* (1952–1953). By depicting economic and social reforms effected by the U.N. in two depressed regions of Mexico and Thailand, the film helped to dispel the widespread opinion that the postwar fact film had fallen on dark days.

Devotees of the documentary organized an annual festival at Edinburgh, Scotland, shortly after the war, where controversy flared over the complacency of postwar film makers, dependent upon commercial sponsorship, and the plethora of purely expositional productions. Such films were widely employed in the United States and Britain as extensions of industrial advertising programs, and they frequently lacked the inspiration and "divine discontent" of the work of earlier craftsmen like Grierson, Flaherty, and Lorentz.

However, two men had made their way to the forefront as outstanding contributors to the film document: the Englishman, Humphrey Jennings, who before his untimely death in 1950 had produced several remarkable, eclectic achievements such as the wartime studies *Listen to Britain* and *Diary for Timothy* and his final film, *Family Portrait,* commissioned by the Festival of Britain; and Arne Sucksdorff of Sweden, whose favorite theme of the conflict of good and evil in all living things was reflected first in short films like *People in the City* and *Divided World,* and then in the feature, *The Great Adventure* (1953).

The stunning, but short-lived, career of Italian "realist" films (in which nonprofessional actors dramatized their ordinary lives) had a strong counterpart in the United States (1954) with the making of a controversial, pro-labor feature, *Salt of the Earth,* performed mainly by members of the International Union of Mine, Mill and Smelter Workers in New Mexico. The film depicted an actual, violent strike against a zinc mining company that brought unity to Mexican-American and "anglo" miners and their women. Another picture with a factual flavor, Walter Wanger's *Riot in Cell Block 11,* was an offbeat Hollywood film that dealt with some deplorable aspects of American prison life, and employed real prisoners at California's Folsom State Prison as extras in mass riot scenes.

Continuing the admirable "living" biographies begun after World War II, French documentary people produced a series that by 1954 included Henri Matisse, Pablo Picasso, Georges Braque, André Gide, Colette, Paul Claudel, Arthur Honegger, and Albert Schweitzer. Documentary memorial films honored the film innovators, Louis Lumière and Georges Meliès.

JULES VICTOR SCHWERIN.

EDUCATIONAL FILMS

The tremendous potential of the film in education was appreciated by many of the pioneers in the development of the motion picture. However, the difficulties of handling the complex and heavy equipment and the fire hazard of 35mm. nitrate film kept films out of the schools until the development of the 16mm. size and its acceptance as standard for nontheatrical use in the period 1919–1923. A number of silent films made specifically for classroom use were produced in the 1920's, and the schools began to acquire 16mm. projectors. The visual education movement grew, finding enthusiastic approval from some educators, and opposition from others who feared the "mechanization of learning." The coming of sound in 1928 added a new dimension to 16mm. as well as theatrical motion pictures.

It was the Second World War, however, which helped audio-visual education to come of age. With thousands of men to be trained in new skills with a minimum expenditure in time and personnel, the armed forces turned to the 16mm. sound film and the filmstrip. New techniques and new equipment were developed. Immediately after the war, 16mm. production increased in volume and in quality, new producers joined the old ones, and in many classrooms the projector was accepted as a teaching tool like the blackboard. By 1953 more than 15,000 titles were in current distribution in the United States. Similarly, better understanding of the principles of audio-visual education and improved distribution have brought the motion picture to classrooms and informal gatherings all over the world.

Types of Educational Films.—Modern educational films use all the resources of motion picture photography and recording. Although there is still low-budget amateur production, chiefly for local use, most educational films today are produced by highly professional crews, with writers, cameramen, and editors trained in the special techniques of their field. Color is used frequently; music, sound effects, and synchronized dialogue are used as well as straight narration. All new developments in the motion picture field are scrutinized by the 16mm. producers with an eye to their possibilities in educational films. Both three-dimensional and wide-screen films are now possible in 16mm.; demonstrations were given in 1953, but the expense was still prohibitive.

The educational producer may choose from a wide variety of film types according to the needs

of his particular script. Documentary films show how people live and work in various parts of the world; a number of countries have made films about their own people to send abroad, and whole series of films showing typical families of many nations have been made for geography and social studies classes. The straight demonstration film, known as the "nuts and bolts" film, is used for training in skills. Dramatization is used effectively in historical re-enactments and human relations themes and has been particularly valuable in mental health subjects.

Animated charts, diagrams, and maps have been included in educational films from the earliest days, and their value in clarifying such subjects as the circulation of the blood or the operation of the internal combustion engine is obvious. Full animation, of the Walt Disney type, is less common because of the expense, but a number of animated and semianimated films have been made. New techniques developed for non-theatrical films have included the use of static material—paintings and drawings used under the animation camera to give the illusion of movement. Another type of film developed for 16mm. use is the discussion film, which presents a problem, or two sides of an issue, and leaves the audience to reach its own conclusions through discussion.

It would be a mistake to assume that educational films are used only in the schoolroom. Industry uses films in training technicians and salesmen, and to describe its activities to the public. Governments make films to attract tourists from abroad, and to show farmers or other special groups in their own countries better methods of working. Health organizations rely on films to demonstrate good nutrition and sanitation practices to adults with little formal education. UNESCO units use films in fundamental education in underdeveloped countries. Doctors study film records of complex operations in order to improve their own knowledge and skill. And small children eagerly welcome films shown at the public libraries as another form of storytelling.

Financing and Distribution.—Unlike theatrical motion pictures, educational films are not financed by paid admissions. The producer must either sell enough prints to schools, colleges, film libraries, and other film users to pay his production costs and enough over to make the venture profitable; or the production cost must be underwritten by a sponsor who wants a particular film produced. The nonsponsored film is sold much as a book is sold, except that the unit cost is higher. Most classroom films are nonsponsored, and the producer must make sure that he wins the approval of his customers—the teachers and audio-visual directors. The sponsored film may be paid for, and of course controlled, by a government, a foundation, an industrial corporation, or an educational institution. Such prints are generally loaned to film users without charge except for shipping. The films may range from straight advertising to such classics as *Nanook* or the *The River*.

In many countries educational films are controlled and distributed by a branch of the government, usually the ministry of education. Films are then made specifically for the requirements of the department. In the United States there is no government control of films, although many government departments have produced films at various times. Most of the states have film libraries operated in connection with the state universities. In addition, many city school systems have their own film collections, as do some public libraries. Commercially operated film libraries also serve school and nonschool audiences. Religious denominations, labor unions, art galleries and museums, and many national and local organizations also have film collections for rental or loan.

While most films are distributed primarily in their country of origin, there is increasingly an international exchange of educational films. Great Britain, Canada, Australia, and the United States all use one another's productions, unhampered by language difficulties. Some western European countries have contributed to the exchange by re-recording sound tracks in several languages. India has made a large number of films, only a few of which have yet been seen in the United States. UNESCO is producing an international catalogue of film information and evaluation designed to help in sending educational films around the world.

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MOWAT, mou'ăt', **SIR Oliver,** Canadian statesman: b. Kingston, Ontario, Canada, July 22, 1820; d. Toronto, April 19, 1903. Admitted to the bar, he practiced in Kingston and Toronto; was vice chancellor of Upper Canada, 1864–1872 and premier of Ontario, 1872–1896. He opposed Sir John A. Macdonald on the question of provincial autonomy, Mowat regarding the provincial legislature as sovereign within its own sphere, and his reading of the British North America Act was in this sense borne out by the

Imperial Privy Council, notably in the Ontario boundary dispute. In 1896, he entered the ministry of Sir Wilfrid Laurier (q.v.) as minister of justice and was made president of the Senate. He was appointed lieutenant governor of Ontario in 1897, and served until his death. Altogether, Mowat gave 45 years to the public service. He was given a knighthood in 1892.

MOWATT, Anna Cora. See RITCHIE, ANNA CORA OGDEN MOWATT.

MOWBRAY, mō'brā, name of an Anglo-Norman baronial house, founded at the Conquest by GEOFFREY (DE MONTBRAI), bishop of Coutances. NIGEL, his nephew, founded the second house of Mowbray; WILLIAM, 4TH BARON MOWBRAY (d. 1222?), great grandson of Nigel, was a leader in the rising against King John. JOHN DE MOWBRAY (1328?–1368) gained by marriage the earldom of Nottingham and the marshalship of England; his second son Thomas, obtained a dukedom. The line ended with JOHN, 4TH DUKE OF MOWBRAY (1444–1476), the dukedom passing to the Howard family after his daughter Anne died in 1481.

MOWBRAY, Henry Siddons, American decorative and figure painter: b. Alexandria, Egypt, Aug. 5, 1858; d. Washington, Conn., Jan. 13, 1928. After a year at the United States Military Academy, he abandoned a military career for art. In 1878 he went to Paris where he studied under Léon J. F. Bonnat. From 1886, he maintained a studio in New York where he executed many beautiful murals. He began his work as an illustrator and portrait painter but later confined himself to decorative painting in which he displayed taste in composition, perfection in draftsmanship, and warmth of tone. The frieze, *Development of the Law,* in the Appellate Court in New York City is a fine example of his work. His murals may be seen in the Congressional Library, Washington, D.C., the Federal Court, Cleveland, Ohio, Gunn Memorial Library, Washington, Conn., The Morgan Library, New York City. He was elected a national academician in 1891, and in 1903, he became the first director of the American Academy in Rome.

MOWBRAY, J. P., a pseudonym of Andrew Carpenter Wheeler (q.v.).

MOWER, mou'ẽr, **Joseph Anthony,** American soldier: b. Woodstock, Vt., Aug. 22, 1827; d. New Orleans, La., Jan. 6, 1870. After two years at Norwich University and a year working as a carpenter he enlisted in the Engineer Corps and served throughout the Mexican War. Commissioned 2d lieutenant in the regular army in 1855, he attained his captaincy in 1861. His Civil War career was one of the most distinguished. Regular army brevet commissions followed more rapid promotions in the volunteer forces. As major general of volunteers he accompanied the Missouri expedition against Price, then joined Gen. W. T. Sherman in the Atlanta campaign (November 1864) and led a division in the march to the sea. Mustered out as brevet major general in February 1866, he was recommissioned a colonel of infantry. At his death he was in command of the department of Louisiana.

MOWRER, mour'ẽr, **Edgar Ansel,** American journalist: b. Bloomington, Ill., March 8, 1892. In 1913, after study at the Sorbonne, in Paris, he graduated at the University of Michigan, and thereupon returned to France, where he became a contributor to American and English publications. On outbreak of World War I, in 1914, he joined the Paris bureau of the Chicago, Ill., *Daily News,* which was headed by his brother, and reported the campaigns in France, Belgium, and Italy. He represented his paper in Italy until 1922 when he secured transfer to the *Daily News* bureau in Berlin. His frank and critical dispatches reporting the disintegration of the Weimar Republic were republished in book form as *Germany Puts the Clock Back* (1932; rev. ed. 1939), earning him the Pulitzer Prize in journalism for the best foreign correspondence, but incurring for him the hatred of the Nazis. He was ordered to leave Germany and, in 1934, after a lecture tour in the United States, he succeeded his brother as chief of the *Daily News* bureau in Paris. While occupying this post he reported the Spanish Civil War, 1936, and visited the Soviet Union, 1937, and China, 1938. Returning to the United States in 1940 after the German occupation of Paris, he was appointed Washington correspondent of his newspaper. The following year he visited the Orient for a second time, then joined the government service as deputy director of the Office of War Information; he continued in that post until February 1943. Since then he has been active as a columnist and broadcaster on foreign affairs.

His books include: *The Dragon Awakes* (1938); *Global War* (with Martha Rajchman, 1942); and *The Nightmare of American Foreign Policy* (1948); *Challenge and Decision* (1950).

MOWRER, Paul Scott, American journalist: b. Bloomington, Ill., July 14, 1887. He became a reporter on the Chicago, Ill., *Daily News* in 1905 and, in 1910, after two years at the University of Michigan, he was made Paris correspondent for that newspaper. He reported the first Balkan War, 1912–1913, and throughout World War I he directed his newspaper's services in France. Subsequently he reported the proceedings of the Paris Peace Conference, 1918–1919, and of five conferences on limitation of armament, 1921–1933; during 1924–1925 he participated as correspondent in the Moroccan campaign in the Riff. In 1928, he was awarded the Pulitzer Prize for the best foreign correspondence. In 1934, he was made associate editor and chief editorial writer of the Chicago *Daily News,* and the following year he became editor of the newspaper, a position he held until 1944. In 1945 he became European editor of the New York *Post.* He wrote several books, including *Balkanized Europe* (1921); *Our Foreign Affairs* (1924); *The Foreign Relations of the United States* (1927); *The House of Europe* (1945). Among volumes of verse were *Poems Between Wars* (1941). Edgar Ansel Mowrer (q.v.) is his brother.

MOXON, mŏk's'n, **Edward,** English publisher and verse-writer: b. Wakefield, Dec. 1801; d. Putney Heath, June 3, 1858. He was a close friend of Charles Lamb, whose adopted daughter, Emma Isola, he married in 1833. In 1831, he founded the *Englishman's Magazine,* but it was not a success and ceased to appear the following year. Upon publishing the first complete works

of Percy Bysshe Shelley (q.v.), he was prosecuted and convicted in 1841 because of blasphemous passages in *Queen Mab;* though compelled to delete them, he escaped further punishment. He visited William Wordsworth (q.v.) at Rydal Mount in 1846, and continued as his publisher until the poet's death in 1850. Other well-known authors whose works he published included Southey, Tennyson, Browning, and Landor. Though lacking in original talent, he was a true lover of poetry. His volumes of verse comprised *The Prospect and Other Poems* (1826); *Christmas* (1829); *Sonnets* (1830 and 1835).

MOZAMBIQUE, mō-zam-bēk', or **PORTUGUESE EAST AFRICA,** colonial possession of Portugal bounded on the east by the Indian Ocean, on the north by Tanganyika Territory, and on the south by the Natal Province of the Union of South Africa; the western boundaries, from north to south, comprise Lake Nyasa, Nyasaland Protectorate, the Rhodesias, the Transvaal, and Swaziland. The area is 297,731 square miles, and at the census of 1940 the population numbered 5,081,266, of whom 5,027,591 were Africans, and whites totaled 27,438. With surrender of sovereign rights on July 19, 1942, by the Companhia de Moçambique, last of the chartered companies operating in the territory, all of Mozambique came under a single colonial administration. Lourenço Marques (pop. 1936, 47,390), the capital and principal seaport, is situated on Delagoa Bay, near the southern extreme of the colony. Other ports include Beira (pop. 12,988), formerly the capital of the lands of the Companhia de Moçambique, and terminus of railways to Southern Rhodesia and Nyasaland Protectorate; and Mozambique, or Moçambique, until 1907 the country's capital.

Topography.—The coastline of Mozambique, nearly 1,500 miles in length, extends southward from Cape Delgado, near the mouth of the Rovuma River, to Oro Point, just above Kosi Bay. Low-lying swamplands fringe the shores as far north as Mozambique, and from there onwards the coasts are rugged. North and south of the wide delta of the Zambezi many rivers flow into the Indian Ocean, among them the Lurio, Ligonha, and the great Limpopo. Numerous lateral waterways connect the large rivers. The Urema and the Zanque, whose waters flow south and north from a marsh at a slight elevation, almost unite the Zambezi with the Pungwe and the Kwakwa, and join the Zambezi with the Bons Sinais; the latter is also connected with the Munguzi, so that a small amount of canalization would render possible an inland waterway from Beira to Quelimane, a distance of more than 300 miles. Inland from the coastal plains the surface rises to a grassy plateau lying generally at an elevation of 6,000–8,000 feet above sea level; at the northwestern end of the country the plateau terminates abruptly in an escarpment, below which, near the shores of Lake Nyasa, the general level is some 4,000 feet lower. While most of the highlands are healthful for white people, they have a relatively small white population because of poor communications; much has been done to improve health conditions in the large coastal towns, but elsewhere in the lowlands, and in the valleys of the largest rivers, malaria is endemic and climatic conditions difficult for those not reared in the country. For Mozambique as a whole the dry season extends from May to September.

Flora and Fauna.—Many varieties of tropical and semitropical plants flourish in Mozambique. Mangrove trees are plentiful in the deltas of the rivers and along the coast, as are date palms, while the coconut palms are ubiquitous. In the highlands are considerable forests with many kinds of hardwoods, notably ebony and ironwood, and through the grasslands are vast areas studded with acacias. Despite indiscriminate hunting in the past, some parts of the country still teem with large game. Lion, leopard, and other carnivora are plentiful, as are such hoofed animals as the elephant, black rhinoceros, zebra, hippopotamus, and buffalo; there are many varieties of gazelles and antelopes on the open grasslands, and monkeys and baboons in the forests. Since earliest times of Portuguese settlement gold mining has been carried on in Mozambique. By far the most important goldfield is that of Manica, some 220 miles northwest of Beira, the reefs extending across the border into Southern Rhodesia; silver and other minerals are also found in the Manica district. On the north side of the valley of the Zambezi, in the neighborhood of Tete, large deposits of good coking coal have been found in seams ranging up to 25 feet in thickness; other deposits have been located in Chicoa, and at several places between Tete and the border of the Nyasaland Protectorate. In the Tete district, too, rich deposits of magnetite iron have been located, some of the ore containing up to 75 per cent of iron. Copper exists over an extensive area in the Serra Itsitica, on the western boundary of the country, and tin has been found at Inchope and Doeroi.

Population and Education.—The native Africans of Mozambique are almost entirely of Bantu stock. They are expert stockmen and agriculturists, and many thousands of them are recruited annually for labor in the gold mines of the Witwatersrand (q.v.) and for work in Southern Rhodesia. Considerable revenue accrues to the Mozambique government from this employment of its natives in British territory; it receives "pass money" on every native leaving the country as a contract laborer and "customs duty" on his return, besides a subsidy should his stay be extended over six months. Both the central government and the municipalities conduct schools for native and white children, and schools for natives are also attached to many of the Christian missions. Primary schools in 1942 numbered 697 (with an enrollment of 103,081); and there was one high school (614 pupils) and 48 vocational schools (3,232 pupils). The greatest share of missionary work is done by the Roman Catholic Church; the few Protestant missionary bodies operating in Mozambique include that of the American Methodists, whose principal station is in Inhambane. British subjects comprise a large proportion of the white population, otherwise consisting principally of Portuguese; most of the whites live in the towns, as do, also, the Indians (9,147 in 1940), most of whom are engaged in retail trade.

Government.—A governor general appointed for a four-year term by the government of Portugal heads the administration. He is assisted by an Executive Council and by a Legis-

lative Council; besides officials and nominated nonofficials, the membership of the latter body includes elected representatives of the four provinces into which the country was divided in 1942 after the last of the chartered companies surrendered its sovereign powers (see *History*). Lourenço Marques, besides being the capital of Mozambique, is also the seat of the provincial administration of Sul do Save, all that area of the country south of the Save River. The Province of Manica and Sofala extends from the Save to the Zambezi, and northwest of the latter river as far as the frontiers of Northern Rhodesia and Nyasaland Protectorate; Beira is the provincial capital. Northeast of Manica and Sofala is the Province of Zambezia, of which the capital is Quelimane; Mozambique, or Moçambique, is the chief town of Nyassa, or Niassa, the northernmost province. In 1944, the revenue and expenditure of the country balanced at 658,524,000 escudos; the public debt stood at 5,000,000 escudos on Dec. 31, 1943.

Agriculture and Manufacturing.—Mozambique has extremely fertile soil, and, despite great heat and unhealthiness, there is considerable agricultural activity. Sugar, sisal, and copra are produced on large plantations, and corn (maize) and cotton are widely cultivated. Other crops include peanuts, beans, and fruits in wide variety. The cutting of mangrove bark is an important industry along the coasts, and large numbers of men are employed in lumbering, the hardwoods of the forests commanding a good market for furniture making and as railway ties (sleepers); several wild vines yield rubber of superior quality. Stock raising is carried on in many parts of the country, particularly in the Tete district (the northwestern area of the Province of Manica and Sofala) and in the Sul do Save Province. Besides gold and coal, the principal minerals being exploited are copper and tin. Manufacturing industries are few. Cement and soap are made in the vicinity of Lourenço Marques, and paper is manufactured, while vegetable oils are produced at several places. Total exports of Mozambique in 1943 were valued at 469,768,000 escudos.

Communiction.—Markets for many of the country's exports are in contiguous British territories. The products are carried on railways across Mozambique built from the seaports with British capital principally for the large transit trade. One line from Lourenço Marques, 57 miles in length, connects at Komati Poort in the Transvaal with the system of the railway system of the Union of South Africa; and a second from the capital runs to Goba, 44 miles distant, on the Swaziland border, whence South African railway motor buses traverse the protectorate to meet the Union's system at Bremersdorp. From Beira, a line extends westward across the country to Macequece, a distance of 183 miles, and continues for 13 miles to enter Southern Rhodesia, eventually connecting with Salisbury and Bulawayo. A second line from Beira runs northward to Murraça on the Zambezi, crosses the river by the longest railway bridge in the world (12,064 feet), and continues to link up at Port Herald with the railways of the Nyasaland Protectorate. Few of the 20,000 miles of highways in Mozambique are fit for motor traffic during the rainy season (October to March). Seaports, in addition to those mentioned above, include, from north to south, Porto Amelia, located on Pemba Bay, which is one of the most spacious harbors in the world (8 miles long, 5 miles wide, with an entrance 1½ miles wide); Porto Amelia was the capital of the territory of the Companhia do Nyassa, a former chartered company. Chinde, situated at one of the mouths of the Zambezi River, was the port of entry for Nyasaland Protectorate until river freight services were discontinued following construction of the railway from Beira. Inhambane, 284 miles north of Lourenço Marques, has a harbor 9 miles long by 5 miles wide; a Portuguese settlement was first established there in the middle of the 16th century.

History.—Arab influence was paramount along the eastern seaboard of Africa in 1498, when Vasco da Gama (q.v.) visited Quelimane and the town of Mozambique (q.v.) before continuing his voyage to Mombasa (see KENYA COLONY AND PROTECTERATE) and thence to India. Sofala, a little to the south of Beira, was captured by the Portuguese in 1505, and Mozambique, or Moçambique, in 1507, and from this period dates the commencement of the great dominions of Portugal on the East African littoral. During the height of the Portuguese power considerable progress was made in the exploration of the territory, notably by members of the Jesuit and Dominican orders. Gonçalvez da Silveira, a Jesuit priest, traveled to the region southwest of the delta of the Zambezi and visited the *monomotapa* (ruler) at Beira, his capital, on the Mazoe River; the missionary and his converts were strangled here on March 18, 1561. Subsequently the monomotapa's sphere of influence became the Dominican Mission Province No. 14 of the Rosary. For two hundred years the Portuguese settlements along the coast were subject to frequent assault, first by the Arabs and the Turks, and later by the Dutch, and by 1730 all those north of the Rovuma River had been extinguished. Even that which remained to Portugal (the area subsequently known as Mozambique) was overrun early in the 19th century by Bantu tribesmen from Gazaland (q.v.), who captured and for a time held most of the Portuguese seacoast towns. By the middle of the century migration of Dutchmen from Cape Colony had resulted in establishment of the South African Republic in the Transvaal (q.v.), across Mozambique's southwestern frontier; and, following the work of explorers in the interior of Africa, British and German spheres of influence were created in proximity to the other land frontiers of the country. Disputes then arose regarding the precise boundaries of the area of East Africa over which Portugal claimed sovereignty. Her right to Delagoa Bay was established by arbitration in 1875; and at the international Berlin Conference in 1884–1885, and by a convention with Great Britain in 1891, all boundaries of Mozambique were finally determined.

Thenceforth the colony was variously administered, some regions directly through officials appointed by the Lisbon government, and others by chartered companies exercising sovereign rights. The state administered two districts in the south, Lourenço Marques and Inhambane and, across the center of the country, the districts of Tete, Quelimane, and Moçambique. Manica and Sofala, lying between these two divisions, was administered by the Companhia de Moçambique, rights over this area of 65,000 square miles being granted to it by royal decrees in 1891, 1893, and

1897; and the Companhia do Nyassa, or Niassa, received a charter in 1894 to administer the 73,292 square miles situated at the northern end of the colony. Although not chartered, the Campanhia da Zambesia administered on behalf of the colonial government much of its Tete district. The last-named surrendered its administrative powers during World War I, and the Companhia do Nyassa, in 1929; while, as noted above, the territory of the Companhia de Moçambique was taken over by the colonial government in 1942. Portuguese colonial forces, during World War I, took a small part in the later stages of the East African campaign against the Germans. The latter, expelled from German East Africa (later Tanganyika Territory), retreated across the Rovuma River into Mozambique in November 1917. By July 1918, the German troops had advanced through the colony to within 25 miles of Quelimane, and then were driven northwestwards (eventually to surrender in Northern Rhodesia). At the Paris Peace Conference in 1919 Portugal obtained retrocession to Mozambique, "as the original and rightful owner," of the Kionga Triangle, an area of 400 square miles on the right bank of the Rovuma River, near its mouth, hitherto administered by German East Africa, which had thus been able to levy export dues on riverine exports from the northwestern end of the Portuguese colony. Consult Prestage, Edgar, *The Portuguese Pioneers* (London 1933) and *Chapters in Anglo-Portuguese Relations* (Watford, England, 1936); Axelson, Eric, *South-East Africa, 1488–1530* (London 1940); *Annuario de Mozambique* (Lourenço Marques annual).

MOZAMBIQUE, or **MOÇAMBIQUE,** seaport of the Portuguese colony of Mozambique, on a small coral island three miles from the shores of Mosuril Bay. Visited by Vasco da Gama (q.v.) in 1498, it was captured by the Portuguese in 1508. Numerous buildings dating from the 16th century still stand, many of the barred windows having the original panes of mica, used in place of glass. The principal fort, which still exists, was built during 1508–1511 of stone brought from Portugal, 8,000 miles distant, in the tiny vessels of the period. From Lumbo, on the mainland south of Mozambique, a railway runs to M'conta, a distance of 58 miles. The commercial importance of Mozambique declined after transfer of the capital of the colony from that town to Lourenço Marques in 1907. Pop. 6,817.

MOZAMBIQUE CHANNEL, the passage between the east coast of Africa and the island of Madagascar, about 1,050 miles long from northeast to southwest, 530 miles wide at its southern entrance, about 250 miles wide in the center and nearly 600 miles wide at the northern entrance, where lie the Comoro Islands (Isles Comores). At one period the Mozambique Channel was a noted resort of pirates. On its west shore, the coast of the Portuguese colony of Mozambique, are several harbors, including those of Mozambique (or Moçambique), Quelimane, Chinde, and Beira.

MOZARABS, term applied in Spain to those Christians who, under the Moorish domination, maintained their old life and religious practices amid the Moslems. The liturgy preserved by these people is known as the Mozarabic; sometimes it is styled *Officium Gothicum* or *Isidori Missale,* because it was in vogue during the Gothic domination and was first revised by the great and learned Isidore of Seville in the 6th century.

MOZART, mō'tsärt, **(Johann Georg) Leopold,** German musician: b. Augsburg, Germany, Nov. 14, 1719; d. Salzburg, Austria, May 28, 1787. Father and teacher of Wolfgang Amadeus Mozart (q.v.), he was the son of a bookbinder and came to Salzburg in 1737 to study law. In 1743 he joined the court orchestra as a violinist, and later was promoted to court composer and assistant conductor. He was a teacher and composer of high reputation and possessed unusually versatile interests. In 1756 he published his *Violin School,* the very first of its kind, which was translated into various languages. He devoted many years almost exclusively to the education and promotion of his son, repeatedly facing dismissal from the orchestra because of his frequent absences, but was continued in his post until his death.

MOZART, Wolfgang Amadeus (real name JOHANNES CHRYSOSTOMUS WOLFGANGUS THEOPHILUS), Austrian composer: b. Salzburg, Austria, Jan. 27, 1756; d. Vienna, Dec. 5, 1791. Titled archbishops were the rulers of Mozart's native Salzburg and the surrounding country until 1803. Mozart's father, the Swabian Leopold Mozart (q.v.), held a respectable musical position at their court. His mother came from near-by St. Gilgen, on the Lake of St. Wolfgang.

Wolfgang was the youngest of seven children, five of whom died at a tender age. At three he began to play the harpsichord, a little later the violin and the organ; at five he had already tried to compose. He and his sister Maria Anna (Nannerl), who shared Wolfgang's child prodigy career, were taught from notebooks in which their father copied simple pieces by Austrian and German composers.

In 1762 the family started on a series of concert tours which eventually took them all over central and western Europe; in 1769, Wolfgang went to Italy with his father. Mozart was pampered by the imperial family in Vienna and the kings of France and England, and was knighted by the pope. Musicians and scientists tested and appreciated him. At 14 he was made a member of the conservative Philharmonic Society of Bologna, Italy. Only a series of dangerous illnesses, including smallpox and scarlet fever, interrupted constant work. Leopold Mozart's noisy publicity was critically remembered later, when the adolescent Wolfgang tried to obtain a steady position at some respectable court. On the other hand, he gained invaluable experience by hearing a cross section of the important music of his day. Early impressions of immediate effect were the meetings in Paris with Johann Schobert (d. 1767), who introduced the child to the poetical nature of music; and in England with Johann Christian Bach (1735–1782), the youngest and Italianized son of Johann Sebastian Bach. Wolfgang became familiar with Italian and French operas of current taste, as well as those by the innovator Gluck (1714–1787); with instrumental music of Joseph Haydn (1732–1809), and that by older masters of various nationalities. He studied voice with an Italian vocalist and counterpoint with the eminent polyphonist, Padre Mar-

tini (1706–1784), of Bologna. He also gave a concert with the famous Mannheim Orchestra and heard the works of Handel (1685–1759) performed in England, but these experiences were only to bear fruit much later.

At the age of eight, in Paris (1764), he had his first set of sonatas for violin and piano printed, and also discovered the ability to improvise for which he became famous. A few months later, in England, he composed his first symphonies, in Italian style. At 12, in Vienna (1768), he wrote his first *opera buffa* (*La Finta Semplice,* commissioned by Emperor Joseph II), his first Singspiel (*Bastien und Bastienne*), and his first mass. At 14, in Italy (1770), he composed his first string quartet and his first *opera seria* (*Mitridate, Re di Ponto,* under contract for Milan).

At home between trips, his father taught him languages, mathematics, and counterpoint. His chief model during these periods was Michael Haydn (1737–1806). In 1769 he was made concert master to the Salzburg court orchestra, where his duties later included composition for entertainment and church services.

In the early 1770's, Mozart's style took on a more subjective note. This process was speeded up by his first personal troubles. The new archbishop, Hieronymus Count Colloredo, did not like him and lost no opportunity to belittle him. Mozart's popularity with Salzburg aristocrats and burghers as a teacher and composer could not make up for abuse at court. On leave in Milan, where he was under contract for another *opera seria* (*Lucio Silla,* 1772) his new personal idiom that led away from the traditional Italian operatic style failed to please. He was not asked to return to Italy, but an Italian flavor remained forever attached to his music.

In the fall of 1777, Mozart resigned from the Salzburg court and went on a final journey with his mother. In Munich he was impressed with attempts to present opera in German. In Mannheim, the famous orchestra had a marked effect on his symphonic style. The symphony he wrote in Paris (*Paris Symphony,* 1778) was more fully scored and more colorful than his earlier ones. Among his other Paris compositions were the ballet music to *Les petits riens,* and a set of piano sonatas including the one in A Major with the Turkish rondo. In general, the sojourn in Paris was a failure, heightened by the sorrow of his mother's death. Early in 1779, Mozart returned to Salzburg to a better position with the court orchestra. His aversion to his home town and its sovereign archbishop, however, remained unabated.

Mozart's next important work was *Idomeneo, Rè di Creta,* an *opera seria* commissioned by the elector of Munich (1781). It was Mozart's first mature opera, and for the first time he took a hand in the shaping of his libretto. The score is rich and colorful and the treatment of the choruses points to Gluck's influence.

Shortly thereafter, the final break between Mozart and the archbishop developed during a state visit to Vienna. This step carried with it an estrangement from his father, who had long criticized his son's lofty ambitions. Wolfgang Mozart owed valuable teaching and stern discipline to Leopold, but they were fundamentally different in character. The son lacked the cunning yet ponderous mind of his German father. He was emotional and frank, oversensitive and optimistic, and opposed to menial tasks.

Mozart's pleasant demeanor, his superb piano playing, and his reputation as a teacher made him popular with the people of the highest rank, including the emperor, Joseph II. Although the court theater was traditionally Italian, and Gluck's Italian disciple, Antonio Salieri (1750–1825), was a court composer (the other being Gluck himself), Mozart was commissioned to write *Die Entführung aus dem Serail* (*The Abduction from the Seraglio,* 1782) for a group with which the emperor attempted to promote Singspiel in German. It was the first musical comedy in German which can be called an opera.

On Aug. 4, 1782, Mozart married Constanze Weber (1763–1842), a relative of the much younger Karl Maria von Weber, and sister of two excellent singers. Mozart had courted one of the sisters in Mannheim prior to her marriage, and for the other he was later to write the difficult arias sung by the Queen of the Night in *Die Zauberflöte* (*The Magic Flute*). Mozart's married life was happy in spite of Constanze's scanty education and her shortcomings as a housewife. They had five children, only two of whom survived infancy. The younger son, Wolfgang Amadeus, Jr. (1791–1844), had some musical talent and led an inconspicuous existence as a teacher and composer.

The most popular instrumental works from Mozart's first years in Vienna are the *Haffner Symphony* and a series of six string quartets, written under the influence of Haydn's matured quartet style and dedicated to him. During nine years of exemplary friendship, Mozart received valuable hints from Haydn in the handling of thematic material and form, while he in turn considerably affected the older man's treatment of the instruments. Haydn was the only contemporary musician who fully appreciated Mozart; and he repeatedly called him the greatest composer of all time.

In the summer of 1783, Mozart took his wife to Salzburg. On their way back through Linz he composed a symphony for a private performance there (*Linz Symphony*). Although a devout Catholic, Mozart became a Freemason in 1784 and repeatedly wrote music for occasions at his lodge. The winter of 1784–1785 was the most prosperous in Mozart's adult life. From this period date many piano concertos written for his own concerts, which were unprecedented in the interplay of the solo instrument with the orchestra. They became the point of departure for Beethoven's concertos.

Mozart's real desire, however, was directed toward opera. His urge to write for voice found its outlet in a number of songs, the most popular being the setting of Goethe's poem, *Ein Veilchen* (*A Violet,* 1785), until he and the Italian court poet Lorenzo Da Ponte (1749–1838) decided on an adaptation of the much-discussed French play *Le Mariage de Figaro* by Pierre A. C. Beaumarchais. With *Le Nozzi di Figaro* (*The Marriage of Figaro,* 1786), Mozart achieved the perfection of *opera buffa.* It was also the high point in his own life. Thereafter his popularity in Vienna declined.

The Italians in the Vienna opera managed to have *Figaro* shelved after nine performances. Mozart had better luck in Prague, where he visited early in 1787 and was lionized as in

his childhood days. In a concert there he conducted a new symphony, the *Prague Symphony* (without a minuet), written in a gloomy mood the preceding year. He returned with an opera contract for Prague. Back in Vienna, he found his operas crowded out and his music called modernistic. In the spring young Ludwig van Beethoven (1770–1827) came from Bonn to play for Mozart, who prophesied a great future for him.

In May 1787, Leopold Mozart died. Mozart's own mind had been preoccupied with death for some time. The string quintets from that period, particularly the one in G Minor, are expressions of profound sadness, but somewhat later works, such as the serenade *Eine Kleine Nachtmusik* (1787), reveal nothing of that nature. Mozart had started on the opera for Prague, for which he and Da Ponte had chosen the legend of Don Juan (*Don Giovanni,* 1787). The opera was classified by Da Ponte as *dramma giocoso* (gay drama). With significant symbolism dictating the treatment of the characters and the orchestra, it was highly unconventional at the time. It has been discovered that Casanova (1725–1798) contributed the words to an important scene. The first performance was the sensation of the Prague season, but the press was not enthusiastic, and the work did not please in Vienna at its première there the following May.

After the death of Gluck in November 1787, Mozart was named court composer—an honor he had long coveted. The only imperial commissions he received, however, were dances for the Carnival. His fee, much smaller than Gluck's, was inadequate, and the news from France heralding the revolution alarmed many potential patrons into thrift. Thereafter, Mozart was almost constantly in debt and dependent upon loans. A fellow Mason, the merchant Puchberg, was more than once responsible for saving him from starvation.

Within six weeks, in the summer of 1788, Mozart wrote his three "big" symphonies: the lyric in E Flat Major, the tragic in G Minor, and the powerful one in C Major that was later named *Jupiter.* They represent the culmination of his symphonic work and, together with Haydn's last 12 symphonies of a few years later, the perfection of classical symphony.

Physical and mental strain had left their marks on Mozart's health. A trip to Berlin (1789) did not bring the expected financial relief, but Mozart was rewarded by a chance to pore over Bach's manuscripts then still gathering dust in the archives at Leipzig. Their effect on his last chamber music and the *Requiem* was tremendous.

A successful revival of *Figaro* led the emperor to order another *opera buffa* from Mozart and Da Ponte, *Così fan tutte* (1790), a parody on a real incident. Reaching back into the earliest stages of comic opera, written in a shadowy delicate idiom, the music is a supreme example of Mozart's ability to detach himself from his personal troubles while composing. The opera was a great success, and might have solved Mozart's financial worries. But Emperor Joseph died and his brother and successor, Leopold II (1790–1792), did not care for music. Mozart was completely ignored. All he could obtain was an unsalaried position as assistant conductor at St. Stephen's Cathedral. In the summer of 1791, when he received a commission to write an *opera seria* (*La Clemenza di Tito*) for the emperor's coronation as king of Bohemia, he was a sick and depressed man. His interest was absorbed in two other works: *Die Zauberflöte* (*The Magic Flute*) and a *Requiem.*

The Magic Flute, based on a libretto by an old acquaintance and fellow Mason, Johann Emanuel Schikaneder (1748–1812), who operated a suburban popular theater, was originally meant to be a fairy tale burlesque of a type very common in those days. It was written in the form of a Singspiel, poorly worded, its action interspersed with flashy stage effects. A glorification of Freemasonry was introduced in the middle of the first act and caused a break in dramatic logic that was not restored. Yet its deeper dramatic qualities were musically expressed with so much spontaneity, appropriateness, and lightness of touch that it became the point of departure both for German romantic opera and for Viennese operetta.

Mozart's last completed works were a concerto for his preferred orchestral instrument, the clarinet, and a brief cantata for his Masonic lodge. The work on the *Requiem,* ordered by a mysterious stranger in the name of an undisclosed sponsor (who wanted to present it as his own) created in Mozart's overstrained nervous condition the fixed idea that the messenger had been a herald of death. To this was later added the obsession of having been poisoned by Salieri. The last shred of Mozart's strength was spent in the composition of the *Requiem.* His profound Catholicism found vent in the blissful expression of the joys of eternity. By the end of November he collapsed; continuing to write or dictate or even to sing parts of the *Requiem* on his death bed, he passed away in the early morning hours of Dec. 5, 1791. He was buried in a pauper's grave. The *Requiem* was finished by his pupil Franz Xaver Süssmayer (1766–1803).

A few days before Mozart's death, substantial commissions had come in which might have made him a well-to-do man. His fatal illness, a kidney disease, was traced by later research to his early attack of scarlet fever.

Mozart's works were brought into chronological order by Dr. Ludwig Alois Friedrich Ritter von Köchel (1800–1877), an instructor at the Vienna court. The catalogue, first issued in 1862, has been brought up to date several times by more recent findings. The last edition was published by Dr. Alfred Einstein in 1936. The letter *K.* (Köchel with a numeral after the classification of a Mozart work therefore stands for its opus number. So far, 626 authentic works have been listed, a very large number in view of Mozart's short life. He wrote very quickly, detached from surroundings or circumstances to a degree that has become legendary. He attributed his apparent facility to the hard studies in his youth.

Mozart is one of the greatest composers in musical history. He lived during the time when our classical forms were evolved, particularly symphony (q.v.) and chamber music, and he used both old and new structures. His most characteristic form of instrumental music was the piano concerto, to the development of which he contributed decisively. His was improvement rather than innovation; he helped to perfect all the branches of music, but made no attempt to create new styles. Even where he established a precedent, as in German opera, he fol-

lowed existing rules. The novelty of his music lies in its expressiveness, which he sometimes increased by the then uncommon use of chromatic successions and even dissonances. One of Mozart's most striking qualities is the combination of universality and discrimination. His astounding musical memory and early training in writing any kind of music helped him acquire his technical certainty. While wavering between models, tastes, and trends during his formative years, he chose from among them and retained what he could use for their later fusion into his personal idiom. His music came to represent the blending of vocal and instrumental, melodic and contrapuntal, symphonic, and dramatic elements to a degree that has not been reached before or since.

Mozart's part writing is clear and transparent. His feeling for balance and sound was phenomenal. The flow of his inspiration never ceased. His music, ever fresh and young, is a mirror of the composer himself, who was both naive and complicated, gay and melancholy, courtier and buffoon. He always remained natural, and his fundamental goodness was spoiled neither by his triumphs as a child prodigy nor by the ordeals of later struggles.

While Mozart ranked foremost among the pianistic celebrities of his day, he was, to his distress, not so fully appreciated as a composer. His contemporaries called some of his music ponderous and modernistic. Enthusiasts of 19th century romanticism pictured him as a perfumed clavecin player of a remote era. Only in the 20th century has he been recognized as the dramatic composer he considered himself to be.

ANN M. LINGG,
Author of "Mozart."

MOZIER, mō'zhēr, **Joseph,** American sculptor: b. Burlington, Vt., 1812; d. Faids, Switzerland, 1870. He was a merchant in New York from 1831 till 1845, when he retired and went to Rome to open a studio to practice as sculptor. He produced quite a number of figures, the best known being *Pocahontas, The Wept of Wish-ton Wish, Rizpah, Rebecca at the Well, Jepthah's Daughter, Undine, Queen Esther, Truth, Silence,* and *The Prodigal Son,* etc.

MOZLEY, James Bowling, English clergyman: b. Gainsborough, Lincolnshire, Sept. 15, 1813; d. 1878. He was educated at Grantham and was graduated (1838) at Oriel College, where he became a close acquaintance of Newman, Pusey, Froude, etc. He participated in the Oxford Movement, but could not accept the Roman communion and some other features. In 1869 he was made canon of Worcester and was created regius professor of divinity at Oxford in 1871. His *Essays, Historical and Theological* (1878), were published in two volumes, with his sister's biographical comment in the preface.

MR. MIDSHIPMAN EASY, published in 1836, is probably the best known of the many sea novels by Capt. Frederick Marryat. This spirited and entertaining story deals with the life of John, otherwise known as Jack Easy, from the time of his birth to his settlement in life by marriage and inheritance of an important estate. A youth of fine qualities, he is spoiled at home by his mother and educated in ideas of equality by his father. Much against their will he is sent to sea as midshipman at an early age and at the end of four years returns quite cured of odd ideas and with a fine record for bravery. His exciting and humorous adventures in the service of the Royal Navy made up the bulk of the book, which gives a lively picture of sea actions and a sailor's life on shore and on board ship. The galaxy of characters, part serious, part comic, is an especially good one. The deeper purpose of the novel is to show the more humane and chivalrous side of naval warfare and to set forth the finer traditions of the service.

WILLIAM T. BREWSTER.

MR. POIRIER'S SON-IN-LAW. See LE GENDRE DE MONSIEUR POIRIER.

MUCH ADO ABOUT NOTHING. *Much Ado about Nothing* is first mentioned in August 1600 and was printed in the same year. It is not referred to in Meres's famous list of Shakespeare's plays in 1598, unless indeed it is to be identified with the mysterious comedy, *Love's Labour's Won,* which Meres includes among Shakespeare's works. That *Much Ado,* in some less finished form than we now have, had been staged as early as 1598 under the title of *Love's Labour's Won,* is a bare possibility which hardly warrants speculation, but there is this to be said in its favor: it occupies among the comedies of Shakespeare's full maturity a position very analogous to that which *Love's Labour's Lost,* has among the early comedies. Each of these plays, when compared with others of the same period (with *The Two Gentlemen of Verona* and *A Midsummer Night's Dream* or with *As You Like It, Twelfth Night,* and *All's Well That Ends Well*) impresses the reader as a drama of the intellect rather than of the heart. Intrigue and wit overbalance romance in both, and personal planning largely takes the place of delectable chance. Benedict and Beatrice are finished studies which seem to have developed out of the sketches of Biron and Rosaline in *Love's Labour's Lost.* It goes with what has been said that this is a play of prose rather than poetry, of epigram rather than sentiment. Only a quarter of the lines are in verse, and this verse is seldom notable. The unfailing charm of the comedy lies in the infinitely brilliant superficiality of Beatrice and Benedick, the two archenemies of romance—in the unemotional cut and thrust of their badinage; and, next, in the ludicrous realism of the constables, Dogberry and Verges. All testimonies agree that this comedy is one of Shakespeare's most complete successes. It is also a remarkable evidence of the author's versatility, for it proves that he could execute with unsurpassed spirit and skill a type of play for which his other greater works would indicate that he had little natural inclination. *Much Ado about Nothing* is the only one of Shakespeare's major dramas which one can imagine that Congreve or Sheridan might have written. On the stage it has always been triumphant. When compared with its special corrivals among Shakespeare's comedies—the more romantic *As You Like It* and *Twelfth Night*—it impresses one as suited rather more to the theater and rather less to the study. About a quarter-century after the poet's death, it was selected by

Leonard Digges among the special examples of Shakespeare's drawing power:

> "Let but Beatrice
> And Benedick be seen, lo, in a trice
> The Cockpit, Galleries, Boxes, all are full." (1640)

David Garrick was a famous Benedick, and nearly all the greatest actresses have found opportunities for added laurels in Beatrice. The source of this play is relatively unimportant, for the greatest parts of it — the clownery of the constables and the figures of Beatrice and Benedick — seem to have sprung spontaneously from Shakespeare's brain. That part of the plot, however, which concerns Hero, Claudio and Don John is paralleled in several earlier works, in Spenser's 'Faerie Queene' (Bk. IV, ii), in Ariosto's 'Orlando Furioso' (Bk. V), and particularly in the 20th tale of Bandello's Italian *novelle* (printed 1554). It appears to have been from the last (possibly in the French or in some now unknown English version) that Shakespeare drew his hints; but the dramatist, besides altering the material in details, so subordinates it to the newer themes that it is likely to impress modern taste as either repellent or uninteresting.

TUCKER BROOKE.

MUCIC ACID, $C_6H_{10}O_8$, an organic acid formed by oxidizing milk sugar, or galactose, gum arabic and certain other substances, by the action of dilute nitric acid. It crystallizes in colorless tablets which are insoluble in alcohol, slightly soluble in cold water, and rather freely soluble in boiling water; though when boiled with water it becomes converted into an isomeric substance known as "paramucic acid." Mucic acid melts at about 410° F., does not reduce Fehling's solution, and combines with ammonia and with metallic and organic bases to form an extensive series of salts.

MUCILAGE, a solution of gum in water, In chemistry, the gum of seeds and roots. The name is also given to commercial adhesive gum made from gum arabic or dextrin. Mucilages, in pharmacy, are water preparations of substances dissolved in water, used to suspend insoluble ingredients or to bind them together in a mass.

MUCIN, an albuminous proteid substance, which is an important constituent of the connective tissue of the animal body, and which gives to the mucous membranes their characteristic sliminess. It may be isolated by extraction with lime water (or with pure water), and subsequent precipitation with acetic acid, in excess of which mucin is insoluble. Mucin is not precipitated by heat nor by tannic acid. It is, however, precipitated by alcohol, or by saturating its solution with common salt, or with magnesium sulphate. When boiled with strong sulphuric acid, mucin yields leucine and tyrosine.

MUCIUS SCÆVOLA. See SCÆVOLA.

MUCKER, nickname of certain mystic fanatics who were thus popularly derided as "canting hypocrites." The adjective is of ancient origin and did not connote a specific sect until it was applied to the followers of Johann Heinrich Schönherr and later Johann Wilhelm Ebel in Königsberg. Schönherr, who was the son of a Prussian non-commissioned officer, and was educated under the theological faculty of the University of Königsberg, combined odd ends of the Kantian philosophy with gleanings from the Bible into a dualistic neo-Gnosticism. Ebel, a Lutheran pastor, was a convert of his and in 1826 was joined by Johann Diestel, another pastor. The doctrine, which involved peculiar views as to the sexual relations, spread among fashionable circles in Königsberg. In 1835 Count Finckenstein, a former convert, accused Ebel and Diestel of immorality. They were unfrocked, but were not convicted of actual immorality. Consult Mombert, J. I., 'Faith Victorious' (New York 1882); Dixon, W. H., 'Spiritual Wives' (London 1868). See EBELIANS.

MUCORACEÆ, the molds. See FUNGI.

MUCOUS MEMBRANE. The mucous membranes line passages and cavities which communicate with the exterior of the body, where they become continuous with the skin. They constitute the lining of the alimentary canal or tract, which begins at the mouth and ends at the anus, a distance of about 27 feet, and is the passage through which the food for nutrition of the body is introduced, digested and taken up for the preservation and health of the body. They also form the lining of the nose, the throat, the middle ear, the various sinuses communicating with these cavities, the eyes, and of the respiratory apparatus, which comprises the lungs, the windpipe or trachea, and the larynx. The kidneys, the ureter, the bladder, the testes and the urethra in the male, and the Fallopian tubes, womb, vagina and vulva of the female are all lined with mucous membrane, together with the membrane of the ducts of glands which open upon it. In the female it becomes continuous with the peritoneum at the fimbriæ of the Fallopian tubes. The surface of the mucous membranes of the body is subjected to the contact of various matters, such as the food, the air, and the different glandular secretions and excretions. They are protected from undue irritation by a viscid liquid called mucus (q.v.), which constantly bathes their surface, and are also well supplied with blood-vessels and nerves. The mucous membranes are not of a single origin, but may be derived from ectoderm, as is the case with the lining of the mouth, entoderm, as with the greater part of the digestive tract, or mesothelium, as in the urogenital ducts. A mucous membrane consists of an epithelium, or layer of lining cells; a connective-tissue basement-membrane, which may be hyaline and apparently homogeneous; and a further connective-tissue support or *tunica propria.* It usually is invaginated into glands, and may be evaginated into villae, as in the case of the stomach and intestine. For the diseases of the mucous membrane, see the respective organs or systems concerned.

MUCUS, a semi-fluid substance, of a viscid, tenacious character, produced by the various mucous membranes of animals, and found covering the exposed surface of such membranes. Thus it is produced in the mucous membrane lining the nose, the mouth and throat, the gullet, stomach, large and small bowel, the air-tubes of the lungs, the kidneys, ureter, and bladder, the gall-bladder, the ducts of glands, the bile-ducts, etc. In all these situations it serves to lubricate

the membrane over the surface of which it is spread, and to protect the delicate surface from the action of irritating agents. Its viscid character prevents it being readily removed, and thus enables it more effectually to discharge its protective function. It is to be noticed that many of the mucous membranes have special glandular structures embedded in them, which produce special secretions, not mucus, such as the mucous membrane of the stomach and bowels, whose secretions have special properties connected with the digestion of the food. The saliva from the mouth is a mixture of mucus and the special secretion from the salivary glands, which acts on the starchy elements of food. Other mucous membranes have no such special structures, and only mucus is secreted by them, such as the mucous membrane of the nasal passages. Mucus is secreted by glands situated deep in the mucous membrane, and such glands are found in the mucous membrane of the nose; similar glands of very minute form are found scattered thickly in the mucous membrane of the mouth, and are found of considerable size in the back part of the tongue, in the gullet, and other situations. But mucus is also produced by single epithelial cells, lining mucous membranes. The form of epithelial cell called the "goblet cell" is believed to be a mucous-secreting cell, and it is found in large numbers lining the mucous membrane of the air-passages, the stomach and bowels. So that by their agency the special digestive secretions of stomach and intestines contain a large admixture of mucous material. Pure mucus is transparent, but it is usually turbid from the presence of foreign materials, and epithelial cells from the secreting membrane. Its chief ingredient is mucin, a derivative from albuminous bodies, consisting of carbon, hydrogen, oxygen and nitrogen, but, unlike albumin, containing no sulphur. It is held in suspension by water, forming an opaque liquid, but is not dissolved by it. Besides mucin, mucus contains small quantities of proteid substances and salts, chiefly common salt. Water constitutes nearly 94 per cent of its bulk. From fluids containing it in suspension, such as bile, it may be precipitated in a flocculent stringy mass by alcohol. Heat does not coagulate it; and it is dissolved by weak solutions of alkalies and alkaline earths.

MUD (or PEAT) BATH, in which the body is immersed in mud or peat. At Eger, Bohemia, black mud is heated to a temperature of 100°. It contains sulphate of soda, iron, lime, alumina and ulmic acid. The body is immersed for 15 minutes, after which the patient goes into water to remove the mud. Such a bath may be of use in chronic skin diseases, rheumatism, gout, etc.

MUD-BUFFALO, a name, in the leather trade, for the Indian buffalo (*Bos bubalus*) as found in a wild or semi-wild condition in the Malay Peninsula, where they frequent swamps and are shot for the sake of their hides. These hides are not tanned, but are sent green to India, Europe and America to be used in the making of loom-pickers, mallets, gears and other tools used in cotton-milling. They become harder than wood, and are tougher and more elastic.

MUD-CAT. See CATFISH.

MUD CRACKS, cracks formed in mud surfaces by shrinkage due to drying. The surface of the mud flat is usually broken up into polygonal blocks, by cracks varying from a few inches to several feet in depth. These are also known as sun cracks, and are commonly formed in the muds of flood plains and deltas, and on playa (q.v.) surfaces. They are often filled with drifting sand and preserved in the sediment as the rock solidifies. For a discussion of their geological significance, see the section on *Structure,* in the article on GEOLOGY.

MUD-EEL, the amphibian *Siren lacertina,* which has persistent gills but no hind legs. It resembles the Proteidæ (q.v.) in many ways. See SIRENIDÆ.

MUD-FISH, the name of various fishes found in muddy water, or fond of burrowing in the ooze of swamps. The Nile bichir and its relatives, the reed-fishes of the sluggish African rivers, are so called; also the lepidosiren and other dipnoans, which grovel on muddy bottoms. In the United States, the name belongs to some small mud-minnows (q.v.), and to a curious fish (*Amia calva*) of the Mississippi Valley, known as dogfish, bowfin and by various other names. This, like the bichir and the reed-fish, is a ganoid (q.v.). It is a rather shapeless, dark-colored, exceedingly hardy fish, reaching a length of two feet and a dozen pounds in weight. It is carnivorous, feeding voraciously upon crayfish, small mollusks and anything it is able to seize and swallow; and it greedily seizes a baited hook and then fights gamely for its life, so that it is a favorite with anglers, though hardly fit to eat.

MUD-HEN, or MARSH-HEN, a sportsman's name for any of several rails, gallinules, coots and similar birds which make their home in marshes; it is most often given in the North to the Gallinule (*Gallinula galeata*), a bird of the rail family, much like the British water-hen (*G. chloropus*), and common in the marshes about the Great Lakes and Mississippi Valley, where its cluckings resound in summer from every reedy marsh. It is about a foot in length, olive-brown on the back, dull black on the under parts and with a red bill. It is migratory; but the Southern States have a smaller and more handsome mud-hen in the resident purple gallinule (*Ionornis martinica*).

MUD-MINNOW, or DOGFISH, one of the smaller fresh-water carnivorous fishes of the pike family, the *Esocidae* and the genus *Umbra* related to the Alaskan blackfish (*Dallia*). It lives in muddy bayous, and among weeds at the bottom of clear but sluggish streams, often burrowing in loose mud. There are two North American species: *Umbra limi* of the interior, and *U. pygmæa* of the eastern coast; and one in Austria. Such a distribution increases the probability that this is of "an archaic type, characteristic of some earlier fish-fauna." The mud-minnows reach a length of about four inches and are valued as live bait, since they will long endure with vigor impalement on the hook.

MUD-PUPPY, or **WATER-DOG,** a member of the *Proteidae* (q.v.). In this country usually *Necturus maculatus,* a large newt common in the eastern Mississippi Basin. For its

development and metamorphoses, see EMBRYOLOGY.

MUD-SHAD (*Dorosoma cepedianum*), the hickory or gizzard shad. This fish grows to a length of about 15 inches, is silvery blue in color, and occurs throughout the Mississippi Valley and in great abundance from Cape Cod to Mexico.

MUD-SKIPPER, a minute tropical fish of the goby family and genus *Periophthalmus,* which is accustomed to go ashore and skip about the space between tide-marks, exploring the rocks, roots of trees, etc., for food, and skipping about like grasshoppers. Some curious qualities distinguish these little creatures, which are found from West Africa to Japan, and make them highly interesting to naturalists. Consult Day's 'Fishes of India' (1878) and other works on the natural history of the Eastern seas.

MUD-TURTLE, or **MUD-TORTOISE,** any fresh-water turtle usually found in muddy places. In the United States, the ordinary mud-turtle is *Cinosternon pennsylvanicum,* which has a grayish-brown smooth shell, and a dark-colored head, with light dots. See BOX-TURTLE.

MUD-WASP, one of the many kinds of solitary wasps which fabricate out of wet clay cell-like receptacles, variously shaped and placed, in which to store their eggs and the provision for the larvæ. See WASP.

MUDDOCK, Joyce Emmerson, English journalist and author: b. Southampton, England, 28 May 1843. He has been connected with several London journals and beside publishing some 52 volumes under the *nom de guerre* of "DICK DONOVAN" is the author of many other works, among which are 'Basile the Jester'; 'The Great White Hand'; 'Fair Rosalind,' and 'Pages from an Adventurous Life.'

MUDGE, Enoch, American Methodist clergyman: b. Lynn, Mass., 28 June 1776; d. 2 April 1850; the first Methodist clergyman reared in New England. He became an itinerant clergyman of the Methodist Church in 1793, and in 1793–99 traveled on his duties about Maine until hardships affected his health, and he was settled at Orrington (1799–1816). During this period he was twice elected to the legislature, where he obtained the repeal of a law imposing a tax on other denominations for the benefit of the Congregationalists. Having resumed itineracy in 1816, he was stationed at Boston, Lynn, Portsmouth, Newport and other places. From 1832 until his retirement from active life in 1844, he was pastor of the Seamen's Chapel at New Bedford. He was a member of the Massachusetts Constitutional Convention in 1819. He contributed much to the press, and published in bookform 'Camp-Meeting Hymn-Book' (1818); 'Notes on the Parables' (1828); 'Lynn,' in verse (1830), and 'Lectures to Seamen' (1836).

MUDIR, moo-dēr', the title of a Turkish or Egyptian official; the governor of a province.

MUEZZIN, mū-ĕz'ĭn, in Mohammedan countries the beadle of the mosque, whose duty it is to summon the faithful to prayer at the assigned periods by public proclamation from the minaret (q.v.). His call is the *azan,* and is sounded five times each day. The call is "God is most great [four times]! I bear witness that there is no god but one God [twice]! I bear witness Mohammed is the apostle of God [twice]! Come to prayer [twice]! Come to salvation [twice]! God is most great [twice]! There is no god but God [twice]!" In the morning call the words "Come to salvation!" "Prayer is better than sleep!" are repeated twice.

MUFTI, the title of a high Turkish official: who assists the judge or cadi by interpreting the law of the Koran, of Moslem tradition and of other legal sources. The Grand Mufti or Sheikh-ul-Islam (see SHEIK) is one of the interpreters of the Koran, by whose decisions the cadis have to judge. The phrase, "in mufti" meaning, "not in uniform; in civilian dress," is an Anglo-Indian expression, referring to the loose robes of the Moslem mufti.

MUGGER. See MARSH-CROCODILE.

MUGGLETONIANS, a religious sect founded (1610) by Lodowicke Muggleton in London. He claimed that he and his cousin John Reeve, a tailor like himself, were the two witnesses who should "prophesy a thousand two hundred and three score days, clothed in sackcloth" (Rev. xi, 3). He was 40 years old when he received this commission through visions and mysterious voices. 'The Divine Looking Glass' (1656) contains an exposition of the teachings of the Muggletonians who deny the doctrine of the Trinity and believe in a material God, who suffered on the cross. Penn's 'The New Witnesses proved old Heretics' (1672) was a reply to the attacks of Muggleton. This Muggletonian bible was republished 1846 by a few remaining adherents of the sect. Consult Jessopp, A., 'The Coming of the Friars' (1888).

MUGWORT, an ornamental and culinary herb. See ARTEMISIA.

MUGWUMP, *in American politics,* a term originating during the Presidential campaign of 1884 between Grover Cleveland and James G. Blaine. It was applied by a New York newspaper to such members of the Republican party as refused to support their party nominee, James G. Blaine, and advocated the election of Grover Cleveland in the interest, they claimed, of civil service reform. The word belongs to the Algonquin dialect of the Indian languages and is used by John Eliot in his translation of the Bible to translate the Hebrew word *Alluph,* a "leader." Eliot used it in the sense of "big chief," a term more comprehensible to the Indian mind than that which appears in the King James' version—"duke." The word was spelled "Mugquomp" in the singular, and "Mugquompaog" in the plural. It appears in many places throughout the Algonquin translation of the Old Testament.

MUHARRAM, (Ar. *muharram,* sacred, from *horama,* to forbid), moo-hăr'am, the first month in the Mohammedan year. The tenth day is known as the day of Ashura, and was originally made by Mohammed the great fast of the year, in imitation of the Jewish Day of Atonement, which is celebrated on the tenth day after New Year's Day. Later on this came to be replaced by the fast-month of Ramadan. Nowadays among the Sunnites the day of Ashura is only a voluntary

fast. The Shiites mourn on this day in memory of the martyrdom of Husein (q.v.) at Kerbela.

MÜHLBACH, mül'bäh, **Luise.** See Mundt, Klara.

MÜHLBERG, mül'bĕrk, Germany, town in Prussian Saxony, eight miles from the city of Riesa, Mühlberg is located on the Elbe, has two Evangelical churches, court of justice, inland-revenue office, etc. Its industries consist of a sugar factory, saw-mills, brick kilns, besides commerce in lumber and grain and shipping. It is noted in history through the victory of Emperor Charles V over John Frederick, Elector of Saxony, in 1547. Pop. 3,345.

MUHLEMAN, mūl'mạn, **Maurice Louis,** American author: b. near Alton, Ill., 27 Nov. 1852; d. 12 June 1913. He was graduated from the law school of Columbia University in 1879 and was appointed to the United States treasury service in 1872. In 1888–1901 he was deputy assistant treasurer of the United States. He has published 'The Money of the United States' (1894); 'Monetary Systems of the World' (1896); 'Treasury System of the United States' (1907); 'Banking Systems of the World' (1908); 'A Plan for a Central Bank' (1910); 'Governmental Supervision of Banks' (1911).

MUHLENBERG, mū'lĕn-berg, **Frederick Augustus Conrad,** American Lutheran clergyman and politician; son of Heinrich Melchior Muhlenberg (q.v.): b. Trappe, Pa., 1 Jan. 1750; d. Lancaster, Pa., 4 June 1801. He was educated in Halle, Germany, and returning in 1770 was ordained to the Lutheran ministry. In 1773–76 he had charge of a Lutheran church in New York and then removed to Pennsylvania where he held several pastoral charges. He was a hearty sympathizer with the cause of the colonies and though not participating in the war aided his countrymen politically and ultimately abandoned his pastoral work for a political life. He served in the Continental Congress and was speaker of the first House of Representatives under Washington, and in 1795 his was the deciding vote which rescued the Jay treaty from defeat.

MUHLENBERG, Gotthilf Henry Ernst, American Lutheran clergyman and botanist: b. Trappe, Pa., 17 Nov. 1753; d. Lancaster, Pa., 23 May 1815. He was a brother of F. A. C. Muhlenberg and son of Heinrich Melchior Muhlenberg (qq.v.), and was educated with him in Halle, Germany. He returned to America in 1770, was ordained to the ministry and became an assistant to his father who was in charge of a Lutheran church in Philadelphia. He served in various charges until 1779 when he accepted a call to Lancaster where he remained until his death. In addition to his pastoral duties he distinguished himself as a scientist and took first rank as a botanist. He published 'Catalogus Plantarum Americæ Septentrionalis' (1813); 'Descriptio Uberior Graminium' (1817), etc.

MUHLENBERG, Heinrich Melchior, German-American clergyman, organizer of the Evangelical Lutheran Church in America: b. Eimbeck, Hanover, 6 Sept. 1711; d. New Providence (now Trappe), Montgomery County, Pa., 7 Oct. 1787. He was educated at the University of Göttingen (1735–37), studied theology there (1737–38) and at Halle (1738–39), was ordained in 1739, and from 1739 to 1741 was deacon of the church at Grosshennersdorf, Upper Lusatia. On 6 Sept. 1741 he was called as missionary to the Lutheran congregations of Pennsylvania, located at Philadelphia, New Providence (now Trappe), and New Hanover. At that time there was a large number of Lutherans in America; but they were unorganized and without pastors, and such religious meetings as they had were conducted by laymen. Muhlenberg, who arrived at Charleston, S. C., 22 Sept. 1742 and at Philadelphia, 25 November, was well qualified for the work of effecting union and order. He at once entered on the duties of his charge, and preached his first sermon in Pennsylvania in an unfinished log-building at New Hanover, 28 November. Though Muhlenberg's local pastorship was largely restricted to the three congregations which had summoned him, his activities were really those of a bishop. He traveled over a wide extent of territory, preached at Lancaster, York and other places in Pennsylvania, in New York, and also occasionally in New Jersey, Maryland and among the Salzburger Lutherans of Georgia. "There was probably," thinks Stoever, "not a Lutheran church, in his day, in this country in which he had not officiated." He was at first looked upon as an intruder by Zinzendorf and other Moravians, with whom he was for a time involved in conflict. But so successful was he in his labors that by 1745 there was real need for the reinforcement from Halle, consisting of the Rev. Peter Brunnholtz and the catechists Kurtz and Schaum. The first church edifice at Philadelphia, Saint Michael's, was completed in 1743, and on 25 June 1769 Zion's Church, then considered the largest and finest in the United States, was dedicated there. On 14 Aug. 1748 the first Lutheran synod in America was organized under the direction of Muhlenberg, who became its president. In 1754 Muhlenberg prepared the 'Kirchen Agende,' a directory for public worship, and in 1762 reorganized the Philadelphia congregation under a constitution which became the basis of that of most congregations later established. He identified himself with the American cause in the Revolution, and was in consequence subjected to many annoyances, particularly when Pennsylvania was the scene of war (1777–78). He was a linguist of high rank, versed in Hebrew, Greek and Latin (in which he made an address at the synod of 1750), and proficient in English, Dutch, French, Bohemian and Swedish. His large foreign correspondence appeared at Halle in 1787. Consult 'Die erlaubte Klage über den Abschied treuer Knechte Gottes' (1788), a memorial sermon by J. H. C. Helmuth (with biographical sketch); Stoever, 'Memoir of the Life and Times of Muhlenberg' (1856); Mann, 'Life and Times' (1887), considered the best.

MUHLENBERG, John Peter Gabriel, American patriot: b. Trappe (then New Providence), Montgomery County, Pa., 1 Oct. 1746; d. near Philadelphia, 1 Oct. 1807. He was the son of H. M. Muhlenberg (q.v.), the founder of the German Lutheran Church in America. He was educated for the ministry, was for a time pastor of German Lutheran churches at New Germantown, N. J., and Bedminster, N. J. In 1772 he went to Woodstock, Va., and

finding that, in order to enforce the payment of tithes, he must be ordained in the Episcopal Church, he was ordained priest in England. He was chairman of the Shenandoah County committee of safety, and in 1774 became a member of the Virginia House of Burgesses. At Washington's request he was made a colonel in the Continental Army. His last sermon was upon the duties men owe their country; and saying, "There is a time for all things—a time to preach and a time to fight—and now is the time to fight," he stripped off his gown after the service, appeared in full uniform, called for recruits and enrolled about 300 of the parishioners. He participated in several battles, was made brigadier general in 1777, and major general at the close of the Revolution. After the war he removed to Pennsylvania, where he was elected a member of the supreme executive council, and in 1785 became vice president of Pennsylvania. He served as representative in Congress from 1789 to 1795, and from 1799 to 1801. In 1801 he was elected United States senator, but soon resigned and was appointed supervisor of revenue for Philadelphia. From 1802 till his death he held the office of collector of the port of Philadelphia.

MUHLENBERG, William Augustus, American clergyman: b. Philadelphia, Sept. 16, 1796; d. New York, April 8, 1877. He was graduated (1815) at the University of Pennsylvania and was ordained deacon (1817) of the Episcopal Church and priest three years later, becoming assistant to the rector, Bishop White, of St. Peters and St. James parishes. In 1821 he went to Lancaster, Pa., becoming rector of St. James Church and established there the first public school in the state outside of Philadelphia. He went to Flushing, L. I. (1826), and founded a Christian high school (1828, later St. Paul's College), he remained principal till 1846, when he was appointed rector of the Church of the Holy Communion, New York City, erected by his sister. He started collecting a fund for the erection of a church hospital out of which St. Luke's Hospital was built (1858) on 54th Street between Fifth and Sixth avenues, and he became its first pastor and superintendent, which positions he held till his death. His last very useful work was in founding St. Johnland Christian industrial community on the north shore of Long Island. In 1852 he organized the first Protestant sisterhood in the United States. He wrote several well-known hymns including *I Would Not Live Alway; Like Noah's Weary Dove; Shout the Glad Tidings.* His chief works published are *Evangelical Catholic Papers,* 2 vols. (1875–1877); *Christian Education* (1831). Consult, Ayres, Sister Anne, *Life and Work of William Augustus Muhlenberg* (New York 1880).

MUHLENBERG COLLEGE, in Allentown, Pa., founded in 1848 under the auspicies of the Lutheran Church. In 1946 there were connected with the college 85 professors and instructors, and about 786 pupils. There were in the library 70,000 volumes.

MUHLHAUSEN, mül'hou-zĕn, France, a town of Alsace-Lorraine. See **Mulhouse** (German Mülhausen).

MUHLHAUSEN, Germany, town of Thuringen, in a fertile district on the Unstrut, 29 miles northwest of Erfurt. It has two interesting old churches, an old town-house, a gymnasium, various technical, commercial and other schools, hospitals, an orphanage, etc. It manufactures woolen and cotton or mixed goods, hosiery, cigars, leather, sewing-machines, wooden wares, furniture; and carries on tanning, dyeing, malting, brewing, etc. The Anabaptist Thomas Münzer, a leader in the Peasants' War, had his headquarters here, and was executed nearby in 1525. The town became part of the Kingdom of Prussia in 1815. Pop. (1939) 44,398.

MUHLHEIM, mül'hīm. See **Mülheim.**

MUIR, mūr, **John,** Scottish Sanskrit scholar: b. Glasgow, Feb. 5, 1810; d. Edinburgh, March 7, 1882. He was educated at Glasgow University and at Haileybury College, whence he passed into the Bengal Civil Service in 1829. He remained in India 25 years, filling various offices in the revenue, educational and judicial departments. His fame will rest on his *Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions,* illustrated (1858–1870). The first volume discusses the legendary accounts of the origin of caste; the second, the primitive homes of the Hindu; the third, the opinions of Hindu writers on the Vedas; the fourth, the contrast between Vedic and later Hindu theology; and the last the cosmological and mythological conceptions of the Indians in the Vedic age. In 1862 he founded a chair of Sanskrit and comparative philology in the University of Edinburgh, following out the plans of the Association for the Better Endowment of Edinburgh University, of which he was the main originator.

MUIR, John, American naturalist and explorer: b. Dunbar, Scotland, April 21, 1838; d. Los Angeles, Dec. 24, 1914. He came to America in 1849 with his father, who settled near Fox River, Wis.; entered the University of Wisconsin when 21; and after a special course of four years commenced his lonely journeys through Canada, eastern and western United States, the West, and the South, that made him a botanist and a geologist. In 1868 after visiting the Yosemite Valley, he made it his main central camp for 6 years while studying the forests, glaciers, etc., of the Sierra Nevada. He discovered in the High Sierra 65 residual glaciers. He made his first trip to Alaska in 1879, discovered Glacier Bay, and Muir Glacier, named after him, and explored some of the upper courses of the Yukon and Mackenzie rivers; in 1880 accompanied the DeLong search expedition to the Arctic, and in 1903–1904 traveled in the Caucasus, Siberia, Manchuria, Japan, India, Egypt, Australia and New Zealand. He wrote much for newspapers and periodicals, urging the formation of national parks—both the Sequoia and Yosemite are in great part due to his efforts—and published *The Mountains of California* (1894), and *Our National Parks* (1901). He was a member of the American Academy of Arts and Letters, and received honorary degrees at Yale and the universities of Wisconsin and California. Among his works are *Stickeen* (1909); *My First Summer in the Sierra* (1911); *The Yosemite* (1912); *Story of my Boyhood and Youth* (1913); and the

posthumous *Letters to a Friend* and *Unpublished Prose and Letters* (1915).

MUIR, Sir **William,** Scottish administrator and Arabic scholar: b. Glasgow, April 27, 1819; d. July 11, 1905. He attended lectures at the universities of Edinburgh and Glasgow and at 18 entered the Bengal civil service, where he attained distinction. He became secretary of the government of the North-West Provinces and member of the Revenue Board, and during the mutiny was in charge of the Intelligence Department at Agra. He was lieutenant governor of the North-West Provinces 1868–1874, and financial minister to the government of India 1874–1876. Returning to England he sat on the Council of India, 1876–1885, was elected principal of the University of Edinburgh, 1885–1905. His published works included: *Life of Mohamet* (1858 and 1877); *The Côran: Its Composition and Teachings* (1877); "Ancient Arabic Poetry," *Royal Asiatic Society's Journal* (1879); *The Early Caliphate and Rise of Islam* (1881); *Annals of the Early Caliphate* (1883); *The Old and New Testaments, Tourat, Zubûr and Gospel* (1899).

MUKDEN (Shenyang, earlier Fungtienfu), capital of the original Manchurian Province of Liaoning (q.v.) and of the new province of that name, created in 1945. It is on the Hun River (a tributary of the Liao), about 500 miles northeast of Peiping. Mukden is the original home of the Manchus, and is a miniature Peiping. The city proper, which is laid out in regular blocks, is surrounded by a wall of squared stone or brick, thick and massive at the base and tapering to the top, surrounded by a wide moat. Suburbs, including the modern New City, extend beyond the wall for a mile or more on all sides. In the heart of the city there is an inner wall, three miles in circuit, enclosing the imperial residence, government offices, courts, and other buildings connected with them, which are arranged on a plan similar to those in Peiping. In 1631 the Manchu monarchs made Mukden the seat of government, and succeeding emperors did much to enlarge and beautify it. The tombs of the Manchu emperors are at Mukden. Other interesting relics, remains of which are still to be seen in the environs of the city, are the Temple of Heaven and the Temple of Earth, both built by Emperor Tai Tsung (r. 1636–1643). After the building of railways in Manchuria by the Russians, Japanese, and Chinese, Mukden became a strategic center in south Manchuria. During the Russo-Japanese War, Mukden, used by the Russian Army as a base of supplies, was captured by the Japanese in one of the most remarkable battles of modern history. After the defeat of Russia, the Japanese established their sphere of influence in south Manchuria, and Mukden became a base for Japanese penetration in China. A planned "incident" gave Japan an excuse for seizing the city, Sept. 18, 1931, starting aggressions that led to World War II. During the 14 years of Japanese occupation of Manchuria, Mukden was developed into one of the most important industrial centers in the Far East. It was estimated that there were over 3,000 Japanese factories in Mukden, investments in which equaled about half the total investments by the Japanese in their home industries, which were rivaled in importance by those in Mukden. After the Soviet Army entered Mukden on Aug. 20, 1945, the Mukden plants were stripped by the USSR of their best equipment. When the Chinese national troops arrived in Mukden early in 1946, they found an empty industrial city. In May 1946, President and Madame Chiang Kai-shek paid a special visit to Mukden.

MUKHTAR PASHA, mookh-tär'păsh'â, (Ghazi Ahmed), Turkish general and statesman: b. Brusa, September 1832; d. Constantinople, Jan. 21, 1919. He attended military schools in Brusa and Constantinople and entered the army. Serving in the Crimean War, he later taught in a military school and became the military instructor of Prince Yusuf Iseddin, favorite son of Sultan Abd-ul-Aziz, and was second in command of the expedition to Yemen in 1870, taking full command in 1871, and consequently being given the title of *müshïr* (marshal). In the campaign of 1860 in Montenegro he played a conspicuous part and thereafter received steady and rapid promotion. He became a full general in 1870 and in 1873 was appointed minister of public works. In the wars of Bosnia, Herzegovina and Montenegro in which he commanded he displayed great generalship, gaining 20 victories and never suffering defeat. The campaign of Kars-Erzerum in 1877 went against him and he was defeated by the Russian general Melikoff after a brilliant engagement for which he received the highest Turkish military title, "Ghazi." In 1878 he was made grand master of the Turkish artillery, in which capacity he subdued the Cretan insurrection in that year, and in 1885 was designated to the post of Turkish high commissioner in Egypt. He remained there about 10 years, and then returned to Constantinople.

MULA, moo'la, Spain, town in the province of Murcia, on a branch of the Segura. It has ancient castle ruins, but is chiefly known on account of its iron and sulphur natural hot baths. Pop. about 9,632.

MULBERRY, a genus (*Morus*) of trees of the order Moraceae (q.v.), of which 100 species have been described, but only five are now recognized. The mulberries are characterized by the possession of leaves variable in form even upon the same twigs; monoecious flowers in axillary catkins; and multiple blackberry-like fruits formed by the coherence of the pistillate flowers which become fleshy as they swell. They are natives of the mild parts of Asia, Europe and America, whence they have been taken by man to similar regions throughout the world. In the Old World various species are of economic importance, principally because their foliage supplies the food of the silkworm, and their fruit a dessert and a wine. The wood of most species is of inferior quality, but that of one species, the red mulberry (*M. rubra*), is fine-grained, strong and useful for shipbuilding. The trees are readily propagated by means of seeds, layers, cuttings or by graftage. They thrive upon almost any soil; even on rocky hillsides and gravelly lands, but succeed best upon arable soil in which they may be planted from 20 to 40 feet apart, and cultivated like other orchard fruits until they have full possession of the ground. The fruits,

which are borne in great profusion, are too soft for market purposes, and usually too sweet for preserving alone. They are generally shaken from the trees upon sheets. Pigs are very fond of them.

The following are the most important species. The white mulberry (*M. alba*) is the silkworm mulberry, and has produced most of the named American varieties valued for their fruit, but not those esteemed in Europe. The black mulberry (*M. nigra*) is the European «dessert» species, and is little used for the feeding of silkworms. The red mulberry (*M. rubra*) is a native American tree to be found from Massachusetts to Nebraska and southward to the Gulf States. It has produced several good dessert varieties, the fruits, of which are characterized by greater acidity than those of the Old World sorts. It seems to be ill adapted to the feeding of silkworms. The so-called Russian mulberry is a variety of the white. It produces inferior fruits but is valued in the Plains States for wind-breaks, for which purpose its ability to resist extremes of drouth, cold and neglect specially fit it. All the above species have produced horticultural varieties, some variegated, others weeping, which are planted more for ornamental purposes than for fruit.

Another important species is the Indian (*M. indica*) which is used in silk culture and for its fruit, which is of fine flavor. It is cultivated in India, China and other countries of the East.

The allied paper-mulberry (*Broussonetia papyrifera*) is a native of Eastern Asia. This tree is of a moderate size, bearing leaves which are either simple or divided into lobes, more or less deep, rough above and hairy beneath. It was originally from India and Japan, but is now very commonly cultivated in Europe, and succeeds even in the more northern parts. The islanders of the Pacific make a kind of clothing from the bark of this tree in the following manner: Twigs of about an inch in diameter are cut and deprived of their bark, which is divided into strips, and left to macerate for some time in running water. After the epidermis has been scraped off, and while yet moist, the strips are laid out upon a plank in such a manner that they touch at the edges, and two or three layers of the same are then placed upon them, taking care to preserve an equal thickness throughout. At the end of 24 hours the whole mass is adherent, when it is removed to a large, flat and perfectly smooth table, and is beaten with little wooden clubs till it has attained the requisite thinness. This kind of cloth is easily torn, and requires to be washed and beaten many times before it acquires its full suppleness and whiteness. The natives dye it red and yellow, and also make a similar cloth from the bread-fruit tree, an allied plant; but that from the mulberry is preferred. The paper which is used in Japan and many other countries in the East Indies is made from this plant. For this purpose the annual shoots are cut after the fall of the leaves, tied in bundles, and boiled in water mixed with ashes; after which the bark is stripped off by longitudinal incisions. and deprived of the brown epidermis. The mark of the more tender shoots is separated from the rest, as it furnishes a white paper for writing, while that produced by the remainder is coarse and gray, and serves for wrapping or similar purposes.

MULCH, any material kept in a loose condition at the surface of the soil for the purpose of checking evaporation, conserving moisture, protecting plant-roots or low-growing plants from frost or heat, preventing puddling and washing of the soil, retarding growth in spring, keeping the surface soil open, supplying plant-food, protecting fruit or flowers from dirt, and keeping down weeds. The materials most frequently applied are straw, marsh-hay, leaves, litter and brush; but the most widely important mulch is the surface soil itself, kept powdery by frequent tillage, given especially after rains when it is desirable to break the crust formed upon the surface. Since mulches keep the soil beneath them moist by breaking the capillary, they are of particular advantage in dry climates; but since the vegetable mulches, such as straw and leaves, cannot be used in summer where the land must be cultivated and since they supply hiding places for insects, they can rarely be used advantageously in fruit plantations, in which they are often also a positive detriment because they encourage the growth of roots near the surface. In climates liable to extremes of temperature this position of the feeding roots is often disastrous to the crop if not to the plants themselves. Except, therefore, for winter protection, when such seems to be necessary, the soil itself is generally best. But the depth of the powdery layer will depend largely upon the climate, character of the soil, and kind of crop; in arid regions, with light soils, and with deep-rooted plants, the soil-mulches are usually deeper than with the reverse conditions.

MULDER, mool'dĕr, **Gerardus Johannes,** Dutch chemist and physician: b. Utrecht, Holland, 27 Dec. 1802; d. there, April 1880. He was educated at the University of Utrecht and became professor of botany and chemistry there (1840–68), but first practised medicine in Amsterdam for some years. He was also for a short time professor of chemistry at Rotterdam. He became known chiefly through his researches on the proteids, and advanced the belief in a hypothetical substance which he called protein. This he believed to be the essential nitrogenous constituent of food, existing in animals, and derived ready-formed from plants and vegetables. The publication of this theory involved Mulder in a controversy with Liebig, who from the first doubted the existence of protein as an independent chemical compound. The whole theory has been abandoned, and the word protein is now used to indicate the first element in compounds. His principal work 'Chemistry of Vegetable and Animal Physiology' has been translated into English by Fromberg, and his 'Chemistry of Wine,' by Bence Jones. He also wrote 'Chemical Researches'; 'De Voeding in Nederland'; 'De Voeding van den Neger in Suriname,' and his posthumous autobiography 'Levensschets' (1881; 2d ed. 1883).

MULE, *in zoology,* a term loosely used as synonymous with hybrid, more usually applied to the produce of a male ass with a mare, the mule proper, and to the hinny, the offspring of a stallion and a she-ass. The mule does not

attain maturity as soon as the horse, but is useful a much longer period. As a beast of burden it is in some respects preferable to the horse; it is easily fed, is equally good for carrying and drawing, its less sensitive skin enables it to support exposure to the weather; like the ass, it enjoys comparative immunity from disease, and it is as surefooted as a goat. Mules have been known from the earliest ages; there are frequent references to them in Scripture and in Greek and Latin literature. Kentucky, Missouri and Kansas take the lead in mule-raising in the United States, and the small Mexican mule is a very useful animal. France is the most important mule-raising country in Europe; then come Italy, Spain and Portugal, where they are used for pack and draft. They are largely employed as draft animals in warfare. Fecundation of the hybrid-female by the male ass or the stallion is not very rare, though she rarely throws a living foal. Consult Fegetmeier, 'Horses, Asses and Zebras' (London, 1895), and publications of the United States Department of Agriculture. (See HYBRIDITY). In 1931 there were 5,131,000 mules in the United States, valued at $351,994,000. The average value per head was $68.60. For further statistics see DAIRY INDUSTRY, AMERICAN.

MULE DEER, or BLACKTAIL, a deer of the western United States (*Odocoileus hemionus*), remarkable for its disproportionately large ears. Its common name «blacktail» among the hunters is due to the black color of the terminal part of the tail, distinguishing it from the «whitetail» or eastern deer (q.v.); but is better reserved for the Pacific Coast species. (See BLACKTAIL). This deer is rather larger than the eastern one and is a deer of the rocky plains, and especially of the mountains, which it climbs in summer as high as it can go, pasturing upon alpine slopes and resting upon the summits of cliffs and ledges where it has a wide outlook. Its gait is very distinctive, also, consisting of a series of jerking bounds very effective on declivities, but looking strange on a level plain. The character of the sport afforded by this deer depends much upon the kind of country in which it is hunted, the method of pursuit being very different in the chaparral of southern California from that followed among the broken plains of Montana. When hiding in summer it will often wait until almost touched before starting off. In winter it gathers into herds and wanders among sheltering hills and vales. It is therefore the characteristic deer of the Rocky Mountain region and was formerly exceedingly numerous and one of the principal sources of food and clothing for the Indians. Originally the species occurred commonly as far east as the plains and prairies extended; but was early exterminated in the central Mississippi Valley; and from about 1875 to 1895 was the object of persistent slaughter by hide hunters. At the beginning of the present century, therefore, it had nearly disappeared from the plains south of the upper Missouri, was scarce in the central Rockies and numerous only in the less frequented parts of the Northwestern States and adjoining provinces of Canada. Its hide makes the best tanned deer-leather (buckskin) and its flesh is excellent. The mule deer is not much taller than the Virginian deer, standing about three feet four inches high at the shoulder, but is heavier and of coarser build. The ears are very large and thickly haired, the tail roundish and white with black tip. The coat is dull yellowish in summer, palest in the southern desert varieties, but becomes bluish gray with the autumnal molt; face between the eyes dusky, elsewhere white; throat, abdomen and inside of the legs white; antlers forking equally and each prong again bifurcating. Consult Baillie-Grohman, 'Fifteen Years' Sport and Life in the Hunting Grounds of Western America' (1900); Caton, 'Antelope and Deer of America' (1877); Lydekker, 'Deer of all Lands' (1898); Roosevelt (and others), 'The Deer Family' (1902).

MULE-KILLER. See MANTIS.

MULE MACHINE, a spinning-machine in which the rovings are delivered from a series of sets of drawing rollers to spindles placed on a carriage, which travels away from the rollers while the thread is being twisted and returns toward the rollers while the thread is being wound. It was invented by Samuel Crompton, of Bolton, England, and perfected in 1779. The combination which gave rise to the term mule was the junction of the drawing rollers of Arkwright with the spinning jenny of Hargreaves. The object of the machine is to deliver the roving with the required degree of attenuation and twist it as delivered. For this purpose the spindles, instead of being stationary, are placed on a movable carriage which is wheeled out to twist the threads and wheeled in again to wind on the spindles.

MULE AS A WORK ANIMAL, The. The use of mules for doing the work of the world is almost as old as history. The historical records that have come down to us recounting the exploits and industrial achievements of the more civilized peoples of the earth have all mentioned the mule. The impression which one gathers from reading the opinions of the earlier peoples is that the mule was highly regarded, particularly as a burden bearer.

So far as the writer has been able to determine, there are no unfavorable reports of the work of mules. On the other hand the unanimous opinion of those who have had most to do with the utilization of mules is that they are in many respects the most efficient and satisfactory work animals employed by mankind.

In more modern history the evidence of the value of mules is still more thoroughly recognized. The number of mules in the United States has increased rapidly. One hundred years ago the mule was not generally used as a draft animal except in a few Southern States. At the present time the mule is used to a greater or less extent in every State of the Union. He is particularly valued in the South, in the Middle West and the West. In these great agricultural regions the mule has won a place in competition with horses and he will not be replaced unless we should ultimately come to a type of farm practice which will make it possible to employ mechanical motors exclusively for agricultural production.

The favorable opinion of mules as work animals is not due to any accident nor indeed to any peculiar psychology of those who have used the mule largely in their industrial occu-

pations. There are certain outstanding qualities characteristic of the mule which single him out from among other types of draft animals and have made him what he is to-day — undoubtedly one of the most popular and economical of draft animals.

The mule is recognized as possessing unusual endurance, exceptional courage, sure-footedness, steadiness and is exceptionally free from excitability and harmful nervousness. The mule is also given credit for the possession of an unusual amount of instinctive wisdom which protects him against many of the dangers and accidents to which horses are subject.

No draft animal so far developed has the endurance of the mule under all kinds of hard working conditions. In the excessive hot climate of the tropics mules will work steadily day after day without injury to themselves and will accomplish an astonishingly large amount of productive labor. Under similar conditions horses are far less efficient and indeed it is plain that under many such conditions horses are entirely unable to accomplish the work. On the arid plains and in the desert regions of the world the endurance of the mule has been recognized and particularly where the trails are rocky the mule outlasts any other draft animal.

A part of the endurance of the mule is due to his temperament, a part to his sound, thoroughly good feet and a part to his instinctive food habits. The mule is not so well adapted to the sandy stretches of the arid regions because his small, somewhat pointed foot causes him to sink more deeply into the sand than flat-footed horses. The mule is sure-footed. Over the dangerous trails of the mountains the mule rarely meets with an accident. He is wise in selecting his foothold and will carry the rider or pack safely along precipitous trails where under similar conditions horses would be unsatisfactory.

On the farms, particularly of the Middle West and the South, the mule is more economical. The statement is frequently made that the mule requires less food for the performance of a given amount of work than the horse. This is the general opinion among farmers experienced in the use of mules. Investigations on this point are not numerous and are not thoroughly convincing, but in the main the conclusion that mules will consume less food than horses is probably true. It is certainly true that mules will thrive on a coarser character of fodder. They will thrive under conditions which would be impossible for horses.

The mule will rarely if ever injure himself by over-heating, over-eating or drinking when he is too hot. Under similar conditions horses are frequently injured and their usefulness greatly diminished.

This interesting hybrid, descended from the ancient wild ass of the deserts, has inherited a certain type of wisdom which protects him from the dangers incident to civilization. The mule avoids accidents. On the farms of Missouri where mules attain their highest development the risk from rearing young mules, so far as acquiring blemishes is concerned, is much smaller than the risks from similar accidents among young horses. This is an economic factor which is clearly recognized and one which constitutes an argument for the increased profit in the raising of mules. In the earlier use of mules in this country the small, active, hardy mule of good quality was universally favored. In more recent years with the larger use of heavy farm machinery, larger mules have been in demand. At the present time (1919) the large draft mule of good quality sells for the highest price on the market. The draft mules are not only used in the cities for heavy hauling but farmers also now more often demand the heavy mule than in former years. The smaller mules, known on the market as «cotton» mules, are more generally sold in the South. The draft mules are sold in the mining regions, for city drayage and on larger farms of the Middle West. The «sugar» mule is a larger mule than the «cotton» mule and is demanded in the cane-growing regions of the South. The demand for large draft mules has caused the breeders of jacks and jennets to produce a large jack of good quality. This animal mated to the mares belonging to the principal draft breeds of the United States is the source of the draft mules of America. These draft mules may perhaps lack somewhat in quality as compared with the smaller, more active mules of earlier history but they do possess a power and efficiency in the hauling of heavy loads which is comparable to the similar power of great draft horses so long used on the city streets.

This brief article on the value of the mule as a work animal would not be complete without recognizing the great value of the mule in war. During the great European War the Allies made large use of the mule in transporting artillery and supplies, particularly in carrying supplies to the front. The mule because of his courage and steady, reliable subservience was dependable under fire and could be used where horses could not be employed.

The rearing of mules has come to be as much an art based upon scientific principles of breeding as has the production of any other class of domestic animals. While it is true that the mule is a hybrid and always sterile, the principles of breeding which may be applied in his production are more complicated and involve the successful breeding of two distinct species, it is nevertheless true that the value of the mule for industrial purposes is to-day as largely dependent upon the skill of the breeder as is the breeding of cattle, horses, sheep or swine.

FREDERICK B. MUMFORD,
Dean and Director of the College of Agriculture, University of Missouri.

MULFORD, Elisha, American Episcopal clergyman and philosophical writer: b. Montrose, Pa., 10 Nov. 1833; d. Cambridge, Mass., 9 Dec. 1885. He was graduated from Yale in 1855 and subsequently studied theology, law and philosophy. He entered the Episcopal ministry and held several rectorates, but from 1881 lived in Cambridge, Mass. He wrote 'The Nation' (1870), a treatise on the philosophy of the State, and 'The Republic of God' (1881), relating to the philosophy of religion. From 1881 till his death he taught at the Episcopal Theological School at Cambridge, Mass.

MULHALL, Michael George, Irish statistician: b. Dublin, Ireland, 1836; d. Killiney, Ireland, 12 Dec. 1900. He was educated in the

Irish College at Rome, and in 1861 went to Buenos Aires, where he founded the *Standard*, the first English daily paper in South America. He gained a wide reputation as a statistician, and in 1880 made a calculation of the census of the United States for 1900 which came within 95,000 of the number given by the census report in that year. He was a frequent contributor to the *Contemporary Review*, and published *Rio Grande do Sul and Its German Colonies* (1873); *A Dictionary of Statistics* (1883); *Fifty Years of National Progress, 1837–87* (1887); *Industries and Wealth of Nations* (1896). His wife, MRS. MARION MULHALL, wrote *Between the Amazon and the Andes* (1883); *Celtic Sources of Dante's Divine Comedy*.

MÜLHEIM, mül'hīm, Prussia, two towns of the Rhineland area: (1) Mülheim-am-Rhine, with a bridge spanning the river, is almost opposite Cologne with which it was incorporated in 1914. During the 17th century the town received many expelled Protestants from Cologne. The town's manufactures include machinery, cables, velvet, and chemicals. (2) Mülheim-an-der-Ruhr is 14 miles north of Düsseldorf. The city is located on the Ruhr, a tributary of the Rhine, and has coal and iron mines, blast furnaces, rolling mills, foundries, and engine works. While its chief industry is ironmaking, it also manufactures leather, beer, paper, and tobacco. One of its churches, St. Peter's, dates from about the 12th century. Pop. (1939) 136,805.

MULHOLLAND, mŭl'hŏl'ănd, **William,** American hydraulic engineer: b. Belfast, Ireland, Sept. 11, 1855; d. Los Angeles, Calif., July 22, 1935. He was educated at the Christian Brothers' School, Dublin. Coming to the United States, he became superintendent and chief engineer of the waterworks of Los Angeles, Calif., from 1886. He devised the plans and estimates, then superintended the construction of the Los Angeles aqueduct to bring to the city water from Sierra Nevada Mountains, a distance of about 250 miles, at a cost of $24,500,000. He had been consulting engineer on many projected water supply and irrigation plants.

MULHOUSE, mü'lōōz', (German, MÜLHAUSEN or MUHLHAUSEN), France, a town of Alsace-Lorraine, on the Ill River and the Rhine-Rhône Canal, 66 miles by rail southwest of Strasbourg, and 18 miles northwest of Basel, Switzerland. It is an important commercial and manufacturing center, cotton-spinning being one of the largest industries. The town carries on calico printing, dyeing, the spinning of woolen and worsted yarn, the manufacture of machinery, railway material and numerous other industries. Its industrial importance dates from 1746, when a cotton factory was established. It is noted for its model dwellings for the working classes in the *cité ouvrière*, workingmen's colony, on the northwest, founded by Mayor Dollfus in 1853. A migration to the suburbs, however, left the artisan colony in the occupation of small tradesmen. Mülhausen is first mentioned in 717; it became an imperial free city in 1273, and in the 15th century entered into an alliance with the Swiss, which lasted till 1798, when it became French. It was included in the cession of Alsace to Germany in 1871. In World War I it was the scene of considerable military activity. In 1918 it reverted to France. Pop. 1936, 96,011.

MULITA, a small armadillo, with head and ears like those of a mule, native to southern South America.

MULL, Scotland, an island of Argyllshire, the largest of the Inner Hebrides next to Skye. Its length is 35 miles; greatest breadth, 30; superficial area, 347 square miles. It is irregular in shape, and the large bay on the west side contains a number of islands, including Ulva and Staffa. Iona lies off its southwest extremity.

The island is rugged and mountainous; Benmore, the highest mountain, is over 3,000 feet above the level of the sea. The principal town is Tobermory; other villages include Salen and Lochbuie. Pop. (1931) 2,903.

MULLANY, mŭl-lā'nĭ, **James Robert Madison,** American naval officer: b. New York, Oct. 26, 1818; d. Bryn Mawr, Pa., Sept. 17, 1887. He was appointed to the navy as midshipman in 1832 and received steady promotion, becoming lieutenant in 1844. He served with distinction in the Mexican War, and at the outbreak of the Civil War in 1861 was promoted commander. He commanded the *Oneida* in the Battle of Mobile Bay and performed valiant service with her on that occasion, losing his left arm.

He was commissioned commodore in 1870 and rear admiral in 1874, and until 1876 was in command of the North Atlantic squadron, and in conjunction with General Emory and General Sheridan at New Orleans protected American interests on the Isthmus of Panama. From 1876 until 1879, when he was retired from active service, he was governor of the naval station at Philadelphia.

MULLEIN, a genus of biennial and perennial herbs (*Verbascum*) of the natural order Scrophulariaceae. The species, of which more than 100 have been described and more than 30 are cultivated, have tap-roots, woolly foliage in rosettes during the first year, and terminal spikes or racemes of small, usually yellow, flowers which appear from midsummer until late autumn. Some species were formerly reputed medicinal. In America they are usually considered as weeds, but in Europe they are valued as ornamental plants, particularly for mixing with shrubbery and planting in the rear of flower borders. Though natives of the Mediterranean region, some species are known in England as American flannel or velvet plant. The best-known species in the United States are probably the moth mullein (*V. blattaria*), the common mullein (*V. thapsus*), the white mullein (*V. lychnitis*), and *V. phlomoides*.

MÜLLER, mü'lĕr, **Adam Heinrich,** German economist: b. Berlin, 1779; d. 1829. In his 19th year he went to the University of Göttingen, where he at first occupied himself with theology and then became a student of jurisprudence, in which he was a pupil of Hugo. He afterward sought to complete his education by the private study of the natural sciences, which he had previously neglected.

He early formed a close intimacy with Friedrich Gentz, his elder by 15 years; and this connection exercised an important influence both on his material circumstances and his mental development in after life. The two men differed widely in character and in their fundamental principles, but agreed, at least in their later period, in their practical political aims, and the friendship was only terminated by death. Müller's relations with the Junker party and his co-operation with them in their opposition to Hardenberg's reforms made any public employment in Prussia impossible for him. In 1805 he was in Vienna, where he became a convert to Roman Catholicism, and through Gentz was brought into relations with Metternich, to whom he was useful in the preparation of state papers. In 1806–09 he was in Dresden, being occupied in the political education of Prince Bernhard of Saxe-Weimar. In 1813 he entered the Austrian service, and in 1815 accompanied the Allies to Paris. He was ennobled by the emperor in 1820. In 1827 he settled a second time in Vienna, and was employed in the state chancellery. He was one of the principal literary instruments of the reaction and took part in framing the Carlsbad resolutions. He was distinguished as a writer not only on politics and economics, but on literature and æsthetics. His principal work is his 'Elemente der Staatskunst' (1809), which contains the substance of a course of lectures delivered at Dresden to statesmen and diplomatists. In political economy he represents a reaction against the doctrines of Adam Smith, whom, while he highly commends him in certain respects, he censures as presenting a one-sidedly material and individualistic conception of society, and as being too exclusively English in his views. Müller's leading idea is that of the organic unity and continuity of the state and of social institutions in general. Some of his higher tendencies, freed from much of their alloy, are reproduced in the writings of the historical school of German economists. Other works by Müller are 'Die Theorie der Staatshaushaltung und ihre Fortschritte in Deutschland und England seit Adam Smith' (1812); 'Versuch einer neuen Theorie des Geldes' (1816); 'Vermischte Schriften über Staat Philosophie und Kunst' (2 vols., Vienna 1817); and 'Von der Nothwendigkeit einer theologischen Grundlage der gesammten Staatswissenschaften und der Staatswirthschaft insbesondere' (1819). Consult biographical notice of Mischler in 'Allgemeine Deutsche Biographie.'

MÜLLER, Charles Louis, French painter: b. Paris, 22 Dec. 1815; d. there, 10 Jan. 1892. He was the pupil of L. Cogniet, Baron Gros and others in the Ecole des Beaux-Arts, and in 1850 was made director of the manufactory of Gobelin tapestries. His fertility in the production of historic pictures and portraits was amazing. Among them are 'Heliogabalus' (1841); 'Primavera' (1846); 'May-day'; 'Lady Macbeth'; and his masterpiece, 'The Last Victims to the Reign of Terror'; the last two being in the Luxembourg; 'Vive l'Empereur' (1855); 'Marie Antoinette' (1857); 'A Mass During the Reign of Terror' (1863); 'The Madness of King Lear' (1875); 'Mater Dolorosa' (1877). He executed the frescoes of the Salle d'Etat in the Louvre, and as a painter is more to be commended for clever drawing and composition than for his somewhat flat and mediocre coloring. In 1864 he became a member of the Institute.

MÜLLER, Friedrich, called "Maler Müller," or "Müller the Painter," German artist and poet: b. Kreuznach, 13 Jan. 1749; d. Rome, 23 April 1825. Some of his etchings, animals, compositions in the Flemish style, pastoral scenes, etc., were remarkable for their originality and freedom. He deserves more credit as a poet, for at a time when German poetry had degenerated, Müller helped to give a new impulse to German literature. His best works, 'Nible,' 'Faust' and 'Genevieve,' are characterized by richness, warmth and elevated delineation of character, though sometimes wild and disconnected.

MÜLLER, Friedrich Max (known as Max Müller), English philologist: b. Dessau, Germany, 6 Dec. 1823; d. Oxford, 28 Oct. 1900. His father was Wilhelm Müller (q.v.), a famous German lyrist, and his maternal great-grandfather Basedow, the eductional reformer. His bringing up was in his mother's hands, as his father died when the boy was four. He studied in Leipzig, at the Nicolaischule; had some thoughts of becoming a musician, but entered the University of Leipzig in 1841, and there, under the leadership of Hermann Brochaus, devoted himself to Sanskrit, publishing a German version of the 'Hitōpadēša' in 1844; worked under Bopp in philology and Schelling in philosophy at Berlin for a year; in 1845 went to Paris, where Burnouf suggested to him an edition of the 'Rig Veda'; and in 1846 went to England and interested the East India Company in this work, which he undertook at the expense of the company. He was in Paris in 1848, and brought to Palmerston, in London, the first news of Louis Philippe's flight from Paris. In the same year he settled in Oxford, where the 'Rig Veda' appeared, with Sāyana's commentary, 1849–74. He became deputy Taylorian professor in 1850, and Fellow of All Souls' in 1858; but in 1860 was defeated in his candidacy for the chair of Sanskrit by Monier Williams, after a fierce fight on the part of his opponents, who objected partly to his foreign birth and partly to his very free and unorthodox religious views. The result for linguistic science was unfortunate, as it turned Max Müller from the narrow field of Sanskrit, in which he easily outranked his contemporaries, to comparative philology and the science of religion, in which his achievements were less exact and scholarly, to say the least. In 1868 he became professor of comparative philology at Oxford. He was made a privy councillor in 1896. His greatest single work was as editor of the 'Sacred Books of the East,' a series of English versions of Oriental scriptures, to which he contributed three volumes, and which was begun in 1879 and is not yet complete. He is possibly even better known as a popularizer of the first principles of linguistic science, so that he became in the lay mind the main exponent of this science, whereas his grasp of its detail was inadequate, and many of the etymologies he advanced showed that he was not conversant with the strict rules of phonetics. But the charm of his style, his general grasp of so large a subject, and his admitted pre-eminence in San-

skrit, make interesting and valuable, if not absolutely authoritative, reading of *The Science of Language* (1861–63); *Essays on Language and Literature,* and *Biographies of Words* (1888), all of which have passed through new editions. Max Müller's works on mythology and religion also have a higher repute among general readers than with the specialist, but it cannot be denied that they did much good in stimulating research, as the *Sacred Books* did in supplying a field for such research. In this class of writings mention should be made of the *Essay on Comparative Mythology* (1856); 'Introduction to the Science of Religion' (1873); 'The Origin and Growth of Religion' (1878); 'Natural Religion' (1889); 'Physical Religion' (1891); 'Anthropological Religion' (1892); 'Theosophy, or Psychological Religion' (1893); the 'Essays on Mythology and Folklore' in the 4th volume of 'Chips from a German Workshop'; and 'Contributions to the Science of Mythology' (1897). His versions from the Sanskrit and the Pâli have been alluded to; 'A History of Ancient Sanskrit Literature' (1859), and a 'Sanskrit Grammar' also should be mentioned, and it should be borne in mind that it is in this field that the scholar spoke with authority. From his youth Max Müller was interested in philosophy; he wrote an excellent version of Kant's 'Critique of Pure Reason' (1881); also 'The Science of Thought' (1887), urging that thought was inconceivable without language, and the Oriental studies, 'Three Lectures on the Vedânta Philosophy' (1894), and 'The Six Systems of Indian Philosophy' (1899). An entirely different side of the man is disclosed by 'My Indian Friends' (1899), which shows much of his broad and charming personality; or by 'Deutsche Liebe' (1857), a romantic and popular story translated into French, Italian and Russian, and appearing in English in two versions, one American, unauthorized and very successful, and a later one (1873) by Mrs. Max Müller. He also edited his father's poems (1868), and Scherer's 'History of German Literature.' His collected works, including the four volumes of 'Chips from a German Workshop' (1867–75), appeared 1898 et seq. Consult his own 'Auld Lang Syne' (1898), and 'My Autobiography' (1901); his wife's 'Life and Letters of Max Müller (1902); and Whitney, W. D., 'Max Müller and the Science of Language' (New York 1892).

MÜLLER, Georg Friedrich, German-English philanthropist: b. Kroppenstädt, Prussia, 27 Sept. 1805; d. Bristol, England, 10 March 1898. Entering the University of Halle as a student of theology in 1825, although he had fallen into irregularities of life, he was converted before the end of that year, and in the following year began to preach and teach. In 1829 he went to London, whither the Society for Promoting Christianity Among the Jews had invited him, settled at Teignmouth as pastor of Ebenezer Chapel, where he gave up pew-rents and substituted box-collections, finally refusing a salary and depending on voluntary gifts. In 1832 he joined Henry Craik, a prominent member of the sect of Plymouth Brethren, in ministerial work at Bristol. In 1835 he published a proposal for the establishment of an orphan home, which took shape in 1836 at Bristol. The experiment was successful, the work grew from year to year, and by 1875 no less than 2,000 children were lodged, fed and educated without other financial maintenance than that received in donations from all parts of the world. The orphanage was moved in 1849 to Ashley Down, a suburb of Bristol. With his wife Müller made evangelistic tours in Europe, America and Asia. He published *A Narrative of Some of the Lord's Dealings with Georg Müller* (1837). Consult biographies by Pierson (New York 1899); by Warne (New York 1911).

MULLER, Johann Friedrich Theodor, yō hän frēd'rĭH tā'ō-dōr (better known as FRITZ MÜLLER, and also known as MÜLLER-DESTERRO), German naturalist: b. near Erfurt, 31 March 1821; d. 1897. After studying at the universities of Greifswald and Berlin, he went to South America in 1848, and settled on the island of Santa Catharina, Brazil, living there the ordinary pioneer's life until appointed (1856) to teach natural history and mathematics in the Desterro gymnasium. From 1874 he was engaged for a time as collector for the museum at Rio de Janeiro. His published papers on crustaceans, insects, worms, jellyfishes, etc., were many, most of them appearing in the 'Annals' of the Rio de Janeiro Museum, Wiegmann's 'Archiv für Naturgeschichte,' and similar publications. In his 'Facts for Darwin' (1864), a book written under the stimulus of Darwin's 'Origin of Species,' he made valuable applications of Darwinianism in new fields, and won reputation among men of science for the originality and fertility of his observations and deductions. Among the more important pieces of work which he did were researches on mimicry (q.v.) and the first clear statement of the theory of recapitulation (q.v.).

MÜLLER, Johann Gotthard von, German engraver: b. Bernhausen, near Stuttgart, 4 May 1747; d. Stuttgart, 14 March 1830. After studying under Guibal, the painter, he turned to engraving, and in 1770 went to Paris, where, under Willie, he studied for six years, and after winning several prizes was elected to membership in the French Academy. Returning in 1776 to Stuttgart, he taught there for nine years. While there he was called to Paris to engrave a portrait of Louis XVI. This is regarded as his most important work, next to which may be ranked his 'Battle of Bunker Hill,' after Trumbull; 'Madonna della Seggiola,' after Raphael, etc. He was knighted in 1818.

MÜLLER, Johannes, German physiologist: b. Coblenz, Prussia, 14 July 1801; d. Berlin, 28 April 1858. He studied, from 1819, at Bonn and Berlin, started service (1824) as private dozent of physiology and comparative anatomy at Bonn, and became assistant professor (1830), then (1833) professor of anatomy and physiology at Berlin. His first important works, 'Zur vergleichenden Physiologie des Gesichtsinns' (Leipzig 1826) and 'Uber die phantastischen Gesichtserscheinungen' (Coblenz 1826), are of a subjective philosophical tendency, the first concerning the most important facts as to human and animal sight; the second sounds depths of difficult psychological problems. He soon became the leader in the science of the morphological treatment of zoology as well as

of experimental physiology. To his active researches (1830) are due the foundation of the Bell law concerning the work of the roots of the nerves of the spinal marrow, the settlement of the theory of reflex action, the more exact knowledge of the blood's constitution, lymphs, chyle, etc. He even investigated the vocal organs and sound expression, producing fundamental work on the sense of hearing. He finished his great work 'Handbuch der Physiologie des Menschen' (Coblenz 1833–40; 4th ed., 1841–44) in Berlin. It has been translated into English under the title 'Elements of Physiology' (1837–43). The work discloses an entire knowledge of physiology, including comparative organology and medical histology from their microscopical and chemical viewpoints. The work was epoch-making. From 1833 he issued numerous treatises on comparative and pathological anatomy and systematic zoology. Of such should be cited 'Der verglichende Anatomie der Myxinoiden' (Berlin 1835–41); 'Beschreibung der Plagiostomen' (ib. 1838–41), in collaboration with Jacob Henle; 'Ueber den Bau und die Grenzen der Ganoiden und das natürliche System der Fische' (ib. 1844); 'Ueber die Larven und die Metamophose der Echino-dermen' (ib. 1849). His 'Ueber den feineren Bau der krankhaften Geschwülste' (ib. 1838), which was never finished, was a pioneer for microscopical research in pathological anatomy. From then on he worked almost exclusively in the realm of comparative anatomy and brought forth numerous researches concerning the lower animals. He took 19 trips to the Baltic and North Sea, the Adriatic and the Mediterranean to investigate salt-water life. It is declared of him that he was the most versatile, fruitful, genial and lucky investigator of modern days, and he maintained his vitality till the end. He never questioned the rights of philosophy or even faith nor positive religion, but no single being has done more toward placing physics and chemistry in their correct place in physiology and establishing the true method in contrast with the errors of natural philosophy, spiritualism and orthodoxy, for all time. From 1834 he published *Archiv für Anatomie, Physiologie und wissenschaftliche Medizin.* In 1899 a bronze statue was erected in his memory at Coblenz. Consult his biographies by Virchow (Berlin 1858) and De Bois-Reymond (ib. 1860).

MULLER, Johannes von, German-Swiss historian: b. Schaffhausen, 3 Jan. 1752; d. Cassel, 29 May 1809. He studied at Göttingen, and in 1772 became professor of Greek at the gymnasium at Schaffhausen, and published 'Bellum Cimbricum,' his first work. He lived and taught in Geneva 1774–80, where he began his 'Allgemeine Geschichte' (3 vols., 1810), and published the first volume of his 'Geschichte der Schweitzer.' From 1781 to 1786 he taught history and statistics at the Collegium Carolinum at Cassel. In 1786 he became librarian and councillor of state to the Elector of Mainz. Here he wrote his 'Geschichte der schweizerischen Eidgenossenschaft' and several other works. In 1792, when Mainz was taken by the French, he went to Vienna, where the Emperor Leopold nominated him a member of the Privy Council. In 1804 he left Vienna for Berlin, where he was appointed historiographer of the Hohenzollern family. He also published 'Ueber die Geschichte Friedrich I'; 'Ueber den Untergang der Freiheit der Alten Völker'; 'Versuch über die Zeitrechnungen der Vorwelt.' After the battle of Jena, he was appointed by Napoleon (1807) Secretary of State in the new kingdom of Westphalia. His 'Sämmtliche Werke' appeared in 27 volumes (1800–17); (new ed., 40 vols., 1831–35). Consult lives by Heeren (1820); Döring (1835); Monnard, in French (1839), and Thiersch (1881).

MULLER, Julius, German theologian: b. Brieg, Prussia, 10 April 1801; d. Halle, Germany, 27 Sept. 1878. He was educated at Breslau and Göttingen, and abandoned the study of law for theology. He was opposed to the Rationalists, and in 1825–31 was in charge of several small parishes. In 1831 he was preacher at Göttingen University, and in 1834 was elected professor of theology there. From 1835–39 he was professor in Marburg, and for the remainder of his life filled the chair of theology at Halle. His greatest work is 'Die christliche Lehre von der Sünde' (1829; trans. Edinburgh 1868), and among his other books are 'The Evangelical Union' (1854); 'Dogmatische Abhandlangen' (1870), etc.

MULLER, Karl Otfried, German archæologist and philologist: b. Brieg, Silesia, 1797; d. Athens, 1 Aug. 1840. The son of a field preacher, his education began at the gymnasium of his native town. He was then sent to Breslau, and afterward went to Berlin, where, as a pupil of Böckh, he devoted himself to the study of the life and art of the ancients. After publishing the 'Ægineticorum Liber' (1817) he was appointed instructor in the Magdalum at Breslau. Here he made an elaborate analysis of Greek mythology, separating allegorical inventions from true history. In 1819 he was made professor of philology and in 1823 became professor ordinarius at Göttingen. He was a great traveler, and his writings embrace the whole circle of antiquity. His intention was undoubtedly to concentrate the results of his whole life of scholarly activity in his great work, 'Geschichte hellenischer Stämme und Städte.' He only completed two volumes, however: Vol. I, 'Orchomenos und die Minyer' (1820), and Vol. II, 'Die Dorier' (1824). One of his best-known works, 'A History of the Literature of Ancient Greece,' a translation by Lewis and Donaldson from the author's manuscript, was published in London in 1840, and the continuator, Donaldson, published another edition in 1858. His 'Kunstarchäologische Werke,' in five volumes (1872–73), is a valuable work. Müller's 'Æschylus's Eumenides' (Göttingen 1833) was the object of a profound controversy in which Gottfried Hermann and his followers attacked him with great bitterness. Karl Müller was also prominent as an editor. Consult the biography by F. Ranke (1870).

MÜLLER, Morten. See MORTEN-MULLER.

MÜLLER, Victor, German historical painter: b. Frankfort, 29 March 1829; d. Munich, 21 Dec. 1871. Beginning his artistic career at the Frankfort art school, he continued it at Antwerp and ultimately went to Paris (1849), where he stayed for 11 years, dili-

gently studying the methods and manner of Couture, Delacroix and Courbet. He settled in Munich in 1865, and for the castle of Kronberg in the Taunus painted a series of scenes from the history of Baron Hartmuth von Kronberg. He also produced his famous 'Hero and Leander.' Following these works came 'Hamlet with Horatio in the Churchyard'; 'Ophelia'; 'Romeo and Juliet,' and his last and unfinished work, 'Faust on a Stroll.' Among his other works are 'Wood Nymph'; 'Tannhäuser in Venusberg'; 'A Scene from Les Misérables.' His last finished picture was a 'Flower Girl.' All of his works are distinguished by a certain literary or poetic character which appeals to the fancy like a strain of lyric music, although the coloring sometimes runs in its vividness to the verge of extravagance.

MÜLLER, Wilhelm, German poet: b. Dessau, 7 Oct. 1794; d. there, 30 Sept. 1827. He studied at Berlin, but the war of 1813 called him from his books, and he was present as a volunteer in the Prussian army at the battles of Lützen, Bautzen, Hanau and Kulm. In 1814 he returned to his studies at Berlin. His journey to Italy (1819) produced his ingenious work 'Rom, Römer und Römerinnen' (1820), and on his return to Germany he became teacher of Latin and Greek in the newly-established school at Dessau, where he was also appointed ducal librarian. In 1824 appeared his 'Gedichte aus den hinterlassenen Papieren eines reisenden Waldhornisten.' His 'Lieder der Griechen' (1821–24) celebrate the awakening of an oppressed nation, its struggle and its victory. His 'Lyrische Spaziergänge' (Leipzig 1827) displays the same truth to nature, freshness and fire and the same harmony of language which characterizes his other poems. Many of his poems imitate with utmost perfection the true German Volkslied. Several of the 'Müllerlieder' are familiar through Franz Schubert's remarkable musical settings. His 'Bibliothek deutscher Dichter des 17. Jahrhunderts' (1822–27) is a valuable collection of the best lyric poems of that period. His works were collected in five volumes (1830). He was the father of Prof. Max Müller, the well-known philologist. A critical edition of his works appeared at Berlin in 1906. Consult Hako, B., 'W. Müller, Leben und Dichten' (Berlin 1908).

MULLER, Wilhelm Max, American Orientalist: b. Gleissemberg, Germany, 15 May 1862; d. 12 July 1919. He studied at the universities of Erlangen, Leipzig, Berlin and Munich, obtaining the degree Ph.D. at Leipzig. In 1888 he became a resident of the United States, but spent much time making researches in Egypt (1904, 1906 and 1910) under the auspices of the Carnegie Institution. He was professor in the Reformed Episcopal Seminary at Philadelphia after 1890 and assistant professor of Egyptology at the University of Pennsylvania. He wrote 'Asia and Europe after the Egyptian Monuments' (1893); 'The Love Poetry of the Ancient Egyptians' (1899), both of which are in German; 'Egyptological Researches' (1906–10); 'Mythology of the Ancient Egyptians' (in 'Mythology of all Races,' 1918). He was also a contributor to the 'Encyclopædia Biblica,' 'Jewish Encyclopædia' and joint editor of 'Gesenius Hebrew Dictionary' (1905).

MULLER, mŭl'ler, **William James,** English painter: b. Bristol, 28 June 1812; d. there, 8 Sept. 1845. He studied painting under J. B. Pyne, and first exhibited in the Royal Academy in 1833, his picture being entitled 'The Destruction of Old London Bridge — Morning.' In 1833–34 he visited Germany, Switzerland and Italy, and in 1838 Greece and Egypt; while in 1843 he accompanied the Lycian expedition under Sir Charles Fellowes, bringing back many sketches and pictures of Oriental life and scenery. He lived for some time in London, but returned to Bristol in later life. His pictures, though not numerous, are of exceptional power and merit, among the more notable being the 'Baggage Wagon'; 'Dredging on the Medway'; 'The Slave Market'; and the 'Salmon-weir.' He painted both in water-color and in oils, and was remarkable as a colorist. Consult the 'Memoir' by Solly (London 1875).

MULLER-URY, Adolfo, Swiss-American portrait painter: b. Airolo, Switzerland, 28 March 1864. He was educated at the public schools and at Sarnen and became a pupil of Deschwanden at Stans, Switzerland, after which he entered the Munich Academy and then went to Paris to study under (1881–83) Cabanel. From 1883–85 he worked at Rome and came to the United States in 1886. He has done numerous canvases on religious subjects but his paintings are mostly portraits, among which figure Popes Pius X and XI, several cardinals including Mercier, Bishop Kennedy, English nobility and other celebrities. In America he has painted among other portraits those of President McKinley, General Grant, Senator and Mrs. Depew, Senator Hanna, J. Pierpont Morgan, J. J. Hill, Mrs. Woodrow Wilson (1916), President Wilson (1917), etc.

MULLET, the name of several distinct kinds of fishes having external similarities. (1) The red mullets or surmullets are a group of elongate marine fishes of moderate size, renowned for the delicacy of their flesh, and the esteem in which they were held by the ancients. They with the goat fishes (*Upeneus*) and others form a family *Mullidæ*, with five genera and about 40 species, found in all tropical seas, and some species straying northward. Jordan, who classifies them in the suborder *Berycoidei*, remarks: «The family is a very natural one and not closely related to any other.» It resembles the barracudas (*Polymixiidæ*) in having two long unbranched erectile barbels at the throat, which are of service in exploring the muddy bottom along which these fishes creep and search for animal food, mainly small crustaceans. The best-known species is that of the Mediterranean (*Mullus barbatus*), which is a small fish, rarely exceeding six inches in length, and is carmine red on the upper parts and silvery white on the lower surface. This is the fish held in so high esteem by Roman epicures, and reared in ponds where they were attended and caressed by their owners, and taught to come to be fed at the sound of the voice or bell of the keeper. Specimens were sometimes sold for their weight in silver. Pliny instances a case in which the sum of about £60 sterling was

paid for a single fish; and an extraordinary expenditure of time was lavished and wasted upon these slow-learning pets. Juvenal and other satirists descanted upon the height to which the pursuit of this luxury was carried as a type of foolish extravagance. Hortensius, the rival of Cicero, we are told, had a canal of water constructed below the festive table, in which the mullets were allowed to swim, and from which they might be carried to table, and thence to the fire to be cooked and dressed. Apicius invented a mode of drowning or suffocating these fishes in a certain sauce or pickle, which process was said to add highly to their flavor. A similar fashion prevailed of old in England with regard to lampreys, which were drowned in wine previously to being cooked and eaten. This mullet is still esteemed as an article of food, the flesh being white, fat and nutritious. They are caught mainly in nets and are hawked about the streets of Italian cities, not under the old Latin name *mugil,* but by one from the Greek, *trigle.* The roes are preserved as condiment called *botargo* and resembling caviar.

A closely related fish, the striped red mullet or surmullet (*M. cephalus*), is caught abundantly about the British Islands and along the Continental coast, and is seen sparingly in the local markets. By some naturalists these mullets are thought to be only the females of the Mediterranean species. A smaller form of the same species is frequently taken on the eastern coast of the United States. Another genus (*Mullolides*) is represented in the Gulf of California by a single species.

(2) The gray mullets are a group of spiny-rayed marine fishes forming a family (*Mugilidae*) of the suborder *Percesoces,* allied to the silversides and barracudas. They are oblong fishes of moderate size, without a lateral line, very numerous in species common in all warm parts of the world, and often appearing in vast schools, so that they may be captured by wholesale in large nets. Though the flesh is not so good as that of the red mullets it is nutritious, and many species are economically important. These mullets are short-finned, small-mouthed, bottom-feeding fishes, subsisting chiefly upon the little animals or organic matter found in sand and mud; and they have a special straining apparatus in the pharynx for the purpose of preventing objects of too large size from entering the stomach, or foreign substances getting into the gill-chamber; after grinding a mouthful between the pharyngeal bones (for teeth are absent or feeble) the mineral matter is rejected. Another peculiarity of the mullets is to be found in the structure of the oesophagus and stomach, the former being lined with long threadlike papillae, while the latter has its second portion furnished with muscular walls like the gizzard of a bird, but not divided. The common species is the striped or liza (*Mugil cephalus*) which seems to be almost cosmopolitan, as it is known not only on both Atlantic shores but abundantly from California to Chile. It is one to two feet long, dark bluish above, sides silvery, with conspicuous dark stripes along each row of scales. A smaller, more thoroughly marine species, dark olive and without streaks, is the white mullet or liza blanca (*M. Curema*) numerous on both American coasts. Several other species are taken in the Gulf of Mexico and southward, one of which (*M. gyrans*) has the curious habit of swimming round and round at the surface in schools, and is called whirligig mullet.

(3) In the Mississippi Valley, several suckers (q.v.) of the family *Catostomidae* are called mullets in reference to their mulletlike appearance and behavior.

Consult Günther, *Study of Fishes* (1880); Goode, *Fishery Industries,* sec. 1 (1883); *American Fishes* (1888); Jordan and Evermann, *American Food and Game Fishes* (1902); La Gorce, John Oliver, ed., *The Book of Fishes* (National Geographic Society, Washington, D.C., 1939).

MULLIGAN LETTERS, in American political history, a series of letters written by James G. Blaine (q.v.) to Warren Fisher, a business associate, which it was alleged proved legislative corruption upon the part of Blaine in the matter of bills in Congress concerning the Little Rock and Fort Smith, and the Northern Pacific railroads. The letters were obtained by one James Mulligan, a clerk of Fisher, who appeared as a witness before a Congressional committee appointed to investigate Blaine. On 5 June 1876 Blaine secured these letters and read them before the House, after defying the committee to compel him to surrender them. The letters were freely used as campaign documents in the presidential contests of 1876 and of 1884, by Blaine's enemies. Consult Peck, *Twenty Years of the Republic* (New York 1906).

MULLINGER, mŭl'lĭng-gẽr, **James Bass,** English historian: b. Bishop Stortford, England, 1834; deceased. He was graduated from Saint John's College, Cambridge, in 1866 and in 1881–83 was lecturer at Bedford College, London. In 1885–95 he was lecturer on history of education to the Teachers' Training Syndicate at Cambridge and in 1890–94 lecturer on ecclesiastical history at Trinity College, Cambridge, after which he became librarian and lecturer in history in Saint John's College. He published, among other works, *Cambridge Characteristics in the 17th Century* (1867); *The Schools of Charles the Great* (1876); *The Age of Milton* (1897); *History of Saint John's College, Cambridge* (1901). He was also the author of encylopedia articles on various subjects.

MULLION, *in architecture,* a vertical division between the lights of windows, screens, etc. The term is also applied to the division between the panels in wainscoting.

MULOCK, mū'lŏk, **Dinah Maria.** See CRAIK, DINAH MARIA.

MULOCK, mū'lŏk, SIR **William,** Canadian educator and politician: b. Bond Head, Ontario, 19 Jan. 1844; d. Toronto, 1 Oct. 1944. He was graduated from the University of Toronto in 1863 and in 1868 was admitted to the bar. He was elected to the Parliament of Canada in 1882 and was vice-chancellor of the University of Toronto from 1881 until 1900. He was Postmaster-General of Canada from 1896 to 1905 and was instrumental in establishing penny postage within the empire. He was Minister of Labor 1900–05, Chief Justice, Exchequer Division of the Supreme Court of Ontario (1905–23), and then Chancellor of the University of Toronto.

MULREADY, mŭl-rĕd'ĭ, **William,** Irish genre painter: b. Ennis, County Clare, Ireland, April 1, 1786; d. London, England, July 7, 1863. He was born to working-class parents and brought up in London, where with the assistance of the sculptor Thomas Banks, he entered the Royal Academy as a pupil in 1800. He first exhibited at the academy in 1804, and became a member in 1816. Mulready's work was influenced by Dutch painters of domestic scenes and by his contemporary Sir David Wilkie (q.v.). He chose scenes from common life, and his canvases had a high moralistic and anecdotal quotient, as indicated by some of their titles: *Lending a Bite, Choosing the Wedding Gown,* and *The Wolf and the Lamb,* which was purchased by the royal family. He also illustrated Oliver Goldsmith's *Vicar of Wakefield* and in 1840 made the design for the first British postal envelope. Most of Mulready's best work became the property of the nation after he died.

MULTAN, mo͝ol-tän', or **MOOLTAN,** city, Pakistan, capital of Multan District, in southern Punjab. The District of Multan, with an area of 5,653 square miles, grows grain, cotton, sugar, fruit, indigo, and silk. The city manufactures textiles and a variety of metal products; handicrafts like pottery, leather, ivory, and silver work are also important. Multan is a banking and export center for the area west of the Indus. So ancient that Herodotus mentions it, the city was fought over by many nations and finally conquered by the British from the Sikhs in 1849. It has ruined Moslem shrines, elaborate fortifications, and a Hindu temple to Vishnu. Pop. (1951) district, 2,107,603; city, 190,122.

MULTIGRAPHING MACHINES. See Business Machines and Equipment.

MULTIPLE SCLEROSIS, sklĕ-rō'sĭs, is a widely distributed disease of unknown origin in which myelin, a fatty complex, which envelops certain areas in the central nervous system, is altered and replaced by scars or sclerotic plaques. It usually affects the 20 to 40 age group and patients have disturbed vision, gait, speech, balance and loss of bladder and bowel control.

A large number of theories have been advocated as to its cause but none is accepted by authorities. Any part of the brain or spinal cord may be involved but the white matter in the cerebellum, cerebrum, and spinal cord is most commonly damaged. The great variety of clinical signs is considered to be a consequence of the scattering of sclerotic plaques irregularly throughout the nervous system.

The course of the disease is uncertain and it may progress rapidly, remain unchanged for years, or show remissions. It was once thought that the average duration of the disease was about one decade but a recent study showed that 17 years after the onset of the disease 42 per cent of its victims were walking and working.

While there is no specific therapy for this disease it is the consensus that patients should be observed very closely by their family physician in order to avoid intercurrent infection and other conditions which by decreasing general resistance may make patients less able to resist the multiple sclerosis process. Psychological and rehabilitative therapy are of the greatest value. Such a therapeutic program is described as "management" of multiple sclerosis by the National Multiple Sclerosis Society, New York, N. Y.

Harold R. Wainerdi, M.D.,
National Multiple Sclerosis Society, New York, N. Y.

MULTIPLE SERIES. See Series.

MULTIPLICATION. See Arithmetic.

MULTITUBERCULATA, mŭl-tĭ-tū-bûr-kū-lā'tà, a group of fossil mammals of small size, which lived from Mesozoic to Paleocene times. See Allotheria.

MUMFORD, mŭm'fĕrd, **Lawrence Quincey,** librarian of Congress: b. Ayden, N. C., Dec. 11, 1903. He was educated at Duke and Columbia universities, and from 1929 to 1945 was associated with the New York Public Library. In the latter year he became assistant director of The Cleveland Public Library, and five years later its director. In 1954 he was named librarian of Congress, the first professionally trained librarian to hold the position.

MUMFORD, Lewis, American author and sociologist: b. Flushing, N. Y., Oct. 19, 1895. He was educated in New York City schools and colleges, and began his literary career as an editor on the *Dial* (1919). Among his earlier books were *The Story of Utopias* (1922) and *Herman Melville* (1929). Later he taught at Dartmouth College, Stanford, and North Carolina universities; was a member of the New York City Board of Higher Education (1935–1937); and, from 1951, professor of regional planning at the University of Pennsylvania. His chief work is as a social critic, especially of city living and machine-age culture. These themes are explored in his trilogy—*Technics and Civilization* (1934), *The Culture of Cities* (1938), *The Condition of Man* (1944)—and in a later work, *Art and Technics* (1952).

MUMMERS, mŭm'ĕrz, bands of costumed men and women who in ancient and medieval Europe led festal rites, especially at the Saturnalia and Christmas. Hence it has also become a facetious term for actors. Sir James George Frazer associates the Whitsuntide mummers with ceremonies in which the vernal god was killed in primitive cults.

MUMMICHOG. See Killifish.

MUMMIUS, mŭm'ĭ-ŭs, **Lucius** (surnamed Achaicus), Roman general and statesman: fl. 2d century B.C. While consul in 146 B.C., he brought to completion the Roman conquest of Greece, destroying the city of Corinth and removing its art treasures to Rome. He was censor in 142 B.C. with Scipio the Younger.

MUMMY, mŭm'ĭ (Arab. *mumiya,* bitumen; Pers. *mum,* wax), a dead body preserved by embalming. The wider use includes bodies preserved dry by any process but it was among the ancient Egyptians that the art and practice of embalming the dead was carried to the greatest extent and highest perfection. From Egypt the practice spread southward along both coasts of Africa and to India, Malaysia, Polynesia, Australia, and Arabia. On the Western con-

tinent it reached Peru, Colombia and Mexico and also Alaska. In the last-named country it may have been sporadic for it was first in vogue there about 1720. All the dead of Egypt, including many animals, were embalmed in some manner, partly, it is supposed, from religious motives and partly for sanitary reasons. The notion formerly prevalent that the Egyptians preserved the body in order to keep it in a fit state to receive the soul when it should have passed through its allotted transmigrations is inconsistent with the facts that tombs were sometimes sold to later occupants. The origin of embalming among the Egyptians has been attributed to their first merely burying in the sand, impregnated with natron and other salts, which dried and preserved the body, which natural process they afterward imitated, drugs and bitumen being later improvements. Comparatively few mummies of children have been discovered in Egypt, though even those just born were embalmed. Embalming was practised by the Hebrews to some extent. Joseph commanded the physicians to embalm his father and in the time of Christ it was "the manner of the Jews" to bury the body "wound in linen cloths with spices." The practice continued in Egypt from 4500 B.C. till the 7th century, and was common among the Greeks there, and even among the early Christians. It seems to have fallen gradually into disuse. See also EMBALMING; EGYPT. Consult Meany, E. S., 'Alaskan Mummies' (Seattle 1906); Pettigrew, J. J., 'A History of Egyptian Mummies' (London 1834); Smith, G. E., 'The Migration of Early Culture' (Manchester, England, 1915).

MUMMY WHEAT, a variety of wheat said to have been produced from grains found in an Egyptian mummy, but there is no good reason to believe the legend. It has long been in general cultivation in Egypt and neighboring countries in Africa. The spike is compound

MUMPS, a popular name for a contagious epidemic inflammation and enlargement of one or both parotid salivary glands, occurring usually in youth, males being more frequently affected than females. In some localities it disappears for years, in other places it is endemic. Epidemics usually occur in the spring or fall. One attack generally gives immunity. The period of incubation is from 7 to 20 days. The disease is sometimes preceded for a few days by malaise, loss of appetite, irritability and feverishness. Its onset is marked by stiffness and pain about the jaws, followed by heat, pain and swelling about the lobe of the ear, earache and tinnitus aurium, fever (100°–104° F.), more or less rigidity of the neck, with distortion of the side of the head and difficulty in chewing, swallowing and talking. The inflammation is usually at its height by the third day of the disease, and the disease has subsided generally by the 7th or 10th day. Very seldom is there any suppuration of the affected gland. In some cases the subsidence of the gland inflammation is followed by pain and swelling of the testes of the male, and of the ovaries, vulva and breasts of the female, the complication being more common in males than in females. Occasionally a meningitis supervenes. Not infrequently a middle ear catarrh follows, leading to total deafness. The term mumps is sometimes applied to a parotiditis following a local injury, diseases of the mouth, diphtheria, occlusion of the salivary duct by a foreign body, etc. There is a secondary symptomatic or metastatic form of mumps which sometimes follows dysentery, scarlet fever, small-pox, measles, etc. The parotid gland in this form of mumps tends to suppurate. The best treatment for mumps consists in rest, preferably in bed, the giving of saline laxatives and soft food, relieving the fever, and securing sleep by mild remedies and keeping the face warm with flannel or some other agreeable application. In cases of slow convalescence tonics should be given.

MUN, mĕn, **Albert,** COUNT DE, French politician: b. Lumigny, Seine et Marne, 23 Feb. 1841; d. 1914. He was graduated (1862) at Saint Cyr, and entered the army and fought in the Franco-Prussian War (1870–71), to become a captain and ordnance officer of the governor of Paris. He devoted himself to the Ultramontaine party and founded the Catholic Labor Circles. Owing to the complaints of the Liberals concerning such activities on the part of an officer he resigned (1875) his commission and, with the aid of the Clerical party, was elected (1876) as deputy. He took his place among the extreme "Rights," representing both Church and monarchy. He led mass-meetings to agitate for the union of Church and State and social reform in the Catholic sense. In 1897 he was made member of the Academy. In 1913 he advocated the abolition of the Three-Year Military Law, but when war broke out next year his eloquent oratory was exerted exhorting his fellow-citizens to show courage and persistence. His speeches were issued in collective form (Paris 1888–1904) in seven volumes. He wrote 'Les congrégations réligieuses devant la Chambre' (1903); 'Contre la séparation' (1905); 'L'heure décisive' (1913).

MUN, Thomas, English merchant and political economist: b. London, England, June 1571; d. there, July 1641. He engaged in mercantile business when very young, was interested in the Mediterranean trade and in 1615 was a director of the East India Company. As a writer on economics he presents really the first clear and systematic treatment on the subject and his is admitted to have been of great influence. He published 'A Discourse of Trade from England into the East Indies,' in 1621, and his greatest work, 'England's Treasure by Foreign Trade,' was published posthumously in 1664.

MUNBY, Arthur Joseph, English poet: b. Bulmer, Yorkshire, England, 22 Aug. 1828; d. Ripley, Surrey, 29 Jan. 1910. He was graduated at Trinity College, Cambridge, in 1851, and was admitted to the bar of Lincoln's Inn in 1855. He was the author of 'Verses Old and New,' which contains the much admired pastoral poem 'Doris' (1865); 'Dorothy' (1880), which has been widely circulated in the poet's own country and in America; 'Vestigia Retrorsum' ('Steps Backward,' 1891); 'Vulgar Verses, by Jones Brown' (1891), mostly in dialect; 'Susan' (1893); 'Ann Morgan's Love' (1896); 'Poems, Chiefly Lyric and Elegiac' (1901); 'Relecta' (1909).

MUNCH, moonH, **Peter Andreas,** Scandinavian historian: b. Christiania, Norway, 15

Dec. 1810; d. Rome, 25 May 1863. He was educated at the University of Christiania and studied deeply the old Norse language and antiquities. In 1841 he was appointed professor of history at the University of Christiania. He was accorded the unusual privilege of access to the papal archives in Rome, where he spent much time in study. His principal work is 'History of the Norwegian People' (1852–63). Munch published several works of a linguistic character, and, repudiating the term «Icelandic,» maintained that the so-called Icelandic literature was really Old Norse. He also translated several of the Old Norse sagas. A collection of his essays was edited by Gustav Storm (1873–76).

MUNCH, Peter Andreas, Norwegian poet: b. Christiania, 19 Oct. 1811; d. near Copenhagen, 27 June 1884. He was originally a student of law, but became an editor (1841–46) and professor in the university (1866) at Christiania. Among his writings are 'Sorg og Trost' ('Grief and Consolation'), of which seven editions have been printed; 'Ephemera' (1836); 'King Sverre's Youth' (1837), a drama; 'The Singer' (1838); 'Poems Old and New' (1848); 'Pictures from North and South' (1848), in prose; 'New Poems' (1850); 'Lord William. Russell' (3d ed., 1888), a tragedy, and 'An Evening at Giske' (1855), a historical drama. Munch translated into Norwegian many works from such authors as Tennyson and Walter Scott, and wrote some popular Norwegian songs.

MUNCH-BELLINGHAUSEN, münk-bĕl'-ling-how'zĕn, **Eligius Franz Joseph,** FREIHERR VON, also known under the pseudonym FRIEDRICH HALM, Austrian dramatist and short-story writer: b. Krakau (Cracow), 2 April 1806; d. Vienna, 22 May 1871. He came to Vienna in 1811 and began studying law there in 1822, making the acquaintance while a young student of such prominent literary men as Bauernfeld, Lenau, Seidl, etc. In 1826 he entered the employ of the Austrian government as a lower official and remained in the bureaucracy from that time until his death, his chief positions being custodian (later director) of the court library and general superintendent of the Vienna Hofburgtheatre. As a dramatist, Halm's position in German literature is that of a constructor of correct dramatic outlines, often banal in their conventionality, which are always surrounded with resounding rhetoric and a peculiar union of romanticism and pessimism, together with occasional real feeling. His first play, 'Griseldis' (1835) had a great stage success and passed over most of the stages of Germany. There followed a number of less successful productions: 'Camoens' (1837); 'Adept,' tragedy (1838); 'Imelda Lambertazzi,' tragedy (1842). His greatest success and his best-known play is 'Der Sohn der Wildnis' (1842; known on the English stage as 'Ingomar'), although 'Der Fechter von Ravenna' (1857) also was very popular. Of his short stories the best are 'Die Marzipanliese' and 'Das Haus an der Veronabrücke.' His works have been published: 'Werke' (8 vols., Vienna 1856–64; 4 additional vols., 1872); 'Ausgewählte Werke' (4 vols., Leipzig 1904: another ed. by Bong, Berlin 1910). Consult Schneider, 'Friedrich Halm und das spanische Drama' (Berlin 1909); Schachinger, R., 'Briefwechsel zwischen M. Enk und Halm' (Wien 1890); Pachler, F., 'Die Jugendjahre Halms' (Wien 1877).

MUNCHEN (mün'hĕn) **GLADBACH.** A town in the Prussian Rhine province.

MUNCHHAUSEN, münh'how-zĕn, **Hieronymus Karl Friedrich,** BARON: b. Bodenwerder, Hanover, 1720; d. there, 1797. He was a German soldier and served in his youth as a cavalry officer in the Russian army. He was possessed of an adventurous and dare-devil spirit and an imagination that knew no bounds. He told the most wonderful stories of his adventures in the Turkish campaign of 1737–39, and soon became famous as the most unique exaggerator that ever lived. The tradition of the baron's story-telling is supported by the evidence of a clergyman, who says that in his old days the officer used to relate his most surprising adventures «in a cavalier manner, with a military emphasis, but without any passion and with the easy humor of a man of the world, as things which required no explanation or proof.» His tales are thought to have been first compiled by Rudolf Erich Raspe, a man of letters, who, being compelled to flee from his position as curator of the museum at Cassel to England on account of a charge of embezzlement, was engaged in London in literary pursuits, and is generally believed to have published anonymously an English edition of the stories under the title of 'Baron Münchausen's Narrative of his Marvelous Travels and Campaigns in Russia' (1785). A second edition, enlarged and ornamented, was published at Oxford in 1786 under the title of 'The Singular Travels, Campaigns, Voyages and Sporting Adventures of Baron Munnikhouson, commonly pronounced Munchausen; as he relates them over a bottle when surrounded by his friends.' A third edition, published by Kearsley in London the same year, bore the title of 'Gulliver Revived.' The story passed through many editions by different hands, gaining more and more accretions each time, whether in form of borrowings from Lucian or of topical «hits» on Baron de Tolt, Montgolfier, the first balloonist, or Bruce, the explorer of the Nile. One of the best editions is that by Shore (1872), illustrated by Doré, with additions by Theodore Gautier. It is said a large proportion of the hunting tales are derived from Henry Bebel's 'Facetiæ' (1508), while other incidents are borrowed from Castiglione's 'Cortegiano' and Bildermann's 'Utopia,' which are included in Lange's 'Deliciæ Academicæ' (1765). Consult Müller-Fraureuth, 'Die deutschen Lügendichtungen auf Münchausen' (1881). See ADVENTURES OF BARON MÜNCHAUSEN, THE.

MUNCHHAUSEN: A Story in Arabesques: a satirical romance by Karl L. Immermann (q.v.) originally published in four volumes in Düsseldorf during 1838–39. The eponymous hero is presented as the nephew of the famous prevaricator, while the author has also taken at least a part of his ideas from 'Don Quixote' in attaching to the hero a droll serviteur who closely resembles the materialistic Sancho Panza. Other influences are traceable in the work, notably of Rückert's translation of Hariri's 'Makamen,' Swift's 'Gulliver's

Travels and *Gil Blas*. The story may be described as a formless mass of episodes played in Westphalian villages. The *New Münchhausen* is a traveller like Humboldt; like Gulliver, he sojourns among and converses with animals; like Gil Blas he serves as kitchen boy; like Cagliostro he lives indefinitely on rejuvenating medicine. He appears in different roles, and in each character successfully exploits the credulity of his audiences. As a disinterested financier and company promoter he is eminently and humorously successful.

MUNCIE, mŭn'sĭ, Ind., city and Delaware County seat, altitude 950 feet; on the White River, not navigable; on the Chesapeake and Ohio; the Cleveland, Cincinnati, Chicago and St. Louis; and the Indiana Railroad System, 57 miles northeast of Indianapolis. State and federal highways, an airport, and electric lines also furnish transportation facilities. The county is agricultural, with grains and hay as principal crops, although there are many dairy, fruit, and truck farms. Of the county's 250,880 acres, 237,000 are under cultivation. Among the industrial products of the city are automobile parts, boilers, glass, iron and steel wire and various wire products; metal furniture, silverware, and novelties; and various items of electrical equipment. Muncie's public school system links with the Ball State Teachers College in courses and in teaching personnel. The plant includes a building for vocational and physical education. The courthouse, city hall, post office, library, Masonic temple, and Ball Memorial Hospital are the most notable buildings. Cultural interests include a civic theater and the Ball State Art Gallery. Twelve social agencies unite in support of the Muncie Community Fund. First settled in 1827, incorporated as a town in 1847 and as a city in 1865, Muncie attained its present status as a city of the second class in 1921. Its name, fixed by act of the legislature in 1845, is derived from the name of an Indian tribe, the Munsees. The city has mayor and council, with city treasurer, auditor, clerk, and judge elected; other officers appointed. The water, light, and power systems are all privately owned and operated. Pop. (1930) 46,548; (1940) 49,720; (1950) 58,479.

MUNDE, mŭn'dĕ, **Paul Fortunatus,** American gynecologist: b. Dresden, Saxony, Sept. 7, 1846; d. New York, Feb. 7, 1902. After coming to the United States in 1849, he attended the Boston Latin School and then studied medicine at Yale. He left before completing his course, entering the Union Army as medical cadet in 1864. He was afterward graduated from the Harvard Medical School in 1866 and went to Germany, where he enlisted in the Bavarian Army. He was decorated by the emperor with the Iron Cross for heroism in saving the lives of patients from a burning hospital near Paris. After devoting himself to study and practice in hospitals in Berlin, Heidelberg, Paris, London and Edinburgh he took up his residence in New York in 1873, and practised obstetrics and gynecology. He was appointed professor at Dartmouth Medical College and in the New York Polyclinic in 1882. He edited (1874–1892) the *American Journal of Obstetrics,* and was president of the American Gynecological Society in 1897–1898. Among his works are *Minor Surgical Gynecology* (1880); *Appendix to the Midwifery of Cazeaux and Tamier* (1884); *Pregnancy and the Puerperal State* (1887); and *Diseases of Women* (1891).

MUNDELEIN, George William, American cardinal: b. New York, July 2, 1872; d. Mundelein, Ill., Oct. 2, 1939. He was educated at St. Nicholas School, De La Salle Institute, Manhattan College, New York, N. Y., St. Vincent's Archabbey, Latrobe, Pa., Propaganda College, Rome. Ordained priest at Rome in June 1895, he returned to the United States and was named secretary to the bishop of Brooklyn and pastor of the Lithuanian Church at Williamsburg. In 1897 he was made chancellor of the diocese of Brooklyn; named domestic prelate with the title of right reverend in 1906; consecrated titular bishop of Loryma and auxiliary bishop of Brooklyn on Sept. 21, 1909. On Dec. 9, 1915, he was named archbishop of Chicago and on March 24, 1924, was elevated to the Sacred College of Cardinals, becoming "The First Cardinal of the West." He was host to the 28th International Eucharistic Congress in Chicago, June 1926, and papal legate to the 8th National Eucharistic Congress in New Orleans, La., in October 1938. In that same year he presided at the beatification ceremonies of Mother Francis Xavier Cabrini in Rome, and, in 1939, participated in the election of Pius XII.

During his administration of the archdiocese of Chicago for nearly 24 years, he emphasized the importance of the parochial school system in the development of Catholic and American citizenry, founded 91 parishes, and had some 600 buildings erected for religious purposes. Always the champion of human and civil rights, he vigorously assailed the anti-Catholic and racial propaganda of the Nazi government in the prewar years. During and after World War I he showed himself a prelate, patriot, and world-citizen by his earnest support of Liberty bonds and his aid to the starving people of Europe. He died of a heart attack at St. Mary of the Lake Seminary, Mundelein, Illinois. This edifice, perhaps the outstanding memorial to the cardinal in tangible form, preserves the remains, which are buried beneath the high altar of the main chapel.

SAMUEL CARDINAL STRITCH,
Archbishop of Chicago.

MUNDT, mo͝ont, **Klara Müller** ("MÜHLBACH, LUISE"), German novelist: b. Neubrandenburg, January 1814; d. Berlin Sept. 26, 1873. She was married to Theodor Mundt (q.v.) in 1839. She was an extremely prolific writer of popular historical novels, which though quite without merit in point of style are by no means wanting in descriptive excellence. They were all published under the pen name "LUISE MÜHLBACH" and have had as many eager readers in this country and England as in the writer's own land. Among them are *Queen Hortense* (5th ed., 1861); *Emperor Joseph II and his Court* (9th ed., 1866); *Marie Antoinette and her Son* (1867); *Emperor Alexander and his Court* (1868); *Mohammed Ali and his House* (1871); *Frederick the Great and his Court* (8th ed., 1882).

MUNDT, Theodor, German author: b. Potsdam, Prussia, Sept. 19, 1808; d. Berlin, Nov. 30, 1861. He was the husband of Luise Mühlbach. He studied at the University of

Berlin, and in 1842 became privat docent there. In 1848 he was appointed professor of literature and history at Breslau, and in 1850 was recalled to Berlin as university librarian and professor. He belonged to the "Young German" school, was a Radical in politics and favored the emancipation of women. His writings include *Madonna, Unterhaltung mit einer Heiligen* (1840), a memoir of Charlotte Stieglitz; the novels, *Thomas Münzer, Carmela* (1844); *Mendoza, der Vater der Schelme* (1847); *Die Matadore* (1850); the critical and historical works, *Kunst der Deutschen Prosa* (1837); *Geschichte der Gesellschaft; Geschichte der Weltliteratur; Geschichte der Literatur der Gegenwart* (1852); and political sketches included in *Pariser Kaiserskizzen* (1856); *Paris und Louis Napoleon* (1858); *Italienische Zustände* (1859–60). He also published Luther's *Politische Schriften,* and with Varnhazen von Ense edited Knebel's letters and posthumous works.

MUNDY, a family of English musical composers: (1) William Mundy (d. about 1591) was a gentleman of the Chapel Royal (1564–1591) and author of the anthem *O Lord, the Maker of all things.* (2) His son John (d. 1630) was also gentleman of the Chapel Royal, an organist of Eton College and St. George's Chapel, Windsor. He wrote anthems, madrigals and songs. Consult Grove's *Dictionary of Music and Musicians.*

MUNGER, Robert Sylvester, American inventor and manufacturer: b. Rutersville, Fayette County, Texas, July 24, 1854; d. Birmingham, Ala., April 20, 1923. He was educated in the Rutersville public schools and the preparatory department of Trinity University, Tehuacana. After taking charge of his father's small plant for the manufacture of cotton gins he evinced considerable inventive talent in improving ginning machinery. His earliest inventions included three saw cleaners patented in 1878 and 1879 and a saw-sharpening tool patented in 1882. In 1885 he established a manufacturing plant at Dallas to exploit his patents and in 1888 organized the Munger Improved Cotton Machinery Company. Resigning the presidency a year later, he soon afterward moved to Birmingham, Ala., and organized the Northington-Munger-Pratt Company in 1892 for the manufacture of cotton gin machinery. The same year he patented what was perhaps his most important invention, a machine "for handling, cleaning and distributing seed cotton." The Munger system, as it was soon called, was a great improvement over the former system and became standard throughout the cotton states and in foreign countries. He also invented a duplex cotton press, a baling machine, and a cotton elevator, cleaner and feeder.

MUNGER, Theodore Thornton, American Congregational clergyman: b. Bainbridge, N. Y., March 5, 1830; d. New Haven, Conn., Jan. 11, 1910. He was graduated at Yale in 1851, and at Yale Theological School in 1855. He held pastorates at Dorchester, Mass., 1856–60; Haverhill, Mass., 1862–70; Lawrence, Mass., 1871–75; San José, Cal., 1875–76. He was for several years pastor at North Adams, Mass., resigning in 1885 to become pastor of the United Church, New Haven, Conn. He was prominent in his denomination as well as an active supporter of municipal reform. He published *On the Threshold* (1880); *The Freedom of Faith* (1883); *Lamps and Paths* (1883); *The Appeal to Life* (1887); *Horace Bushnell* (1899); *Character Through Inspiration.* Consult Bacon, B. W., *Theodore Thornton Munger, New England Minister.* (New Haven 1913).

MUNGO, Saint, or **KENTIGERN,** the patron saint of Glasgow: b. Culross, about 518; d. Glasgow, Jan. 13, 603. He was baptized and brought up by Saint Serf, the head of a monastery at Culross. His name, Kentigern or Cyndegyrn (from *ken* and *tigearna*), means head lord, and it is said that it was exchanged by the brethren of the monastery for Mungo, the beloved, on account of the affection they bore him. On leaving Culross Kentigern took up his abode as a missionary priest near the site of the present Glasgow. Here he was chosen bishop, but having troubles with the king of the Strathclyde Britons afterward took refuge at Saint David's in Wales, and while in that region founded a religious establishment under a follower named Asaph, which afterward became the seat of the bishopric of Saint Asaph. Redderech, king of the Strathclyde Britons, recalled him to Glasgow, where he acquired a character of great sanctity. The city arms of Glasgow are associated with various legends concerning Saint Mungo, and the cathedral is supposed to be built on the site of his monastery. The parish of Saint Enoch, in Glasgow, is so called from a corruption of his mother's name (Theneu). A life, written by Jocelyn of Furness about 1180, was published in Pinkerton's *Vitae Antiquae Sanctorum Scotiae.*

MUNICH, mū'nik, or **MÜNCHEN,** mĭn'-chen, Germany, the capital of Bavaria, one of the most beautiful cities in Europe, lies on an extensive but uninteresting plateau, about 1,700 feet above sea-level, on the left bank of the Isar, with suburbs on the right, the river being crossed by nine bridges. The original nucleus of the town was at one time surrounded by walls and ditches, and entered by lofty turreted gates. The ditches have been filled up and the walls removed, but three of the old gates, with their loopholed and embattled flanking towers, still remain. In the older part of the town there are many old houses, irregular both in size and form, and of quaint but not unpicturesque architecture. This quarter, though it contains the government offices and many public edifices, is surpassed, both in extent and magnificence, by the new town, which has risen chiefly to the north and west, with almost unexampled rapidity and splendor, due to the art-loving proclivities of King Ludwig I and his successors, who spent over 7,000,000 thalers in beautifying the city, and adorning it with buildings of almost every style of architecture, wide and handsome streets, and squares and gardens decorated with statues and other monuments. Near the center of the city, between the Max-Joseph-Platz and the palace gardens, is the royal palace, consisting of an old central building of vast extent and two modern wings. From this great pile run at right angles to each other the two finest streets in Munich—the Maximilianstrasse and the Ludwigstrasse. The chief pub-

lic buildings are the old town-house and the new, the latter in the Gothic style, considerably enlarged in 1899; the old palace and the Herzog Max Burg, now used as public offices; the post office; the central station (1880); the chief customs house (1876–79); and the new palace of justice (1897). Buildings connected with art embrace the gallery of sculpture, or Glyptothek, an edifice of the Ionic order, containing a series of the finest ancient and modern sculptures; the Old Pinakothek or picture-gallery (1826–36) another beautiful edifice, containing one of the richest collections of pictures in the world; the New Pinakothek, adorned externally with frescoes and containing only paintings by recent masters; the academy of arts, an imposing building in the renaissance style; the academy of the plastic arts (1885); the Schack Gallery of paintings (1894), named from its donor; the Schwanthaler and Kaulbach museums, etc. The Crystal Palace (1854) is used for the annual art exhibitions. Other collections are the Hof-und-Staats Bibliothek, with 1,100,000 printed volumes and over 50,000 MSS.; the old Bavarian national museum, now used for art collections; the new Bavarian national museum (1899), etc. The German Museum is in all probability the finest museum of technology and the physical sciences in the world. The chief theatre is the Royal and National Theatre, with a lofty Corinthian portico. Munich is rich in monuments, which adorn its squares, gardens and public promenades. Among the chief are the monument of Maximilian II, with his statue 26 feet high, and the colossal bronze statue of «Bavaria,» 65 feet high. It is a hollow female figure, designed by Schwanthaler and cast from foreign cannon. From the head a fine view of the city and the Alps is obtained. It stands on a low eminence in front of the «Hall of Fame,» a Doric building of horse-shoe shape, containing busts of notable Bavarians. The «Gate of Victory,» in imitation of the arch of Constantine at Rome, and the Propylæa, in imitation of that at Athens, should also be mentioned. There is a fine statue of Maximilian I by Thorwaldsen, and statues of Schiller, Gluck, Schelling, Fraunhofer and Gärtner, a bronze monument to the Bavarian soldiers who died in the war with Russia and a monument to the chemist Liebig. The Hofgarten is a garden near the palace, finely planted, and surrounded by an open and richly ornamented arcade; the so-called English Garden is an extensive and beautiful park. The cemeteries of Munich are noteworthy for their artistic tombs, probably the most beautiful in Europe. The ecclesiastical buildings, include the cathedral or Frauenkirche, founded in 1488, a vast pile, entirely of brick, with two lofty towers, terminating in domes 333 feet high; Saint Michael's or the Jesuits' Church (1583), a handsome Italian structure; the church of the Theatines, another Italian structure, beneath which are the burial vaults of the royal family; the church of Saint Louis, a modern building of brick, faced with white marble, decorated externally with statues by Schwanthaler, and internally by the finest frescoes of Cornelius; the church of All Saints; the basilica or church of Saint Boniface; the Mariahilf church on the right side of the river; the three Protestant churches; and the Jewish synagogue. At the head of the educational institutions is the university. (See MUNICH, UNIVERSITY OF). Closely associated with it are the university library with 600,000 volumes and 2,500 manuscripts, together with 3,000 incunabula; the Collegium Georgianum (1494), a priests' seminary; the Maximilianeum (1852), etc. There is also a high school of technology and numerous other high class institutions for educational purposes. The industrial development of Munich lags behind its æsthetic development. Its stained-glass works, iron, brass and bell foundries, lithographing and engraving works and manufactories of optical and mathematical instruments and various artistic articles, are, however, deservedly noted. Still more famous are the enormous breweries of Bavarian beer, which annually produce about 49,000,000 gallons, of which 37,000,000 are consumed in the city itself. The brew-houses and beer-gardens are world famous. Munich carries on a large trade in grain and in objects of art.

In 1158 Henry the Lion raised the *Villa Muinchen* from its previous obscurity by establishing a mint and a salt-emporium within its precincts, the name (also appearing as *Forum ad Monachos)* being derived from the monks who owned the site. In the 13th century the dukes of the Wittelsbach dynasty selected Munich for their residence and fortified the town. In 1327 the old town was nearly destroyed by fire, and was rebuilt by the Emperor Louis the Bavarian; it was not until the fortifications were razed at the close of the 18th century that the limits of the town were enlarged to any extent. The true history of modern Munich is the account of its artistic development in the 19th century, closely identified with which are Klenze and Gärtner, the architects, Schwanthaler, the sculptor, Cornelius and Kaulbach, the painters, and Wagner, the composer. The modern Munich school of painting, headed by K. von Piloty, W. Diez and Grützner, is characterized by marked realism in color and detail, in contrast to the romanticism of the older masters. Because of its elevation and proximity to the Alps, Munich is subject to sudden and pronounced changes of temperature. The Republic of Bavaria (now extinct) was proclaimed here 8 Nov. 1918, and here, on 30 Sept. 1938, was signed by Germany, Italy, Great Britain and France the agreement that eventually doomed Czechoslovakia. See also SECOND WORLD WAR, Vol 28 p. 782 et seq. Pop. (1939) 828,325.

MUNICH, University of, a German institution located at Munich, Bavaria. It was founded in 1472 by the Bavarian duke, Ludwig the Rich, after he had received (1459) the necessary dispensation from Pope Pius II. (Piccolomini). The university was at first located in Ingolstadt, on the Danube, where it won high repute from the important humanists who taught in its classes—Celtis, Aventin, and Agricola. During the Reformation period the university gained a European significance through its rector, Johannes Eck, the opponent of Luther.

During the Counter Reformation it stood for a time under the influence of the Jesuits, who were fiercely opposed by the society of the *Illuminati* founded at the university. Goethe also belonged to this society. As a consequence of the Napoleonic wars, the university was removed, under King Maximilian I, to Landshut in 1800. Here, in the circle of the German Romanticists, it played an important spiritual-

historical role. Under King Ludwig I. of Bavaria the university was moved to Munich in 1826. In this location it quickly became one of the most important cultural centers of German research and education. Then followed a wide expansion in the domain of natural science (Röntgen). There are also faculties of law, medicine, economics, government, etc. at the university, and many seminars and modern clinics are conducted here. It has a botanical garden, several museums, laboratories, and an observatory. It has access to the libraries, museums, and art galleries of the city. The university library contains some 200,000 volumes, numerous pamphlets, valuable records, and medieval manuscripts. The teaching staff numbers 550; the average number of students enrolled is 7,000.

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MUNICIPAL ACCOUNTING IN THE UNITED STATES. Accounting is the art which provides the principles and rules for the classification, summarization, and presentation of financial data. Municipal accounting is the application of the art to the financial transactions of municipalities. The term «municipalities» is used here to denote any governmental unit below or subordinate to the state. Examples are counties, townships, cities, towns, and villages, school districts, and park districts.

Most accounting principles apply alike to municipalities and private enterprises. One of the main differences is that a municipality is not operated for profit. Consequently, the accounting system of a municipality, unlike that of a private enterprise, is not designed to show whether the operations have resulted in a profit or loss. On the other hand, a municipality is subject to legal restrictions; its accounting system must, therefore, provide for the classification and recording of the financial data in such a manner as to show compliance with the applicable provisions of statutes, charters, and ordinances. Common aims of the two accounting fields are: (1) to show financial condition. (2) to account for changes in financial condition, (3) to gauge the efficiency of operations, and (4) to insure that (a) the private enterprise or municipality receives all the revenues to which it is entitled, (b) expenditures are made for authorized purposes only, and (c) cash or other assets are not misappropriated.

History.—Names of taxpayers together with the amounts due from them and data relating to receipts and disbursements were the only financial data that the early accounting systems produced. Moreover, no attempt was made to classify properly the meager financial information. The movements for improving municipal accounting have aimed at (1) developing principles, (2) obtaining more financial data, and (3) having these data properly classified as an aid both to the municipality itself in the preparation and execution of the budget and in the preparation of national municipal statistics. Although many of the movements aimed at improving municipal reporting, it was realized early that reports are only as good as the accounting records from which they are derived.

The first attempt at improving municipal accounting was made by Indiana in 1852 when it passed a law establishing state supervision over county accounts. Other states soon followed, and state supervision of municipal accounting has continued to grow. The quality of such supervision has not been the same in all states, and consequently the degree of improvement has varied.

The National Municipal League was among the first nongovernmental agencies to attempt to improve municipal accounting. It not only took the lead in getting other organizations interested in the subject but made some notable contributions of its own. In 1897, the league prepared a classification of accounts for municipalities. This classification was adopted within the next few years by the states of Ohio and New York for their municipal reporting forms, by the United States Bureau of the Census for compiling comparative municipal financial statistics, and by many municipalities.

A «National Fund for Promoting Efficient Municipal Accounting and Reporting» was established in 1910 by Herman A. Metz, a former controller of New York City, to be administered by the New York Bureau of Municipal Research. The bureau published a series of bulletins called *Short Talks on Municipal Accounting and Reporting* and distributed them to mayors, accounting officers, and to other persons and organizations interested in the advancement of municipal administration. The «talks» were published in book form as *A Handbook of Municipal Accounting* (New York 1913).

The next major step to improve municipal accounting was taken in 1934 with the organization of the National Committee on Municipal Accounting. This committee is composed of representatives from accounting, governmental, and citizens' organizations. The Committee has conducted extensive research and has issued publications dealing with accounting principles, classification of accounts, terminology, and statements see *Bibliography*). The committee's classification of accounts has been adopted by the United States Bureau of the Census. Due to a large extent to the efforts of the Municipal Finance Officers Association, the committee's recommendations have been made known to and have been adopted by many municipalities. Methods employed by the association include conducting schools for finance officers, publication of procedural manuals and pamphlets embodying the committee's recommendations, and reviewing financial reports of municipalities.

Accounting Organization.—The accounting organization of a medium size or large municipality consists of three principal units: (1) systems, (2) pre-audit, and (3) bookkeeping. The systems unit designates the methods of accounting to be followed by all departments, prescribes the records to be kept, and provides for standardized accounting documents such as purchase orders, invoices, and payrolls as well as forms of reports. It reviews from time to time the methods, records, and reports with a view of improving them. On this unit rests the responsibility of seeing that the accounting principles and rules are being given effect and that the accounting system produces the desired information accurately, promptly, and at the lowest possible cost. Sometimes outside consultants are called in, particularly if major changes are to be made.

The pre-audit unit has two functions. First, it checks the financial transactions to see that they are in order. For example, it sees that the

materials being paid for have actually been received and that the quantity, quality, price, and other conditions under which commodities or services have been furnished to the municipality are as agreed upon. Second, it designates, on the basis of the rules set up by the systems unit, in which records and accounts each transaction is to be reflected.

The bookkeeping unit records the transactions. Bookkeeping, as distinguished from accounting, is a mechanical process. The bookkeeper is not called upon to determine the propriety of the transaction or to classify it for recording. All he or she does is to follow the instructions indicated by the pre-audit unit. This unit also takes off trial balances and prepares some of the financial statements. The forms for such statements are designed by the systems unit; the bookkeeping unit merely fills in the information called for.

Supervising all of these units is the head of the accounting department. He is responsible for all phases of the accounting and bookkeeping work. In a large organization, his work is primarily supervisory. In a small organization, he does all of the work performed by the systems unit of a large municipality. Sometimes he is even called upon to do the pre-audit work.

Accounting Records.—A municipality's records, like those of a private enterprise, are classified into (1) accounting documents, (2) books of original entry, and (3) ledgers. Examples of municipal accounting documents are tax bills, licenses, receipt forms, vouchers, and checks. As in a private business, books of original entry are used to classify the information for posting to the accounts. Examples of municipal books of original entry are (1) a cash receipts register—to record receipts; (2) a voucher register—for recording accounts payable and classifying the accounts to be charged; (3) a check register—for checks issued; (4) payroll registers—to list the names and earnings of employes; (5) a bond and interest register—to show the legal history of each bond issue together with the amount of interest and principal to be met each period; (6) a general journal—to enter transactions not recordable in any other book.

Every municipality must have a general ledger and subsidiary ledgers. The general ledger contains all of the principal accounts. Subsidiary ledgers carry the accounts which support and are controlled by the principal accounts in the general ledger. Examples of municipal subsidiary ledgers are: (1) Revenue ledger. An account is provided in this ledger for each revenue source showing both actual and estimated revenues. (2) Appropriation expenditure ledger. This ledger contains an account for each appropriation to show the amount appropriated, expenditures, encumbrances (purchase orders or contracts), and the unexpended and unencumbered balances. (3) Tax ledgers contain an account for each taxpayer showing the amount billed, the amount paid, and the balance, if any, receivable. (4) Special assessment ledgers carry an account for each assessment payer showing the amount originally receivable, amount paid, and balance. (5) Bond and interest ledger. A separate account is provided to show bonds and interest originally payable, amounts paid, and balance. (6) The property ledger contains an account for each fixed asset owned by the municipality.

Bases of Accounting.—There are two principal bases of municipal accounting, cash and accrual, although in practice some combination of the two is frequently found. Under a strict cash basis, revenues are accounted for only when received in cash, and expenditures are accounted for only when paid. Under a strict accrual basis, revenues are accounted for when earned, or in the case of taxes and similar levies, when bills are rendered, and expenditures are accounted for as soon as liabilities are incurred.

The accrual basis is the more accurate because it recognizes transactions when they take place, regardless of when the cash is received or paid. Cash must, however, be taken into consideration even by a municipality which operates on an accrual basis. In the first place, only those taxes and other receivables should be considered as revenue which will be converted into cash within a reasonable period of time. What is a reasonable time must be considered in the light of the particular circumstances, but it would probably be more than one year. Secondly, in planning the municipality's expenditures, if short-term borrowing is to be avoided, it is not only important to consider revenues but cash receipts as well.

Appropriations and Funds.—As pointed out earlier, one of the distinctions between municipal and private accounting is the necessity of giving effect in the municipal accounting system to legal restrictions. Two examples are appropriations and funds. An appropriation is an authorization granted by the legislative body to make expenditures and to incur obligations for specific purposes. The budget is adopted by means of a legislative act known as an appropriation ordinance or resolution. This ordinance specifies the maximum amount which may be spent during the budget period by each organization unit for specific purposes. The accounts must show the amount appropriated for each organization unit, the amount of expenditures and encumbrances charged to the appropriation, and the unexpended and unencumbered balances. The appropriation expenditure accounts are used not only to show the status of appropriations but also to prevent the overexpenditure of appropriations.

The National Committee on Municipal Accounting has defined a fund as «a sum of money or other resources (gross or net) set aside for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions, or limitations and constituting an independent fiscal and accounting entity.» An appropriation represents a restriction of expenditures to be made out of a fund. If there were no appropriations, all the money flowing into a fund could be expended immediately for any activity financed from such fund. An appropriation restricts these expenditures further by indicating which organization units are to spend the fund resources, the amount to be spent by each unit, and the time during which the expenditure may be made (usually a year). Ordinarily, several appropriations are made out of a fund.

In municipal accounting, as distinguished from commercial accounting, a fund represents not only a restriction of money but also an independent accounting and fiscal entity. Each fund is considered a separate and distinct enterprise, and accounts are set up to show the fund assets, liabilities, reserves, surplus, revenues, and ex-

penditures. In many cases, even a temporary loan cannot be made by one fund to another fund within the same municipality. The degree to which a fund is restricted depends on the legal provisions under which it is set up and the authority creating it. For example, if a fund is called for by a charter provision, no changes can be made until that section of the charter is amended. On the other hand, if the fund is set up by the city council, that body can increase, decrease, or abolish it.

Classification of Funds.—To facilitate the use of funds not only as means of complying with legal provisions but also as an aid in financial administration and in the preparation of uniform financial statistics, the National Committee on Municipal Accounting has proposed the following classification of funds: (1) General fund, (2) Special Revenue funds, (3) Working Capital funds, (4) Special Assessment funds, (5) Bond funds, (6) Sinking funds, (7) Trust and Agency funds, and (8) Utility funds. The general fixed assets and the general bonded debt of a municipality are not included in any fund but are each set up in a separate self-balancing group of accounts.

The *General* fund is the most important fund of the municipality. It is used to account for the financing of activities not handled through any other fund. It receives a greater variety of revenues than any other fund and finances more activities than any other. In general, most of the current operations of the municipality are financed from this fund. Its principal assets are cash, taxes receivable, and amounts due from other governmental units or from other funds of the municipality. Its liabilities consist of accounts payable, judgments payable, matured bonds and interest payable, and amounts due to other funds of the municipality.

Special Revenue funds are used to account for revenue derived from specific taxes or other special sources, usually provided by statute or charter to finance special activities. For example, if the statutes provide for a special tax levy to finance recreational activities, a special fund must be established to account for such taxes. The most important assets of the fund ordinarily are cash and taxes receivable, and fund liabilities consist of accounts payable.

Working Capital funds are established to finance those activities which one department or bureau renders for other departments of the municipality. Examples are a central garage and a central purchasing and stores bureau. The fund operates as follows: fund capital is provided either by the General fund or by a special tax levy. Capital is used to acquire equipment and to meet the initial expenditures for material and labor. Departments are charged with the cost of the services rendered for them and at periodical intervals they replenish the fund by the amount expended for their benefit. The revenues of the fund consist of charges made to departments for services; the expenditures, of amounts spent for material, labor, and equipment. Fund assets are cash, amounts due from other departments, inventory of materials and supplies, and fixed assets. Liabilities consist primarily of accounts payable.

Special Assessment funds are used to finance permanent improvements (e.g., the construction of streets) or services (e.g., street oiling) payable wholly or in part from special assessments levied against benefitted property. Permanent improvement assessments are usually payable in installments over a number of years. The improvement is constructed in a year or two, by which time only one or two installments have been collected. Construction is, therefore, financed by issuing bonds which are retired from special assessment collections. The Special Assessment fund is consequently used to account not only for special assessments but also for special assessment bonds. The important assets of the fund are cash and assessments receivable. The important liabilities are amounts due contractors and bonds payable.

Bond funds receive and disburse the proceeds of all bonds issued by the municipality, except special assessment and utility bonds, proceeds from the latter two being handled through Special Assessment and Utility funds, respectively. For example, a bond issue floated to finance the construction or purchase of improvements is handled through a Bond fund. A separate Bond fund may be established for each bond issue, or all the bonds may be accounted for through one Bond fund, providing supporting records are set up to show the receipts, expenditures, and unexpended balances of each bond issue. Fund assets include cash and bonds authorized but unissued. The liabilities consist of accounts payable.

Sinking funds handle money and other resources being accumulated for the retirement of term bonds. A Sinking fund should not be used to retire serial bonds or to pay the interest on either serial or sinking fund bonds. The retirement of serial bonds or interest should be handled through the General fund or through a Special Revenue fund. The reason is that Sinking fund statements show not only the amount of cash or other resources in the fund at any particular time, but also the amount which *should be* in the fund at that time. The required amount is predetermined on an actuarial basis which takes into account not only the annual contributions to the fund but also the compounded earnings on the contributions.

At the beginning of each year, an account «Reserve for Sinking Fund Bonds» is increased by the required contributions and earnings for that year. At the end of the period, if the amounts actually contributed and earned are as anticipated, the assets of the fund will exactly equal the reserve. If greater than anticipated, the amount of assets in the fund will be greater than the balance in the reserve. The difference represents the amount of fund surplus. If contributions or earnings are smaller than anticipated, total fund assets will be smaller than the balance in the reserve. The difference represents the amount of the fund deficit. The reserve thus shows the financial condition of the Sinking fund. If the fund is used to retire both serial and sinking fund bonds or to pay interest, a confusing element is introduced. The assets of a Sinking fund consist of cash, taxes receivable, and investments. Usually, it has no liabilities.

Trust and Agency funds are used to account for money and property received and held by the municipality as trustee or custodian, or in the capacity of an agent, for certain individuals or governmental units. The difference between a Trust fund and an Agency fund is that the former exists over a longer period of time than an Agency fund and presents additional administrative problems, an example being the investment

of Trust fund assets. The same accounting principles and procedure apply to both of them so that Trust and Agency funds are considered one class of funds.

Trust funds are classified as public and private. A Public Trust fund is one which must be used for a public purpose; for example, public employes' pension funds. Private Trust funds, on the other hand, are those which will ordinarily revert to private individuals or will be used for private purposes. An example is deposits placed by contractors with a municipality to guarantee the fulfillment of contracts.

Trust funds are also classified as expendable and nonexpendable. Expendable funds, as their name implies, are those the principal and income of which may be expended. A pension fund is an example of an expendable fund; ultimately, the fund is used to pay pensions. Nonexpendable funds, on the other hand, are those whose principal must be kept intact. An example is a loan fund. Although loans are made out of the fund, these loans must be repaid so that the fund will be restored to the original amount. Trust and agency fund assets are cash, investments, and loans, and taxes receivable; liabilities consist of the fund balances being held for others.

Utility funds are established to account for the financing of self-supported enterprises which render services primarily to the public. The distinction between a Utility fund and a Working Capital fund is that a Working Capital fund finances activities rendered by one organization unit for other organization units of the same municipality whereas a Utility fund finances services rendered primarily to the public for compensation. Examples of utilities are municipally owned water works, electric plants, gas plants, and central heating systems.

A municipal utility should be accounted for on the same basis as a similar privately owned enterprise. For example, the accounting system must be designed to show whether or not the utility is being operated as a self-supported enterprise. In fact, municipal utility accounting belongs more in the realm of commercial than municipal accounting. Frequently, however, a municipal utility is, erroneously, subjected to the same restrictions as any other municipal fund. In that case, the utility, if it is to produce the necessary information, must in effect set up two accounting systems—one to show its financial condition and operations and the other to indicate compliance with legal provisions.

General fixed assets are all of a municipality's fixed assets except those financed from Working Capital or Utility funds. If these assets were the means of producing revenues, it would be necessary to depreciate them and to charge depreciation against revenues. In that event, the assets would be included in the fund from which they were financed so that their depreciation could be reflected in the fund's financial operations. This is true, for example, in the case of Working Capital and Utility funds. Since, however, a municipality's *general* fixed assets are not the means of producing its revenues, no useful purpose is served by including them in the funds from which they were financed. On the contrary, such inclusion might lead some readers to assume that the surplus represented by the fixed assets is available for further expenditure. Accordingly, general fixed assets are set up in a separate group of accounts.

General bonds include all bonds except those payable from Special Assessment funds or Utility funds. General bonds are ordinarily payable from taxes and from earnings on Sinking fund contributions. Since the funds which receive the proceeds from the sale of the bonds are not the ones whose resources will be used to retire such bonds, general bonds are not shown as part of any fund but are set up in a separate group of accounts. On the other hand, special assessment bonds and utility bonds, since they are payable from the resources of the Special Assessment fund and Utility fund, respectively, are shown as liabilities of these funds.

Classification of Accounts.—The accounts of each fund affected by budgetary restrictions may be classified according to whether they are budgetary accounts or proprietary accounts. Budgetary accounts are those necessary to reflect budgetary operations and condition, such as estimated revenues, appropriations, and encumbrances. Proprietary accounts are those which show actual financial condition and operations such as actual assets, expenditures, etc. Sometimes, however, the same account may serve as both a budgetary account and a proprietary account. For example, an appropriation expenditure account shows an actual financial operation (that is, the amount actually expended), and a budgetary operation (the amount by which the appropriation is to be reduced).

Fund accounts are also classified according to whether they are balance sheet or operating statement accounts, that is, whether they go to make up the fund balance sheet or fund operating statements. Balance sheet accounts are further subdivided into asset, liability, reserve, or surplus accounts. As is evident from the description of funds above, the assets and liabilities of each fund vary with the type of fund. Operating statement accounts are subdivided into revenue accounts and expenditure accounts.

A distinction must be made between fund revenues and revenues of the municipality as a whole. A fund revenue may not necessarily be revenue to the city. For example, proceeds from the sale of bonds are a revenue of the Bond fund but not of the city. They are a revenue of the Bond fund because the bonds will not be paid from this fund but from taxes. On the other hand, the proceeds are not revenues of the city as a whole because the municipality is obligated to pay the bonds.

Similarly, an expenditure of a fund may not be an expenditure of the municipality as a whole. For example, if the General fund contributes money to the Working Capital fund, the amount contributed is considered an expenditure of the General fund because the General fund thereby suffers a reduction in its assets. The contribution is not an expenditure to the municipality as a whole because the reduction in the assets of the General fund are offset by a corresponding increase in the assets of the Working Capital fund.

The distinction is important in compiling and interpreting financial statistics of different municipalities, an example being the financial statistics of cities, published by the United States Bureau of the Census. In preparing these statistics, fund distinctions must be ignored, and all like revenues and expenditures must be combined regardless of the funds in which they originate. Retaining all fund distinctions would make com-

parative statistics an impossibility. For example, one city may account for all general activities through the General fund while another may have them divided between the General fund and several Special Revenue funds.

On the other hand, from the standpoint of the individual municipality, the identification of revenues and expenditures with the funds to which they apply is fundamental. Otherwise the municipality would not be in a position to know if it is complying with legal provisions. The classifications of revenues and expenditures described below are considered from the standpoint of both the individual funds and uniform municipal financial statistics. Some of these revenues and expenditures are found in only one fund, whereas others are common to several funds.

Revenues are classified by source. The principal municipal revenue sources include general property taxes; licenses and permits; fines, forfeits, and penalties; revenue from use of money and property, e.g., interest earnings, rents, and concessions; revenue from other agencies, including state-collected locally shared taxes, state grants-in-aid, grants from the federal government, and grants from the county or other local units; charges for current services; special assessments; and earnings of public utilities. From an individual fund standpoint, bond proceeds are also revenues.

Expenditures are classified by *function, organization unit, activity, character,* and *object.* A function is a group of services aimed at accomplishing a certain purpose or end. Municipal functions include general government, public safety (including police and fire), highways (that is, repair and construction of streets and roads), sanitation and waste removal, conservation of health, hospitals, charities, correction, schools, libraries, recreation, and public utility operations. The foregoing are the main classes of services rendered by a municipality. Of course, some municipalities may not render all of these services. For example, some do not own utilities.

Each organization unit within a municipality carries out a part of a function. The primary subdivision of a function is designated as an activity, and the subdivisions of the activity are known as subactivities. For example, the function of public safety involves among other principal activities those of policing and of fire prevention and fire fighting. The policing activity may be subdivided further into such subactivities as personnel training, crime prevention, activities of detectives, activities of uniformed police, and maintenance and operation of the police communication system. Theoretically, an organization unit should carry on activities which are a part of one function only. Actually, however, one organization unit may carry on activities which belong to different functions. For example, a public works department may construct and repair streets (activities relating to the «highways» function) and also clean the streets (an activity belonging to the «sanitation and waste removal» function).

Comparative financial statistics on expenditures of municipalities are reported by functions. The reason is that variations in the organization structures of municipalities make it impracticable to compile statistics by organization unit. On the other hand, the expenditures as they actually take place are recorded by organization unit. This procedure makes it necessary for compilers to group the organization units and their activities by functions, and in that way arrive at the total expenditure for each function.

Expenditures are also classified by character, that is, on the basis of the periods presumed to be benefited. The three main groups in this classification are expenses, provisions for the retirement of debt, and capital outlays. Expenses are presumed to benefit primarily the current fiscal period. Provisions for the retirement of debt involve expenditures on account of benefits received, at least in part, in prior fiscal periods, although their benefits may extend to the present period and future periods. Capital outlays represent expenditures for durable assets, the benefit of which applies both to this fiscal period and to some subsequent period or periods.

Both current expenses and capital outlays are further classified by object, that is, on the basis of the nature of the article purchased or service obtained. In some municipalities, the object classification is very detailed; in others, it consists of only a few items. The following is a complete object classification composed of only five objects: (1) personal services, (2) contractual services, (3) materials and supplies, (4) interest charges, and (5) sundry charges. No one object classification can be said to be ideal. The detail with which the expenditures should be broken down by objects will depend on the requirements of management and on legal provisions.

The above object classification applies equally to current expenses and capital outlays. In practice, however, capital outlays are not reported by these detailed objects. The reason is that since some of the fixed assets are purchased, the outlay for them cannot be classified as personal services, contractual services, etc. The only way such purchases can be classified is to show the complete object acquired, e.g., land, buildings, improvements, or equipment. To be consistent, therefore, fixed assets constructed by the municipality, even though they are recorded by detailed objects, must be classified by main objects, e.g., buildings, equipment, etc.

The classifications by character and object are not separate groupings but represent a further subdivision of the activity classification. The following is an example of a complete classification for one activity, namely, registering voters.

General Government (*function*)
  Board of Elections (*organization unit*)
    Registering Voters (*activity*)
      Current Expenses (*character*)
        Personal Services (*object*)
        Contractual Services (*object*)
        Materials and Supplies (*object*)
      Capital Outlays (*character*)
        Equipment (*object*)

Although many functions and activities are financed through the issuance of bonds, no attempt is made to allocate the outlay for debt retirement and interest among the several functions. Instead, interest payments are shown as a separate item under current expenses, and debt retirement as a separate item under capital outlays.

Classification of Financial Statements.—Municipal statements may be classified as (1) accounting and (2) statistical. An accounting statement is one prepared directly from the accounts, ordinarily contains no other data except those taken directly from the accounts, and usu-

ally covers a period of one or two fiscal years. Statistical statements, on the other hand, may cover a period of more than two fiscal years or may contain, in part, data not related to accounting. The purpose of accounting statements is, among other things, to show compliance with legal provisions and fund accountability. Statistical statements show financial trends and the present and prospective financial ability of the municipality to finance its program.

Accounting statements are classified into balance sheets and operating statements. A separate balance sheet must be prepared for each fund or group of related funds, with subsidiary schedules set up for those balance sheet accounts requiring further explanation. Since each fund is an independent entity, it is incorrect to present a balance sheet in which like assets or liabilities of different funds are combined. If a combined balance sheet of all funds is desired, it must be so set up that the assets, liabilities, reserves, and surplus of each fund are exhibited in the same statement.

Similarly, a separate operating statement or statements must be prepared for each fund. It is improper to present a combined statement of revenues and expenditures for all funds for several reasons. First, as explained earlier, fund revenues or expenditures may not necessarily constitute revenues or expenditures of the city as a whole. Second, in the case of some funds, no comparison is made of the revenues and expenditures within the same fund. For example, revenues and expenditures of Special Assessment funds for a fiscal year cannot be compared because the assessments are levied in one period, whereas the expenditures may be spread over several periods. Third, each fund is an independent entity, and the revenues of one fund cannot be used to finance the expenditures of another, unless authorized by law.

Statistical statements present a financial history of the municipality together with forecasts of future financial requirements. All factors relating to the property tax should be reflected in the statistical statements. For example, they should show the assessed valuations, tax rates, tax levies, and tax collections for a number of years. They should indicate the amount of shared state taxes and grants received by the municipality for a number of years. Information should also be shown regarding the municipality's debt such as (1) the ratio of bonded debt to assessed value and the per capita bonded debt for a number of years, (2) the amount of debt which the municipality is authorized to incur after taking into account the bonded debt outstanding, (3) the debt of overlying jurisdictions (such as school districts, county, townships, etc.) which the taxpayers of the municipality will have to pay, and (4) the amount of interest plus contributions to sinking funds or retirements of serial bonds that will have to be made each year until all the present outstanding bonds are retired.

Conclusion.—The ultimate aim of an accounting system is to provide financial information which can be embodied in reports to legislators, administrative officials, and the public. The report must serve a dual purpose: (1) It must show compliance with legal provisions. (2) It must reflect in proper form the financial condition and financial operations of the municipality. The same consistent principles must be applied from year to year so that the financial statements of one year can be compared with those of another year. If changes become necessary, they must be explained and their effect must be indicated. A uniform terminology must be employed in all reports, and unusual terms must be explained. In general, in determining whether or not a municipality has a proper accounting system, the test is: Can the system produce accurate and informative reports promptly at the lowest possible cost?

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MUNICIPAL ART SOCIETIES.—See ART, AMERICAN.

MUNICIPAL COLLEGES AND UNIVERSITIES. The United States.—The passion for free public education in the United States has carried well beyond the original intention. At first only the elementary school was free; tuition was free, and the schools were maintained by public taxation. Secondary education was then conducted by private academies and higher education by privately endowed colleges and universities. But before the free elementary school had become universal, free high schools were opened and maintained in the more progressive communities and by the close of the 19th century the free public high school was practically the uniform policy of public education in every state of the United States. Opposition to such free secondary education in tax-supported schools has entirely disappeared. Most of the states have established universities, supported entirely by taxation and offering free tuition to residents of the state.

The municipal college and university, therefore, has grown out of the city high school in response to the public demand for higher education.

England.—England has a type of municipal college but they are not tax supported and, therefore, are not municipal institutions in the truest sense. Nevertheless, although on private foundations and maintenance, many of these English colleges are of local character, reflecting the local industries, local ideals, local pride. Thus the Sheffield College reflects the cutlery interests by its excellent school of metallurgy. The College of Leeds reflects the textile indus-

tries by its school of textiles. Birmingham, Liverpool and Manchester have local universities. The University of London has a long and honorable record.

MUNICIPAL DEBTS. Among those who deal in securities the term "municipals" is used to denote bonds or other evidences of indebtedness of states, cities, counties, school districts, and other public bodies.

Municipal debts may take the form of long-term loans through the issuance of bonds or they may be short-term obligations such as warrants, bank overdrafts, or tax anticipation notes. Long-term bonds are called *serial bonds* when approximately the same amount of the principal is paid each year. *Sinking-fund bonds* are usually payable at a single date, such as twenty years from the time of issue, and the money to pay them is accumulated over the period in such a way that yearly contributions with the interest they earn will pay the debt at maturity.

Serial bonds are now generally favored over sinking-fund bonds by investors and legislators. Several states permit their municipalities to issue serial bonds only.

Municipalities may borrow in anticipation of the collection of taxes. These short-term loans may be necessary because the taxes are not due until long after the fiscal year begins. Loans of this character may be warrants or notes sold to financial institutions, or they may be issued to creditors in settlement of claims. They usually bear interest. Sometimes they are recorded in numerical order of their issuance or presentation and they are then called registered warrants. Canadian cities finance short-term loans by bank overdrafts on which they pay a stated rate of interest.

Municipal debts in the United States presented no special problems until after the Civil War. New York City sold some securities about the year 1812 and by 1822 Boston's debt was $100,000. By 1843 the total municipal debt amounted to about $27,500,000 according to the report of a congressional committee. The federal debt at that time was even smaller, about $20,000,000, while the debts of the states aggregated more than $230,000,000. After 1860 the municipal debt grew rapidly. It reached the $500,000,000 mark by 1870 and totalled $15,000,000,000 in 1932. The growth of municipal debt, both as to time and location, paralleled the growth of cities.

Two types of municipal bonds have caused widespread difficulties. Railroad-aid bonds sold in the middle of the 19th century and special assessment bonds issued during the 1920's have caused many defaults and partial repudiations. General-obligations bonds have the best record of payment over a long period of years. The railroad-aid bonds were sold by cities or counties to help finance railroads as a condition to running the railroad through the city or county. Such bonds were often issued illegally and this was used as an excuse to refuse payment. As a result of such refusal present purchasers of municipal bonds of all types require the approving opinion of an attorney who specializes in municipal bond law.

Special-assessment or local-improvement bonds were sold by municipalities in the 1920's to finance the construction of sewers, pavements, sidewalks, and water mains in growing urban and suburban areas. In many cases the bonds were primarily a debt against the property benefitted. However, when the special assessments were not paid the bonds became a debt of the entire city. In these cases the whole city took on a heavy burden. Other types of special-assessment bonds were payable solely from the collection of special taxes and when these assessments were not paid the bondholders could not get their money.

During the years 1930–1940 scores of municipal districts delayed payment of their debts. However, the record of ultimate payment was excellent and excelled only by the record of the United States government itself. Total losses to investors were far less than one per cent of the total debt.

Control of Municipal Debt.—Several controls exist to limit municipal debts. Nearly all limits are based on a percentage of the assessed value of property in the municipality. Thus municipal corporations in Illinois may not incur debts beyond 5 per cent of the assessed value of property in the city. Some limits are fixed by state constitutions, some in general state statutes and others in city charters. Municipal debts are limited by several means:

(1) Express authority to borrow must be given by the state.
(2) Debts may be incurred only for public purposes.
(3) Definite limitations exist for nearly every type of governmental unit.
(4) Some municipalities may issue bonds only after the approval of the electors. Other require only positive action of the municipal council. Still others may have to obtain the approval of a designated state agency.

Peculiar Characteristics of Municipal Debt.—Bonds issued by municipalities have been sought, since enactment of the income tax law, by persons of large income who wish to have their incomes free from federal taxes. The courts and the statutes, as well as precedent, have exempted from federal income taxes, the income from state and municipal bonds.

Municipal bonds are paid from taxes levied for that purpose. The bonds do not pledge as security the physical properties of the municipal corporation nor the property of the citizens. This contrasts with many corporate bonds which are secured by a mortgage on the corporations' properties. While the municipality does not pledge any property for the payment of its general obligation bonds it does agree to levy unlimited taxes to pay the principal and interest on the debt.

Volume of Debt.—Statistics on municipal debt, issued by the United States Bureau of the Census show the following gross debts as of June 30 each year:

	Total	State Debt	Local Debt
	(All amounts are in millions of dollars)		
1912	$ 4,498	$ 423	$ 4,075
1922	10,256	1,163	9,093
1932	19,562	2,896	16,680
1940	20,201	3,526	16,720
1944	17,426	2,768	14,703
1945	16,552	2,425	14,164
1946	15,887	2,358	13,564

The state governments have kept their debts low. Their conservatism results from the fact that many state constitutions prohibit the government from incurring debt. This restriction on the states was brought about to prevent the states from repeating their spending for canals and banks as they did in the first half of the 19th century.

Revenue Financing.—The most significant development regarding municipal bonds is the widespread use of municipal "revenue" and "authority" bonds. Such bonds are issued to finance enterprises like water works, electric plants, sewage disposal works, and facilities such as bridges and tunnels. These bonds are usually payable solely from the earnings of an enterprise. They may be contrasted in this respect with general-obligation municipal bonds which carry a pledge of the "full faith and credit" of the municipality and for whose payment an unlimited tax levy is usually pledged. When a municipality fails to pay the interest or principal on its general-obligation debt the bondholders must take judgment for the matured debt, and obtain a mandamus compelling the municipality to levy a tax to satisfy the judgment. If there should be a default on revenue bonds payable solely from the earnings of an enterprise, then the bondholders may be able to force higher service charges or they may assume operation of the enterprise.

Interest Rates.—The interest rates on municipal bonds are lower than they are on any other type of security of similar maturity. This is due primarily to the fact that the income from the bonds is exempt from federal income taxes. Interest rates, and therefore interest costs, have gone down as the federal income tax rates have increased. On January 1, 1933, according to an index of such bond prices, the yield was 4.61 per cent. By April 1946 this had declined to 1.29 per cent but rose again to 1.85 per cent in February 1947. Tax exemption and the excellent history of payment of municipal bonds contribute to this low rate. Municipal-bond interest rates tend to rise and fall with general interest rates and more especially with interest rates on United States government loans.

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MUNICIPAL GOVERNMENT. Early settlers in British North America brought with them the concept of the municipal corporation as a means of meeting the complex needs of densely populated places. However, there was little need in the colonial period for municipal corporations and only about a score of them were established, the most important being New York and Philadelphia. Independence gave a great impetus to the incorporation of cities. As a result of the rapid growth of population and the accompanying change from a predominantly agricultural to an industrial economy, the incorporated city has become the usual form of local government. In New England there are numerous urban communities still administered by the less formal town governments. Throughout the rest of the country certain areas adjacent to large cities, though to all intents and purposes urban, have no local government except that of the county in which they are situated. Generally speaking, however, the more than 16,000 incorporated places include the great bulk of our urban population.

The United States census somewhat artificially defines as urban any city or other incorporated place with a population of 2,500 or more. In 1940 there were 3,464 such places, with 56.5 per cent of the country's population. While some cities of 2,500 are compact, densely populated areas, many present few urban characteristics. A line drawn at 5,000 more nearly represents the actual distinction between urban and rural. In 1940 there were 2,042 such municipalities, containing 69,397,791 inhabitants, or 52.7 per cent of the country's population.

The forms and functions of local government in places ranging in population from 5,000 to nearly 7,500,000, is the subject of this article. Of all government in the United States, it is municipal government on which we depend chiefly for the preservation of order and protection from crime, fire and disease; it plays the major role in our educational system; it furnishes basic utilities such as water, light, power, and transportation; and it maintains and cleans the streets, and collects and disposes of refuse and sewage without which service urban life would be impossible.

Relation of Municipality to State.—The power to create municipal corporations belongs to the states. Except for such limitations on its powers as are contained in the federal and state constitutions, the state legislature can make and unmake them at will. The state legislature cannot empower a municipality to do anything which it is forbidden to do by the federal Constitution, such as deprive a person of liberty or property without due process of law. The protection accorded to individuals and private corporations by the first 10 and the 14th amendments to the federal Constitution does not limit the state's authority in establishing, combining, or abolishing municipal corporations, or in altering their powers and privileges. In other words, a municipality cannot invoke the federal Constitution against the state. As a result, such protection as a municipality has against arbitrary action by the state legislature must be found in specific provisions of the state constitution. In the absence of such provisions, and sometimes in spite of them, the legislature's power has been frequently abused, to the detriment of local self-government.

The most common restriction on the legislature, in dealing with municipalities, is the requirement that it act by general law. The courts, however, holding that a law affecting a whole class is general, have in many instances permitted such minute classification of cities by population as to practically nullify the constitutional provision. Another and more effective means of giving municipalities greater powers of self-determination has been through optional acts which any city can adopt. Acts relating to specific subjects, such as planning and zoning, are common. Massachusetts offers five basic forms of government among which its cities, except Boston, may choose by referendum. Other states, including Idaho, Iowa, Kansas, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, South Dakota, Virginia, and Wisconsin, offer their cities similar alternatives.

Nine states (Maine, New Hampshire, Vermont, Rhode Island, Connecticut, Delaware, Georgia, Florida, and Tennessee) do not restrict the power of their legislatures to enact special laws for cities.

Eighteen states (Arizona, California, Colorado, Idaho, Maryland, Michigan, Minnesota, Missouri, Nebraska, New York, Ohio, Oklahoma, Oregon, Texas, Utah, Washington, West Virginia, and Wisconsin) permit some or all of their cities to prepare and adopt "home rule" charters. This can be the most satisfactory method of reconciling the right of the people of the city to self-government with necessary state control. Most home-rule charter provisions actually do give cities freedom to choose their form of government. Home-rule charters are otherwise subject to the general laws of the state except as to such powers as cities are permitted to exercise by the constitution. It is at this latter point that home rule is often crippled by too narrow a definition of powers which the city may freely exercise. Efforts of the last half century to encourage municipal home rule have not won for the municipalities much independence of the state legislature. It is true, however, that even where the practice of special legislation for municipalities is at its height, as in Connecticut, the legislature tends to defer to local opinion in adoption of such acts. In the "home-rule charter" states, changes in charters usually require a popular vote. See also MUNICIPAL HOME RULE.

Relations between Municipality and Federal Government.—It must not be supposed that because the municipalities are left by the federal Constitution at the mercy of the states, that there are no relations between municipalities and the federal government. For a long time such relations as existed were mostly indirect, the national government approaching the cities through their state government. This is still true in such matters as grants-in-aid for highways, social security, and education. It is significant, however, that the Federal-aid Highway Act of 1944 set apart a definite portion of its grant for urban roads. The only exceptions to the general rule prior to the depression of 1930–1940 were such service activities as those of the bureaus of Standards, Mines, and of the Census. Early in the depression, the Reconstruction Finance Corporation began making loans for relief purposes directly to cities. Later, the work relief programs spent billions in immediate cooperation with local units. Public Works Administration loans were negotiated by the cities themselves, and, in the administration of housing, the federal government bypassed the states almost entirely. During World War II Lanham Act allotments and other funds were disbursed directly to cities on a very large scale. These were all emergency matters, but a deep path was worn between the city hall and Washington which in all probability will continue to be used for a growing variety of purposes.

Relations of Municipality with Other Local Government Units.—Almost all municipalities are parts of the counties in which they are physically located and county taxes are paid on all property within the cities, although, except for maintenance of courts, conduct of elections, registration of deeds, and the like, the county spends its money largely on the area outside the city limits. The exceptions to the rule that the municipality is part of the county are very few. New York City contains five complete counties. Boston covers most of Suffolk County and pays all the county's bills, while the city council acts as the board of county commissioners. Philadelphia, Baltimore, San Francisco, St. Louis, New Orleans, and Denver are consolidated city-counties, and the same is true of all "first-class" (10,000 population or more) cities in Virginia. Elsewhere the rule prevails, and, whenever a county includes a large city, there is often overlapping overhead and conflicts of jurisdiction.

Metropolitanism.—City-county relations are only one problem of intercommunity relationship which municipalities face today. Whereas cities continued down to the late 19th century to be compact, closely built-up units in which population clung to the commercial and industrial nucleus, the typical modern city, at least from the social and economic point of view, is a sprawling metropolis embracing numerous independent local units. Annexation has failed (except in a few states like Virginia, where it is effected by court decree, or in Texas where unincorporated territory can be annexed by simple resolution of a city council) to keep pace with the expansion of city population. Examples drawn from the 1940 census figures illustrate this. Pittsburgh's population inside the city limits was 671,659. Its metropolitan area as defined by the census bureau had 1,994,060 inhabitants, including the whole or part of 6 counties, 82 townships, and 137 municipalities. The city of New Haven, Conn., had a population of 160,605, but the 10 towns and 6 cities of metropolitan New Haven had 308,228. Kalamazoo, Mich., had 54,097, but 23,116 more lived in 2 townships and 2 municipalities in its environs.

The census definition of a metropolitan area, which includes all adjacent and contiguous civil divisions having a population density of 150 per square mile, is questionable. The true metropolitan area in which there is a daily large-scale movement of population to and from the nuclear center may be smaller or larger than the census area, but this does not alter the essential fact that most municipalities of any size are but parts of a larger urban community. That political boundaries do not correspond with the real city in the socio-economic sense creates endless confusion and difficulty. The regulations of adjoining municipalities often conflict and the smaller units frequently cannot provide for themselves the kind of public works necessary in a metropolis. While there has been a great deal of talk of metropolitan consolidation, very little has been accomplished. There are a few metropolitan districts supplying water, sewerage, parks, or other specific service to several adjacent local units. In cases like Los Angeles, a county government has been entrusted, for the benefit of the municipalities as well as the unincorporated area, with some of the functions of government usually performed by each municipality for itself. On the whole, however, the problem of metropolitanism remains to be solved. The chief obstacle to its solution is the resistance of the individual municipalities to surrendering anything of their independence. This insistence on the preservation of their identity, sometimes based on lower tax rates or supposedly "cleaner" politics, is generally short-sighted.

Early Forms of Municipal Government.—The basic form of municipal government came from England. Its central feature was a city

council composed of two grades of members—aldermen (usually magistrates) and common councilmen—who sat together and had equal voice in the council's deliberations. Members were generally elected by some form of limited suffrage, although in Philadelphia the council was self-perpetuating. The council as a rule chose one of its number to be mayor, who presided over its sessions and exercised important judicial powers as chief magistrate. There was often also a recorder whose functions were primarily judicial, and a clerk. All these officials, except the clerk who was a busy functionary, served ordinarily without compensation.

This simple form of government worked very well for the small cities of colonial and post-Revolutionary times. The principal function of these municipalities was the formulation of police regulations for the maintenance of peace and good order, and the administration of justice. Most of the municipal services to which we are now accustomed were nonexistent. Police protection was handled by elected constables supplemented by a night watch on which citizens served compulsorily in rotation. Fire protection was a matter of supplying leather buckets or a portable hand pump for the use of volunteer firemen. Water came chiefly from wells, and such sewers as existed were for the drainage of low places. Only a few of the principal streets were paved, and those with pebbles, and, sloping toward the channel in the center, had neither sidewalks, curbs, nor gutters. Refuse was generally piled in the poorer streets, and only occasionally carted away. Public health administration was limited to enforcing a quarantine on the victims of smallpox and yellow fever. Street lighting was by lanterns which householders were obliged to hang beside their doors. Down to the first quarter of the 19th century there was nothing which a city government did, except for the occasional services of a surveyor or physician, which could not be done by any reasonably intelligent and passably educated citizen. The population was small and homogeneous, the problems—judged by modern standards—insignificant.

Growth of Machine Rule.—With the second quarter of the 19th century a series of forces arose which transformed municipal government into what James Bryce, writing in 1888, called our "one conspicuous failure." The first of these was a very rapid growth in city population, swelled by a rising flood of foreign immigration. Another was the widespread adoption of universal suffrage. The greatly enlarged electorate, poorly schooled in the ways of democracy, was torn by bitter national issues which put a premium on party discipline and disposed even good citizens to tolerate the misdeeds of a local machine which contributed to party victory on the national stage. The progress of science and invention created new wants and the means of satisfying them, necessitating the multiplication of municipal functions. There were thus opened up opportunities for the venal politician on a vast scale. The unhappy results were aggravated by the political philosophy of the time. In pursuit of the "separation of powers" and "check and balance" theories which played so strong a part in determining the form of our state and national governments, city councils came frequently to have two chambers; the mayor became a separately elected officer with power of veto but, like the state governors, sharing executive authority with a number of elected officials, and the mayor's appointments had to be confirmed by at least the upper house of the city council; and finally, the doctrine of "to the victor belong the spoils" prevented the formation of a respectable municipal civil service. Council committees still played an active part in administration. For the ostensible motive of removing certain departments like police, fire, and public works from political control, they were put under the control of boards appointed for long and overlapping terms, sometimes by some state authority.

There was thus produced more than a half century of bad municipal government, dominated for the most part by political machines, frequently corrupt and inefficient. This era was climaxed by the scandals which surrounded the Tweed Ring in New York and the Gas Ring in Philadelphia, but there were scores of others whose intentions were equally bad though they lacked access to the treasure chests of such great cities.

It is difficult for the present generation to realize what great progress has been made since Lord Bryce passed his sentence on our city government. In 1888 there was no such thing as a merit system of appointment in any city outside the states of New York and Massachusetts. There was scarcely a sound law in the United States governing the registration of voters. The first "Australian" ballot acts were adopted in 1888 in Massachusetts, and in Kentucky for the city of Louisville. Although municipal government had become a large and complicated business, it was still administered on the theory that any intelligent citizen could fill any job in its service, which—interpreted—meant that any citizen capable of service to the machine was qualified for a city appointment.

Since 1888 these and many other things have changed. It is impossible here to trace in detail the progress of municipal government since that time. It is enough to say that around the turn of the century numerous forces became active which have resulted not in the perfection of municipal government but in making it compare favorably with the government of foreign cities and with federal and state government at home. Unlike some European countries, our improved municipal government has not been imposed from above. It has been in large part the result of increased citizen interest, and the creation of a great number of citizen organizations. The proceedings of the first National Conference for Good City Government held in Philadelphia in 1894 described the organization and methods of the 46 municipal reform organizations known to exist at that time. At this meeting the National Municipal League was organized, which has functioned ever since as the country's clearing house for improvement in municipal government. Since then there has been in most cities of over 100,000, one or more citizen organizations for good government. There has also been a tremendous increase in the literature devoted to municipal problems. A complete *Bibliography of Municipal Administration* was published in 1897 as the first quarterly number of a short-lived periodical, *Municipal Affairs*. Today it is necessary, anywhere that municipal government is seriously studied, in universities, city halls or research agencies, to maintain a special library to make available the flood of printed material. Univer-

sity and college courses in municipal government and administration are numbered in the hundreds, while several universities carry on graduate courses for the training of would-be municipal administrators. Municipal government has been under the spotlight of intelligent public interest sufficiently to have brought about many advantageous changes in its organization and procedures. At the same time, grim necessity has taught even the politicians the futility of trying to run a modern city with men untrained except in the arts of politics. Building streets, laying sewers, preventing crime, fighting fire, controlling disease, feeding and clothing the needy, housing the underprivileged, or providing recreation, are no longer tasks for the intelligent amateur or the political henchman. The consequences of bad administration are so serious that even machine politicians do not dare run the risks that attend a clean sweep of trained personnel after an election. The practice of merit appointment and good-behavior tenure has been spread by law, and also by tacit acquiescence of the political magnates.

Classes of Municipal Organization.—There are three distinct types of municipal organization in the United States: independent executive, commission, and manager.

Independent Executive.—The independent executive, or mayor and council type, represents the perpetuation of the fundamental principle of our federal and state governments. Before 1901 it was the almost universal form of municipal government except for small boroughs or villages in certain states where the mayor, chief burgess, or warden, was little more than the presiding officer of the governing body. It still is found in about two thirds of the cities of over 5,000 inhabitants, and in all cities of over 500,000 except Washington, D. C., which is governed by Congress through a commission of three members appointed by the president. Its essential feature is a mayor elected by the people independently of the city council. There is an infinite variety in the details of municipal governments of this sort, but they fall roughly into two main types, based on whether the mayor has little or much actual authority. The first or "weak mayor" type is by far the more common. It is characteristic of this type that there are other important city officials such as comptroller or auditor, clerk, treasurer, attorney, assessor or board of assessors, street commissioner, and safety commissioner, also elected by the people. The mayor's appointments are subject to confirmation by the council and some departments are presided over by boards appointed for overlapping terms longer than that of the mayor, so that a good deal of his term goes by before his appointees are in a majority on the board. The mayor sometimes has a veto over acts of the council and sometimes is its presiding officer. Where he has either or both of these privileges his influence is increased, but not sufficiently to counteract his lack of direct control of the administrative side of the city's business. In this type of city government the council, even though preparation of the budget is left to the mayor (which is not always the case), has ultimate authority in making appropriations. This control of the purse is vital. The center of gravity in the weak-mayor type is usually in the council or in some machine or boss outside the formal city government.

The second or "strong mayor" type is found chiefly in the larger cities. It is characteristic of this type that the mayor should have power of appointment and removal of all persons outside the classified civil service without council interference; that his appointees should include the heads of all principal departments, and that these heads should be boards only in the case of the library, parks, and schools; that the mayor should submit the budget and supplementary appropriations, and the council be limited to reducing or eliminating items proposed by the mayor; that he should have a veto over the acts of the council, requiring at least a two-thirds majority to overcome. The extreme example of the strong-mayor form of government is to be found in Boston where the mayor is for his four-year term (he cannot succeed himself) practically dictator of the city's affairs. New York properly belongs in the same class, in spite of the modicum of administrative powers assigned to the presidents of its five boroughs.

The council in 16 mayor-and-council cities, all in New England except New York City and Richmond, Va., and all of the weak-mayor type, except New York, still consists of two houses. The size of the council varies in mayor-and-council cities from 50 in Chicago to as few as 2 or 3 in a few small places. The median number is 19 for cities over 500,000, but only 7 for all cities over 5,000. The 2-year term is most common for both mayors and councilmen, but a 4-year term is in effect in more than a third of the mayor-council cities. They are about equally divided between council election at-large and by wards, with a considerable number having a combination of the two methods.[1]

Commission Type.—The most simple form of control of any organization—industrial, commercial, social or political—is a committee of its members. It is not surprising, therefore, that, at various crises in the affairs of cities, resort was had to government by committee or commission. One striking example of this sort occurred in 1874 when, as a supposedly temporary expedient, executive power in the District of Columbia was entrusted to a commission of three appointed by the president, Congress retaining legislative power in its own hands, an arrangement which has become permanent. In 1879 the management of bankrupt Memphis, Tenn., was handed over to a board of 3 fire and police commissioners, supplemented, in the award of contracts, by a board of public works of 5 members. It was, however, the experience of Galveston, Texas, following the disastrous flood of 1900, which actually launched commission government as a normal means of municipal administration. Following the terrible destruction caused by the storm, the old system of government, consisting of a mayor and 12 aldermen elected at large, completely collapsed. In this emergency a body of business men who had been working on plans for harbor development, known as the Deep Water Committee, took over the command. Casting about for an efficient basis for a new, legally constituted government, they hit upon the idea of a commission of five appointed by the governor. In the 1901 legislature the measure was altered to permit the people to elect two of the commis-

[1] Complete details of this sort for all cities of over 5,000 population are to be found in the *Municipal Year Book*, published annually by the International City Managers Association.

sioners. Happily, as it turned out, the Court of Criminal Appeals found the appointment of the remaining three commissioners by the governor unconstitutional, so that in 1903 all five members of the commission became elective. So desperate was the situation of Galveston and so ably did the commission handle its affairs, that the dramatic story was repeated throughout the country and the way prepared for widespread imitation of the "Galveston experiment."

The most original feature of commission government was that while complete municipal powers were vested in the commission as the governing body of the city, each of its members was the working head of one of the five city departments. The reasons for its success, however, were to be found in its compactness, its avoidance of the speech making and exhibitionism of large deliberative bodies, the absence of "checks and balances," and the consequent clear-cut responsibility of its five members to their fellow citizens. Great impetus was given to the spread of commission government by the optional law for first-class cities passed by the Iowa legislature in 1907 and adopted that year by Des Moines and Cedar Rapids. This Iowa act—widely publicized as the "Des Moines Plan"—added to the commission plan the initiative, referendum and recall. Henceforth these features went along with commission government and had a great deal to do with reconciling the people of many cities to the unaccustomed concentration of power in the hands of a body of five men. The Des Moines Plan also embodied the idea of nonpartisanship in municipal affairs which has since been very widely accepted.

The spread of commission government was extremely rapid from 1909 to 1913 when it began to lag, although several of the larger cities adopted it after that date. It has since steadily lost ground, mostly to its younger competitor, the manager plan. It may now be found in about 325 cities of over 5,000 population. None of them are over 500,000. The largest cities with this form of government are New Orleans, Newark, N. J., Portland, Oreg., Jersey City, Memphis, St. Paul, Birmingham, and San Antonio.

The fact that the commission form of government has been on the retreat for many years is due chiefly to the serious defects which it developed in practice. It has never been conspicuously successful except in places of moderate size like Galveston and Des Moines. Its most serious weakness is that it confuses the functions of representation and administration. For the selection of representatives, popular election is essential. The qualities which make a good administrator are not usually the qualities which make for political success. In the commission plan the same persons who as a group determine the city's policies are individually responsible for their execution. There is a continuance of amateur direction of administration not in conformity with the needs of modern cities. There is a certain artificiality, also, in dividing city administration into five compartments, which brings unlike services together under one head. The usual method of electing commissioners simply as commissioners, and then assigning them to their respective posts, results too often in having two or three men adapted to one post and no one suited to another. Election to specific commissionerships does not improve the situation as the public is not discriminating in its choice of commissioners of finance, as distinguished from those of public works. Experience has clearly demonstrated that the heads of administrative departments should be appointed, not elected.

Manager Plan.—The manager plan was, in the historical sense, a development from the commission plan. Given a small commission, or council, in which all the powers of the municipality are concentrated, as in the board of directors of a corporation, it was natural that someone should suggest going one step further, by appointing a general manager to carry out the decisions of the council. That is the essence of the manager plan. The council appoints and removes the manager at its pleasure. The council determines what is to be done—often at the suggestion of the manager—and the manager sees to the doing. It thus squarely meets the chief defect of the commission plan. The council represents the people in determining municipal policy. The manager is its agent in the administration of that policy. He appoints and removes, subject to the personnel provisions of the charter, the heads of departments and frequently many, if not all, of the employees of the city.

The first American city to install a manager was Staunton, Va., in 1908. The Staunton managership was an accidental development, being applied by ordinance on top of a mayor and two-chamber council, then prescribed for first class cities in Virginia. Wide publicity was given by the National Short Ballot Organization to the unsuccessful attempt of the Board of Trade of Lockport, N. Y., to get from the 1911 New York legislature an improved form of commission government featuring a city manager. In 1912 Sumter, S. C., received the first actual manager-plan charter.

The turning point for the manager plan came in 1913 when Dayton, Ohio, taking advantage of the home-rule amendment to the Ohio constitution adopted the year before, wrote itself a manager-plan charter. This charter was brief and well drafted, and contained not only such devices for popular control as the initiative, referendum, recall, and nonpartisan elections, but modern budgetary, financial, and civil service provisions. The flood of May 1913 had put Dayton in the limelight. The first council under the charter drew further favorable attention by seeking to employ as manager George W. Goethals, famed builder of the Panama Canal. Though this effort failed, the man selected—Henry M. Waite—proved an ideal manager. Finally, John H. Patterson, president of the National Cash Register Company and chairman of the commission which had drawn the charter, for many years made the success of the Dayton experiment a leading feature of his company's nation-wide publicity. It is no wonder therefore that the Dayton charter was quickly imitated throughout the country. Every year since 1913 has seen a steady increase in the number of manager-plan municipalities. There were on Dec. 31, 1946, according to the National Municipal League, 725 American cities in which the manager plan was in force, while in addition, Hartford, Conn, had voted to adopt the plan and was merely awaiting legislative approval before putting it into effect. At the time this article was written (1946), only 28 cities had abandoned the manager plan. Although the manager plan is in effect in no city of more than

500,000, it is well represented in all other population groups and, contrary to the popular assumption, is in force in a larger proportion of cities from 50,000 to 500,000 than in smaller places, the figures being 28.8 and 16.8 per cent respectively. More than 80 cities adopted the manager plan in 1946, exceeding all previous records.

The manager plan is no novelty in the field of public administration. Our public school systems are administered by boards of education and superintendents who bear essentially the same relation to one another as city council and city manager. Our public institutions are controlled by boards of trustees who act through a superintendent, president, or other executive. Taking into account private corporations, which are our greatest contribution to the science of management as such, the manager principle is the most common and most successful principle of organization developed in America. It has succeeded in the field of municipal government, as attested by its steady and uninterrupted growth for a generation.

There are some concomitant features of the manager plan which need description. All but a very few manager-plan cities continue to have a mayor who presides over the council and acts as ceremonial head of the city. This further emphasizes the position of the manager as the council's business agent. In the majority of cases the mayor is elected by the council from its own number. In something over a third of the cities of over 5,000 population, he is elected directly by the people, and, in a very few instances, he is the candidate for council receiving the highest vote. In only a handful of manager-plan municipalities does the mayor have a veto. The number of councilmen ranges from 2 to 20, but the most frequent number is 9 in cities of over 100,000, and 5 in other places. It is not unusual to find alongside the council and manager one or more officials elected directly by the people—such as a comptroller or board of assessors. Frequently the council appoints other officers besides the manager, such as the city clerk, city attorney, comptroller, planning commission, or library board. Such elective or council-appointed officials tend to weaken the position of the manager, but as long as he can appoint and remove the heads of the principal money-spending departments such as police, fire, public works, and of any utilities the city may own or operate, the manager plan may still function successfully.

Methods of Election.—Nothing has had a greater influence on the betterment of municipal government than improved election procedure. Good permanent registration systems which make it easy for the bona fide voter to remain on the list without opening the door to the fraudulent voter, good ballot laws, and voting machines which assure an honest count, have been vital on the municipal as well as other levels of government. There are two election devices which were local in their origin, which have done much for better municipal government.

Nonpartisan Majority Elections.—The first device, nonpartisan majority elections, gained wide prominence in the Des Moines Plan of 1907. Under this plan a candidate can be nominated by a small petition—25 signatures is the common requirement. The candidates so nominated compete at a first or elimination election, and the two for each office receiving the highest number of votes become the candidates at the final election. At neither the first nor final election does any party designation appear on the ballot. This put a stop to the old trick of the machine, where a mere plurality of votes was required, of running dummy candidates to split the vote of its opponents. A variation on the same theme first appeared in this country in the Dallas charter of 1907 (slightly antedating the Iowa act). A candidate receiving a clear majority of the votes cast in the first election is thereby elected and the final election is concerned only with those offices for which no one had a majority in the first election. In one or the other of these two forms, nonpartisan elections are now the rule in more than half of all municipalities of over 5,000 population.

Similar results have been accomplished without a double election in a very few instances by the use of one or the other of the several forms of preferential voting. These systems permit the voter to express his preferences among the candidates on the ballot and his second, third and other choices are given weight if his first choice is not elected. This plan, though it saves the cost of one election, has not found favor with the American public.

Proportional Representation.—The second important device developed is proportional representation by the single transferable vote plan. It is in effect in New York City and Yonkers, N.Y., Cincinnati and Toledo, Ohio, Lowell and Cambridge, Mass., and in several smaller places. This plan is intended to give representation in the city council to each group of opinion in the community in proportion to its voting strength. It does this by permitting each voter to express his preferences among the candidates by the use of figures (1, 2, 3), and determining the result by mathematical formulas.

Proportional representation is included in the model charter of the National Municipal League. An excellent brief explanation of the system can be found in George H. Hallett, Jr.'s *Proportional Representation, the Key to Democracy,* distributed by the same organization. It is advocated by many persons interested in municipal reform, not only on theoretical grounds but for the very practical reason that it gives the advantages of electing the council at large without the danger of having all its members of one party. In Cincinnati it has regularly given each of two major parties representation almost exactly proportionate to the votes it has cast. On the whole, this system has commended itself for the quality and representative character of the councils it has produced.

Personnel.—One of the greatest advances in municipal government has been the general recognition that a strong personnel agency is necessary not merely to eliminate politics from appointments, promotions, and removals, but to recruit and train efficient municipal personnel. For this purpose employees are divided into the classified and unclassified service. To the former belong all employees except heads of departments, some confidential assistants, and a few professional and other specially exempted persons. The members of the classified service are selected and promoted on the basis of competitive examinations and can be removed only on definite charges and after hearing.

In the early days of civil service reform, when the emphasis was on breaking the grip of

politics on the service, the personnel agency took the form of a civil service commission made up of prominent citizens drawn from both major political parties, who served without pay. Assisted by a paid secretary, they conducted examinations, made rules relating to their work, and heard appeals in cases of removal or other disciplinary action. These commissioners did a great work in battling with the politicians for the enforcement of civil service regulations. Persons skilled in public personnel problems now favor a personnel department under a director appointed by the mayor or manager, with a consultative board to aid in making rules and in acting on employee appeals. It is felt that the more cordial and intimate relation between the administration and the personnel agency, which this arrangement brings about, makes for a wider and more effective use of its services.

One of the most important functions of a personnel agency is the preparation of classification plans and pay plans under which employees are properly graded and paid in accordance with the nature of their duties. Each class of employment has its range of pay within which the employee advances automatically.

Pensions.—The employees of most municipalities are included in a pension plan which permits retirement after a specified length of service, on reaching a certain age, or both, or upon becoming disabled. Many of these pension plans are not supported by actuarial reserves and the employees' contributions are often so small and the conditions of retirement so easy—after 20 or 25 years of service irrespective of age, for example—that they impose tremendous burdens on the city treasury. Pensions are a proper complement to an enlightened pay schedule but the cost should not be allowed to bear an unreasonable relation to the pay roll itself.

City Planning.—The planning of the physical development of a city is essential to its ordered growth. It is necessary to have a master plan—subject to change from time to time—fixing the location of streets, transportation lines, terminals, public buildings, parks and playgrounds, and indicating the use to which each portion of the city's area should be put. It has been found desirable to have a planning commission make such plans and pass on all variations from them. The commission consists preferably of interested laymen appointed by the mayor or manager for long, overlapping terms, together with representatives of the city council and of the city executive. It is primarily a deliberative body advising, with the help of experts it employs, the city council on the matters within its jurisdiction. It has an administrative aspect when called on to approve or disapprove the plats by which real estate developers propose to subdivide their property. Usually no ordinance affecting the city plan can be passed by the council without first giving the commission an opportunity to express its opinion, and, when it disapproves, many city charters require an enhanced majority in the council to pass the ordinance. Its approval should be necessary to the adoption or amendment of a zoning ordinance.

Municipal Government and the Public Schools.—The operation of the public schools is usually considered a state function and in the United States is regulated by state law. With rare exceptions these laws have made the city school district a corporation distinct from and often including more territory than the municipality itself. The school department, therefore, is not a department of the municipal government in the ordinary sense, but a separate branch of government coordinate with the municipality. In the great majority of urban communities the schools are under the control of a board elected directly by the people. In only two cities are school and general municipal administration completely integrated. These are the commission-plan cities of St. Paul, Minn., and Chattanooga Tenn., where one of the commissioners is commissioner of education. In a number of cities—about a fifth of those of over 50,000, including New York City—the school board is appointed by the mayor, the council, or the two together. In only one city is the school board appointed by the city manager. Even in these cases the control of the municipal authorities over the schools is very limited since their operation is so minutely controlled by state law and the habit of school board independence so well established. The only important exceptions are in those cities where a single powerful political machine dominates both the school board and the municipal government.

About a third of the school districts, related to cities of 50,000 or more, fix their own tax rate and levy their own taxes. The rest have to submit their budgets to the county or city legislative body. In a majority of these cases the city or county has the legal power to reduce the total of the proposed school budget but in few cases does it include the power to revise the school budget in detail. It is only in a serious emergency that a city council will cut a school budget.

In some states, like Massachusetts, Connecticut, and New York, title to school property is vested in the city, and, in these states and some others, bonds for school buildings have to be issued by the city. This does not seem, in practice, to give the municipal authorities much additional influence over the schools. Schools, in fact, sometimes avoid compliance with the city planning ordinance and building code on the ground that they are state agencies.

Where taxes for school purposes are levied and collected by the municipality, the money is kept in the city treasury and paid out in the same manner as other city funds. This saves the keeping of an independent set of accounts by the school department. In about a quarter of the cities of over 50,000 population, the city's personnel department acts for the schools in filling some or all nonteaching positions. The nonteaching staff sometimes participates in city pension systems. In cities of over 50,000 population, the city purchasing department infrequently buys school supplies and only in a few cases do the schools make use of the engineering, architectural, and building maintenance staffs which the larger cities maintain. The public undoubtedly suffers from these failures to cooperate.

Even more serious is the frequent failure to secure coordination between the municipality and the schools in such social enterprises as health, recreation, and the prevention of juvenile delinquency. Some extraordinary results have been accomplished where cordial cooperation exists and the school and municipal agencies each devote itself to the part of the job for which it is best fitted, without conflict or duplication. The chief stumbling block is in the allocation of expense. Until there is coordination between

school and municipal budgets there will be little coordination in social services.

Public Libraries.—The public library is another service commonly associated with the name of a municipality, but is by no means always an activity of the city government. Several hundred public libraries, including those of New York, Baltimore, Buffalo, Springfield, Mass., and Providence, R.I., are operated by self-perpetuating boards of trustees or by associations. In Cleveland, Detroit, Indianapolis, Kansas City, and elsewhere, libraries are a school district—not a city—function. Among strictly municipal libraries only a handful, mostly in commission and manager-plan cities, are directly integrated with the city government without the interposition of a board of library trustees. The remaining libraries—about three quarters of all—are city libraries operated by boards. In Minneapolis, Grand Rapids, and many smaller municipalities, especially in New England, this board is elected by the people. In the majority of cases the board is appointed, usually for long, overlapping terms, by the mayor, the mayor and council, or, by the city manager.

A good many are given a certain degree of independence of the municipal government by a fixed tax rate guaranteed by charter or statute. Many libraries, however, are incorporated, and have their own funds which partially support them, and they are usually, and without ill effect, allowed a degree of independence, less than that of the schools, but larger than that usually accorded other departments.

Administrative Organization.—Generally speaking, except in commission-plan cities, there is always at the head of the administrative activities of the municipality a single executive, mayor or manager. The completeness of his command over the several departments and agencies varies a good deal. It even varies somewhat between one manager-plan city and another. Separately elected officers are confined mostly to the financial field—assessor, auditor, comptroller, treasurer—plus such posts as city clerk and city attorney. No municipality of more than 50,000 population elects a city engineer, a public works director, or police chief, and of lesser places the number that do is small and decreasing. Nearly half the places of over 5,000 population elect no department heads at all. In other words, there is a general pattern of administrative organization shaped like an inverted pyramid and resting on a mayor or manager.

There is no uniformity as to the number and scope of the several departments and other agencies, or in the form of their internal organization. We have already commented on the artificiality of the commission plan's division of administration into five parts. The same is true of the much imitated fivefold division into departments set up in the Dayton charter—finance, law, safety, welfare, and service. In most other cities the division of administration into departments has grown up without much regard to symmetry or order.

While the division into departments varies so much from city to city as to defy brief description, there are certain functions and activities which appear in very similar form in almost all cities though arranged in different departmental groupings. They may be divided into staff and line functions. Under the first head may be grouped those internal activities which are essential to the operation of the municipal government but which do not directly serve the public. Under the second are gathered the service activities to render which the municipal government exists.

Staff Functions.—Among the staff functions are:

(1) Assessment of property for taxation and tax collection—entrusted to an assessor or board of assessors and a tax collector frequently elected by the people, but in modern charters often subordinates of the finance director in an integrated department of finance.

(2) Accounting and budgetary control—usually the duty of the chief financial officer—comptroller, auditor, or treasurer—frequently elective. Appointment, however, by the chief executive of a finance director, with power to pre-audit all proposed expenditures as well as supervise all other financial activities, is a growing practice.

(3) Custody and disbursement of funds—the duty of the treasurer, the most frequently elected of all administrative officers.

(4) Selection, training, and management of personnel—under a civil service commission or a department of personnel headed by a director.

(5) City Planning—under the planning commission.

(6) Legal advice and representation—the duty of the city attorney or corporation counsel.

Line Functions.—The principal line functions are:

(1) Protection from crime and disorder—primarily the work of the police either as a separate department or as part of a department of safety.

(2) Protection against fire—carried on by the fire force which may be a department by itself or a division in a department of safety.

(3) Inspectional services—building, plumbing, electrical, elevator, and weights and measures inspection, frequently uncoordinated but sometimes united as a division in a department of safety.

(4) Traffic safety—the planning and engineering side of that problem may be assigned to any one of various departments.

(5) Protection against disease—the field of the department of health, sometimes grouped with welfare, and even recreation, but properly a separate service.

(6) Protection against the consequences of poverty—usually handled by a department of welfare which covers the charitable activities of the city.

(7) The provision of low-cost housing—under federal policies left to a quasi-public corporation known as a housing authority appointed as are other city officials but independent of the city government.

(8) Hospitals and other institutions—sometimes combined with health or welfare and sometimes set up as separate agency.

(9) Parks and recreation—in many cases united in a single department but often with a separate setup for active recreation.

(10) Design and construction of public buildings and works—the function of the city engineer, sometimes the head of a department of his own, but frequently merged in a department of public works.

(11) Maintenance and cleaning of streets and sewers, the collection of refuse, and the disposal of sewage and other wastes—often the job of an integrated department of public works but sometimes handled through separate departments for streets, sewers, and collection and disposal of refuse.

(12) Utility services—undertaken directly by the municipality as to three quarters of all water plants, one third of all electric generating plants (not including numerous distribution systems for which the city buys current), and a handful of gas plants and transportation systems. The last includes the subway system of New York and the street railway systems of some cities such as Detroit, Cleveland, San Francisco, and Seattle. Municipal utilities are sometimes operated through the public works department but more frequently have their own setup.

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MUNICIPAL HOME RULE. Municipal corporations, in the United States, have no implied right of home rule, no inherent privilege of enjoying untrammeled local self-government. Formerly, considerable rhetoric was expended in attempts to show there was such an inherent right of self-government in local communities, and some courts in a few of the states still assert that it exists. But, the United States Supreme

Court and most state jurisdictions have declared categorically and established that home rule for local subdivisions is not indigenous to them and that it prevails only to the extent, if at all, vouchsafed to them by the state, of which such local subdivision is an arm.

Another postulate to be kept in mind is that all municipal corporations, including, in the broad sense in which the term "municipal corporations" is often used, not merely cities, towns and villages, but counties, school, water, road and utility districts, or so-called authorities, are creatures of the state, called into existence through state enactments for carrying on in various localities the government or some part of the government of the state. Thus, being created as agencies of the state, they exist at the will of their creator. The state may, therefore, incorporate territory and annex it to other territory or dissever it therefrom, dissolve the municipal corporation, restrict its powers or cancel some of those granted, all without consent of the local inhabitants concerned, or, indeed, against their wishes. The local subdivision has no rights under the federal Constitution which enable it to protest successfully against any such action on the part of the state.

A third thesis is, municipal corporations, not enjoying a grant of home rule, have only such powers as are expressly granted and such as are necessarily implied from the powers specifically granted. In this respect, cities (in the broad sense) differ from private corporations which possess all implied powers that are reasonably incident to or convenient in connection with exercise of powers expressly conferred by the legislature. Moreover, the rule of interpretation of municipal powers, varying from that relating to private corporations, calls for strict construction, so that a fair doubt by the court of the existence of a municipal power means it does not exist.

An added obstacle for nonhome rule cities seeking to obtain permissive legislation for legitimate needs is that many state constitutions have provisions that forbid passage of special acts conferring corporate powers (e.g., Section 1, Article XIII, Ohio Constitution) and which require that all laws of a general nature shall have a uniform operation throughout the state (Section 26, Article II, id.). Such constitutional provisions have been interpreted as applying to municipal as well as to private corporations. Often, the clumsy expedient of classification to circumvent the rigidity resulting from such provisions has been attempted by the state legislative body; but when legislative classification becomes so overelaborate as obviously to be a subterfuge and to apply plainly to one or two cities only of the state, the door of this attempted escape from constitutional confinement is bolted by invalidation through court decision. The result is that much overall Procrustean legislation, purporting to fit the needs of large cities and small towns alike, has been enacted. The injustice and crippling effect of such straightjacket legislation is apparent.

As the population of this country, at first rural, became largely urban, sound development of the cities was retarded by their dependence on grants of power from state legislatures. This situation would have been bad enough in any event, but, in many states, the general assemblies have always been predominantly rural and the legislators have had a suspicion or jealousy of the cities and reluctance to grant them powers necessary for their proper functioning and development. Hence, we have had great metropolises like New York, Chicago or Philadelphia, cities, any of which may have as many inhabitants and more property than some states, appear as suppliants for grants of power from a rural general assembly possessing no idea of urban needs, aspirations or possibilities of accomplishment. At the same time, there has been insistence that cities shall assume many new functions. Some of the failure of the cities to obtain from the state legislature needed grants of power was doubtless due to the fault of the city representatives for whom the rural legislators had no respect, knowing them to be boss controlled, of inferior caliber and "city slickers." Some legislatures did grant to cities the choice, by vote of the local electors, of certain optional forms of city government, and such local option laws were upheld by the courts as constitutional against attack for asserted forbidden delegation of legislative power. But grants of home rule by statute, even to the limited extent obtained, are held by insecure tenure; since, the same almoner that confers the boon can always modify it capriciously or withdraw it in part or entirely.

Benefits of Home Rule.—Aside from the great advantage of independence which home rule confers on cities, there are other benefits which result. First, there is opportunity for self-government, initiative, experiment and civic pride and education. A city enjoying home rule may use methods of operation and election of its officers which are different from those prescribed by state law for state and county officials. Thus, the state law may call for a party column ballot with one cross mark as a sufficient vote for all offices under a party emblem convenient for the ignorant and illiterate. Under home rule, a city may utilize voting under proportional representation in elections, which requires ability to read; and this qualification may be required despite the fact that there may be in the state constitution a provision to the effect that no elector shall be deprived of the right to vote for all elected officials. A state constitution may require that all officers shall be electors when chosen. Yet, a city may adopt a council-manager charter providing that the city manager need not, when chosen, be a resident of the state. Formerly, the Ohio Supreme Court held that the constitutional provision of requiring elections by "ballot" forbade the use of voting machines. But it also held that a city, under its home rule charter, could use such machines in city elections; also, that it could enfranchise women for voting in city elections at a time when benighted constitutions limited the suffrage to males.

Second, the grant of home rule avoids much loss of time of municipal officers and much expense to the cities when seeking, at the capital, needed special legislation in the guise of general laws.

Third, the local government is set up with the approval of the persons concerned and over whom the government is to operate. They, therefore, acquiesce more readily in its functioning under methods of their own choice than if the pattern of government is imposed on them by remote control.

Fourth, the ability to divorce municipal from state and national issues is of first importance.

The separation makes for independent thinking on municipal policies and permits selection of local officials on the basis of merit rather than by the irrelevant test of national party affiliation.

Likewise, it is a relief for the legislature, too, and a saving of its time to be rid of the burden and sometimes corrupting influence of demands of municipal lobbies for special legislation.

State Grants to Cities and Counties.—Despite all these advantages, the movement to obtain constitutional grant of home rule was slow in getting under way and its spread has not been rapid and general. Missouri in 1875 was the pioneer, then came California (1879), Washington (1889), Minnesota (1896), Colorado (1902), Oregon (1906), Oklahoma and Michigan (1908), Ohio, Arizona, Texas and Nebraska (1912), New York (1923), Wisconsin (1925). In Pennsylvania (1922) cities were given the right and power to adopt charters, but the provision was too weak to be of substantial benefit. Maryland, Wisconsin, Nevada and West Virginia also have some degree of home rule for cities. Ohio (1932), Virginia and a very few other states have constitutional provisions also for obtaining home rule for counties. But by interpretation of the Ohio Supreme Court, the Ohio provision has been so restricted as to be of little practical utility.

Various patterns of constitutional home rule have been adopted. The phrasing may be something like this:

"Each city is granted full power to pass laws and ordinances relating to its local affairs, property and government; and no enumeration of powers in the constitution shall be deemed to limit or restrict the general grant of authority conferred; but such grant of authority shall not be deemed to limit or restrict the power of the legislature to enact laws of state-wide concern uniformly applicable to every city."

Another usual form is contained in Article XVIII of the Ohio Constitution, part of which is as follows:

"Sec. 3. Municipalities shall have authority to exercise all powers of local self-government and to adopt and enforce within their limits such local police, sanitary and other similar regulations as are not in conflict with general laws."

"Sec. 7. Any municipality may frame and adopt or amend a charter for its government and may, subject to the provisions of section 3 of this article, exercise thereunder all powers of local self-government."

Or the terminology may be that: "Cities may pass ordinances relating to matters of local or municipal concern or relating to municipal or local affairs."

Such expressions are not crystal clear. They require court hermeneutics and, therefore, it eventuates that the measure of home rule the local community enjoys, even in states where it by-passes the legislature and springs directly from the constitution, is what the courts say it shall be; so that the extent of home rule, where it has been accorded by the constitution is not so much a legislative as a judicial question, particularly as in many states the constitutional grant of home rule is self-executing, coming from the people to the people directly through the medium of their constitution and not requiring legislation to put it into effect. Where the constitutional provision is thus self-executing, such direct grant of home rule is a great advantage. This becomes evident when comparison is made with constitutional grants requiring or permitting the legislature to put them into effect, such as, for example, the merit system provision in the Ohio Constitution, Sec. 10, Article XV, which includes: "Laws shall be passed providing for the enforcement of this provision." Some of the laws that have been passed and sanctioned by the Supreme Court have not furthered but have severely crippled enforcement of the merit system in that state.

Total absolute home rule is nonexistent even in constitutional home rule states. Matters of state-wide concern are still reserved for state, not local control. When Cincinnati undertook to place all of its municipal court attachés under the merit system and to fix their salaries in conformity with compensation of similar employees in the city service, and Akron tried to do something of the same sort and to place its legal officers also under the merit system in its home rule charter, their efforts were thwarted by court decisions invoking supposedly conflicting state statutes. No completely satisfactory test has been established for determination whether the action in question comes under state or local legislative jurisdiction. But police measures and such subjects as criminal punishment, regulations affecting the courts, taxes and revenues, education, sanitation and health, utilities, boundary limits and others thought to be of state-wide importance are usually decided to be within the jurisdiction of the state legislative body for action by it. Ohio's constitutional Home Rule Magna Charta, Article XVIII, contains the following restrictive provision:

"Sec. 13. Laws may be passed to limit the power of municipalities to levy taxes and incur debts for local purposes, and may require reports from municipalities as to their financial condition and transactions, in such form as may be provided by law, and may provide for the examination of the vouchers, books, and accounts of all municipal authorities, or of public undertakings conducted by such authorities."

But, in certain fields, cities do have absolute home rule and in such areas may adopt municipal regulations inconsistent with and superseding state laws. A general provision in a number of home rule city charters is that state laws, present or future, shall have the effect of ordinances only and shall be considered repealed by conflicting ordinances. Even in matters of state concern, the cities may legislate if and so long as the state has not preempted the field by legislation. But, if the state legislates on matters of state concern (police, sanitary and other similar regulations, *supra*) where the state is supreme, its enactments will govern and nullify city ordinances or regulations in conflict therewith. In a famous New York case, the subject of a multiple dwelling law for New York City relating to tenements was said to be a matter of state concern, as relating to health.

The state statute does not invalidate a municipal enactment relating to the same matter, however, unless there is a conflict between the city ordinances and the state law. Thus, a mere difference in penalty between ordinance and statute defining an offense is said not to be such conflict as invalidates the ordinance. But, if a municipal enactment seeks to make lawful that which is unlawful by state law or aims to make unlawful what is declared by state law to be lawful, the resulting conflict is fatal to the city's pronouncement. Thus, for example, when a state fixes a permissible rate of speed for motor ve-

hicles, a city may not prescribe that a lower rate of speed, within its limits, is illegal; or, if the state prescribes that liquor may be sold at all hours, a city may not provide that sale within its boundaries after, say, midnight, shall be punishable.

From the above, it will be apparent that a city possessing home rule powers operates at a great advantage over cities which do not enjoy home rule. In the latter, the municipality has no powers beyond such as are granted by the state legislature or necessarily implied. In the former, the city is supreme in certain fields; and, even in others where the state retains jurisdiction, it is still supreme as long as there is no conflict to a material degree with state enactments. There is no conflict where the state has not acted in a field reserved to it, and there is no fatal conflict in all instances between state and municipal enactments on the same subject. If the cities of this country (in the broad sense including counties, etc.), are to perform well the vital function of local self-government essential to the democratic process, they must have omnipresent and more home rule.

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MUNICIPAL HOUSING. See TENEMENT HOUSE.

MUNICIPAL LAW. In England and America municipal law means the national law or the law of the land, both public and private, in contradistinction to external or international law. The municipal law of America is derived from that of England, which has had a continual development extending over 13 centuries. Largely influenced at times by Roman law, both civil and canon, it has retained somewhat the character of the Teutonic system in which it had its origin. By English colonists it reached all quarters of the earth and in the modern world it is the great rival of Roman law. For the first five centuries after Christ Britain was ruled by Roman imperial law after which it was banished by the invading hordes from the coast of the North Sea. With these came their tribal customs, which we find formulated in the "dooms" promulgated by the English kings from the 7th to the 11th century and by the Danish ruler of England, Canute. These laws, more properly "folk-laws," are largely made up of provisions for punishing breaches of the peace and setting fines as penalties for private wrongs. In the 8th and 9th centuries many of the Roman Church laws were introduced, especially the laws of marriage, deeds and wills, but even these were largely modified to conform to local usages and custom.

With William the Conqueror the law of the Franks, also Teutonic in origin, but highly developed in Normandy, was introduced to Saxon England. The two systems were now in practice—the Anglo-Saxon for the English and the Norman for the conquerors—while special enactments after the Norman spirit governed the interrelations of the two races. The two systems were gradually merged with the Norman law taking precedence because of its technical superiority. Down to the days of the Tudors the language of the laws was Norman-French. The common law was developed partly by legislation (royal charters, provisions, assizes, statutes), but mainly by judicial decisions. Ecclesiastical law still exerted considerable influence, having received independent jurisdiction from the conqueror. This jurisdiction churchmen sought to extend, but were checked by several statutes. In family law, however, they remained supreme as also in the administration of estates, and from the canon law are mainly derived these branches of modern English law. Judicial law-making sprang up toward the close of the Middle Ages, some judges boldly overriding the common law by virtue of the powers they believed as inherent in the crown. Since the 18th century, both in England and America, the courts have practically confined themselves to administering the law as established by previous decisions. On the continent of Europe the term municipal law has been often employed to designate a local law, as of a city or province, in contrast to the national body of law; at present the term usually designates a city law in contrast to the national law. In the United States within recent decades a great body of legislation concerning cities has grown up, and the term municipal law has come to be the usual designation of such legislation. See EQUITY; COMMON LAW; CANON LAW; MUNICIPALITY; CITIES, GOVERNMENT OF.

MUNICIPAL OWNERSHIP. In its broad sense municipal ownership includes all properties owned by a municipality: land, streets, parks, buildings, other structures and equipment used for public purposes. However, as used here in the narrow sense, it will pertain to utility properties which are operated to furnish essential or important services to all or most of the people in the community, and which for that purpose require special use of the streets and other public places.

While utilities are commonly organized in the United States as private enterprises, they are recognized as performing public functions, and as such are often provided by a municipality or other political subdivision. This applies principally to water supply, electricity, gas, and urban mass transportation; but it extends also to sewage systems, waste disposal, drainage and other services found necessary or advantageous in modern community life. Other recognized utilities, such as railroads, telephones and telegraph, have seldom, or not at all, come within the range of municipal organization, due to their intercommunity and interstate ramification of properties and interconnection of service.

The term municipal ownership usually includes operation. However, utility plants may be municipally financed and owned, but leased to private concerns for operation, as has been common in the construction of rapid transit facilities. Conversely, a city could lease plant for operation from a private company, but such instances are practically nonexistent. Ownership and oper-

ation prevalently go together. Even in the case of a lease to a private company, the arrangement is likely to be superseded later by municipal operation, as with the New York City subways.

This article is concerned primarily with municipal ownership of the principal utilities in the United States, but it will present also a general summary of municipal ownership in other American nations and Europe. After surveying the relative extent of municipal and private ownership in the United States, the apparent factors and trends in the prospective developments will be considered. While dealing chiefly with cities and villages, such related areas of public ownership as specially organized utility districts and cooperatives, also state and federal supply systems, will be touched upon.

Water Supply.—There are no definite official figures on the extent of municipal ownership. Based upon a survey published in the 28 September 1939 number of the *Engineering News Record,* Mr. Harry E. Jordan, Executive Secretary of the American Water Works Association, estimates that the total United States waterworks installations at the close of 1944 amounted approximately to 12,800, of which about 3,450, or 27 per cent, are privately owned. A tabulation predicated upon data published by the *1943 Municipal Index* (p. 151), shows 1,051 waterworks systems in United States cities of 10,000 population and over, of which 263, or 25 per cent, were private.

As to relative numbers, the country's water systems may be placed roughly 25 per cent private and 75 per cent public. However, as to population served or quantities of water supplied, the private systems appear to furnish between 10 and 15 per cent of the aggregate, while public systems supply between 85 and 90 per cent. The difference is due to the fact that the large cities preponderantly have their own systems. Among the greater cities only Indianapolis, Ind., Birmingham, Ala., New Haven, Conn., Bridgeport, Conn., Scranton, Pa., Chattanooga, Tenn., Wichita, Kans., and Peoria, Ill., are reported as having private systems; no really large city is in the list. Furthermore, some central metropolitan cities deliver water wholesale to private distributors in nearby communities. In a few important instances regional supply is furnished publicly, while a considerable part of the distribution is private. In the case of Wichita, Kans., the city owns the supply and transmission properties, but distribution is private. Considering the situation as a whole, one may justifiably place the public supply at about 90 per cent of the total.

Electric Systems.—According to the Federal Power Commission, as of 1 January 1943, among communities of 2,500 population and over, there were 3,754 receiving residential electric service, of which 2,932 were served by private systems and 822 public, or 22 per cent public. The extent of the public systems varies inversely with the size of the communities; of all communities of 250 population and over, about 3,275 are served publicly. But, among cities of 50,000 population and over, only 22 are publicly served, while only two (Los Angeles and Seattle), among cities of 500,000 and over, have public systems.

While the figures are definite for the number of municipalities served publicly, the amounts of electricity delivered to consumers through public distribution have not been officially stated. However, the volume of public generation was reported for 1942 by the Federal Power Commission at 29,632 billion kilowatt hours, compared with total 189.2 billion, or 15.7 per cent public. While some of the publicly produced energy was delivered to private distributors, the public distributors also purchased to considerable extent from private sources. Roughly 15 per cent of total distribution appears to be public, and 85 per cent private.

Gas Properties.—Again, there are no official figures, but Brown's *Directory of American Gas Companies and Index of Prominent Manufacturers,* 1943–1944 edition, lists a total of 130 municipal gas systems. Of this number, 73 furnish natural gas, 37 manufactured, 15 butane, and 5 not definitely classified. As with electricity, the bulk of the gas industry is private, probably 90 per cent, and only 10 per cent public. Differing from electricity, relatively a greater proportion of large cities have their own systems. There are four among cities of 300,000 to 400,000 population, three between 200,000 and 300,000, two between 100,000 and 200,000, and three between 50,000 and 100,000. The largest four cities are respectively, Indianapolis, Ind., Houston, Texas, San Antonio, Texas, and Memphis, Tenn.

The distinction between supplying natural and manufactured gas is significant. Of the systems in the nine cities of 100,000 population and over, five supply natural gas and four manufactured. Expansion in the industry has centered in the natural gas. This has been due to relatively low price and economical utilization for industrial purposes and residential heating. In contrast, manufactured gas has remained comparatively much more costly, and has come extensively in competition with electricity, especially for domestic uses. It has been distinctly a static or regressive business, and this fact has checked the advancement of municipal ownership. Natural gas has not only furnished an expanding demand, but its mode of supply fits well the conditions of public organization. It is provided chiefly by large interstate transmission companies which usually sell wholesale to local distributing units. A city can thus purchase wholesale and limit itself to distribution.

Mass Transportation.—Nor are there official figures for urban mass transportation. According to the *Municipal Year Book,* published by the International City Managers' Association, there were 34 municipally owned systems at the beginning of 1944. This number includes subway and elevated lines, street railways, trolley coach and gas bus systems. Within the total there are four rapid transit, seven street railways, three trolley coach and thirty gas bus properties, but in most instances the street railways and trolley buses are operated along with the gas bus systems. Three of the rapid transit properties were leased to private operators; only in New York were the rapid transit lines also publicly operated along with street railways and both kinds of buses.

This summary shows that urban mass transportation is provided predominantly under private ownership. However, the public systems appear relatively more in the metropolitan cities as compared with electricity and gas. Thus New York is served almost altogether by the city system. The same is true of Detroit, Cleve-

land, San Francisco and Seattle. Besides, Chicago, Philadelphia, Boston, Newark, N.J., and Rochester, N.Y., own the subway systems, but have leased them for private operation. As a rough estimate, the municipal systems probably serve about 10 per cent of the total urban mass transportation passengers.

Division of Utilities Between Public and Private Ownership.—The above survey shows that water supply is furnished principally through municipal ownership, while electricity, gas and transportation are provided chiefly through private agencies. The difference is due to the character of the industries and the circumstances of their development. First, an adequate and safe water supply is an absolute essential for individual and community life, which has not been true of the other main utilities. Second, water was obtained originally from wells or other individual sources, and the need or advantage of a joint community supply appeared only gradually. The early developments of community water supply systems seldom offered alluring opportunities for profits, and consequently were generally undertaken publicly. When once thus established, they usually continued, and they tended to fix the pattern for all municipal areas. Where private systems were established, there has been considerable public displacement as more extensive and distant regional sources of supply, beyond the reach of the private companies, had to be obtained through special legislation and cooperation with neighboring communities. In important instances, the water supply systems and transmission mains have been provided publicly, while the distribution facilities remained private.

The character and, therefore, the history of the other utilities has differed materially. First, no particular means of furnishing light, heat and power, or transportation, had been an absolute essential to individual and community life. Consequently, each utility emerged as a new kind of service to compete with previously existing ones; while it furnished greater convenience and attractiveness, it had to win its way competitively, and was therefore developed extensively as a private industry. It became recognized effectively as a utility, really important to the community life, only after private organization was firmly established, especially in the larger cities.

Trends Toward Publicly Owned Electric Power.—In the case of electricity, private profitableness became rapidly apparent in the large cities, but not in the smaller ones; it was often provided municipally where private capital would not venture. Subsequently, however, the original public plants were absorbed by the private systems as these, during the 1920's, spread their transmission networks over large, contiguous areas. Usually the small cities were able to sell their properties at attractive prices, and the companies included them profitably in their expanding operations at the prevailing rates or at rates authorized under none too strict state regulation. This movement, however, has come practically to a stop, and in some states has been reversed, as in the Tennessee Valley area, the Pacific Northwest, and in states where public districts have become established. There have been increasing challenges to the efficacy of the private systems, due mainly to the following conditions.

Character of the business.—The furnishing of electricity in a community constitutes a natural monopoly and practically precludes the existence of competitive systems in the same service territory, because of physical and financial factors. As a physical matter, the use of the streets is required for the distribution lines, and more than one system is impracticable. On the financial side, the fixed plant and operating costs are so great that profitable operation is usually impossible if the total business is divided between two or more operators. Maximum economy and minimum rates are available only through monopoly organization. While there are well-known instances of two systems in the same city, one public and the other private, such duplication is generally wasteful and obstructive in the streets. But, the creation of such a monopoly naturally raises the question whether it can wisely be allowed to continue as a private concern.

Conflicts of interest.—A private system is normally managed to produce maximum profits for the controlling group, rather than to obtain minimum costs and rates for consumers. This inherent force affects not only the rates but extends to all the important phases of organization and operation. During the 1920's it led to the perpetration of the far-flung holding company systems, with their notorious over-capitalization, inefficient territorial grouping, extravagant overheads, and absentee control. Such disharmony between public and private interests can be most readily removed through establishment of public ownership.

Failure of regulation.—Because of their monopoly position, the private systems have been placed under state regulation in most of the states. However, because of nonadministrable standards and procedures imposed by past judicial action, rate regulation and other control have not been as effective as had been expected, or as needed for protection and advancement of the public interest. For the future, under recent Supreme Court decisions, the state regulatory systems can be reconstructed so that rate making and other aspects of regulation can be systematically administered according to the accounts and records kept under continuous commission control. The extent of such transformation may influence materially the extension of public ownership.

Antipublic activities.—Under past conditions of regulation and conflicts of interest, the private systems injected themselves extensively into the political alignments for the purpose of getting favors in matters of public policy and action, also in the appointment or election of regulatory officials and others. They also penetrated the various quasi-public organizations and spent large sums in advertising and other publicity campaigns to promote favorable attitudes on the part of the publications and the public at large. In some notorious instances they indulged in bribery to influence political action. There is widespread public resentment against such political maneuvers.

Federal taxes.—The private systems, like ordinary business corporations, are subject to federal taxes. These were increased greatly during the Second World War, and they will probably remain high for an indefinite period after the war. In contrast, federal taxes do not apply to the publicly owned systems. Inasmuch as the payments made by the private companies

enter into the rates imposed upon the consumers, they create substantial differentials against the communities served privately and in favor of those served publicly. There is thus basic discrimination against privately served localities, which can be removed through public acquisition of the private systems.

Holding Company Act of 1935.—This federal statute requires break-up and adjustment of the holding company systems so as to leave for each remaining or reconstituted system of integrated properties a simplified corporate and capital structure. Administration rests with the Securities and Exchange Commission (q.v.). While the changes do not directly promote or favor public ownership, the disposition of the properties in any locality naturally raises the question of desirable municipal acquisition as against transfer to different private control. In a considerable number of instances municipalization has followed, and it is known to be considered by several other cities.

Competitive industrial advancement.—Electric power at low rates has become increasingly a basic factor in community industrial expansion. Localities with low rates attract industries; high rates retard industrial growth. Consideration of how adequate power can be obtained most economically at the lowest possible rates is causing many city officials and industrial leaders to study the relative advantages and disadvantages of public and private organization, and to formulate effective postwar programs accordingly. The fact is that on the average for like sized cities, the municipal system rates are substantially lower than the private.

Obstacles to Municipal Ownership.—Against the combined force of the conditions that appear to favor the extension of municipal ownership, there are important obstacles, which will be briefly summarized.

Lack of legal powers.—Municipalities can do only what they are authorized to do by the state laws. In most states they are variously restricted in establishing their own electric plants. First, they may not be permitted at all to establish their own systems, or they may be limited in the acquisition of the existing private properties, or in the mode of acquisition. Second, they may not have adequate financial resources. Usually, because of constitutional debt limits, they cannot finance the plant acquisition through general credit bonds, and they may not be authorized to issue revenue bonds. A city may thus have the general right to establish its own system, but it is stopped by the restrictions on financing. Extensive revision of the state laws is essential to permit reasonable municipalization on the basis of expected community advantages.

Inertia and lack of responsibility.—Municipal officials are usually kept more than adequately busy with the positive duties imposed by state and local laws. Naturally they are reluctant to promote new undertakings not critically pressing; usually they do not have the special understanding of what is involved in municipal ownership, and their tenure in office discourages the starting of long-range policies and programs. Furthermore, with the prevalence of state regulation, they are particularly prone to pass responsibility for reasonable rates and service to the commissions.

Bias for private business.—American middle-class groups are traditionally and emotionally in favor of private enterprise and against government in business. The business and professional leaders, the newspapers and other publicity agencies, all have strong predilections toward private enterprise. This attitude naturally affects the position of public officials on the issue of displacing private with municipal ownership. Unless conditions become flagrant, and public pressure urgent, they are likely to favor the continuance of the private systems, assuming their greater efficiency and general superiority, without real inquiry as to advantages for the communities.

Entrenched private position.—The companies have franchises, properties and capital structures which are supported by state and local laws. Furthermore, as before stated, they have political and various connections which keep to the forefront their influence in the communities. They are constantly alert to protect and advance their position against encroachment either by more stringent regulation or by public ownership.

Public impotence.—In contrast to the constant zeal of the private systems to maintain and advance their position, there is no organization or group that presents correspondingly the cause of public ownership. Local movements are usually sponsored by public-minded individuals who have little or nothing to gain personally, and have inadequate resources to finance effective campaigns. Municipalization has been defeated repeatedly at elections, not on its community merits, but for lack of organization and financial support, compared with the private opposition that profited from the continuance of *status quo.*

On the whole, the balance of favorable and opposing forces has produced substantial advancement of public ownership. This is best illustrated by the extent of electricity generated through publicly and privately owned plants. According to the Federal Power Commission, the total electric generation amounted to 94.7 billion kilowatt hours in 1930, of which 5.0 billion were produced publicly, or 5.3 per cent. In 1942 total generation was 189.2 billion kilowatt hours, of which 29.6 billion were public, or 15.7 per cent. While this increase includes all public generation, it is indicative also of the advance in municipal generation, and especially distribution. The prospect appears to be for corresponding or more rapid rates of increases in the future.

The factors for and against the extension of public ownership in electricity apply more or less equally to gas and transportation. For gas generally, there is less community importance in the issue. For transportation, there is an additional factor that in many instances favors municipal ownership.

For over twenty-five years motor transportation has come gradually into increasing competition with the existing electric street railway systems. Before the Second World War electric railways had been abandoned altogether in many cities, and in practically all there had been substantial displacements by buses. While this development was halted by the war restrictions upon bus manufacture, after the war street railways seem likely to be replaced rapidly by bus operation, of which the basic advantages as to costs and convenience appear decisive.

However, in many cities the old street railway investment remains largely unamortized or un-

depreciated on the books of the company, and the corresponding securities remain outstanding against the dead plant. This condition naturally obstructs conversion to buses; the managements strive to continue the securities and to require the riders to support both the new bus and the abandoned street railway properties. This double burden is most readily avoided through municipal establishment of bus operation.

Coordinated Public Ownership.—In the postwar utility planning, consideration of municipal ownership by the larger cities will usually transcend the city boundaries and include the adjoining communities which, with the central cities, constitute unified industrial areas. Ordinary municipal powers usually stop at the city limits, but the real economic borders enclose the entire metropolitan region. The basic community services must practically correspond with the larger territorial grouping. District utility organization has become essential in the metropolitan sections.

In the case of water supply, the central cities commonly furnish water wholesale or retail to adjacent communities. In most instances the supply must be developed in common for the entire region, and the sources are often located beyond the metropolitan territory. Under such circumstances, outright district organization has been supplied in a considerable number of instances, in the form of a special municipal corporation for the particular function. The district may develop in common the water resources and transmit the supplies to the individual communities owning their own distribution systems, or it may own and operate all the facilities, including distribution. It may provide also the related utilities of sewage, refuse disposal and drainage, also other district services.

Such metropolitan organization is an enlarged municipal utility to correspond with the industrial area. This development has appeared chiefly with water supply and related utilities, because mostly these services had been furnished municipally. As to electricity, gas and transportation, like district needs have been met by the private systems, which generally are organized on a regional rather than municipal basis. Where these utilities have been municipalized, the central city usually furnishes service to the adjacent communities. For the future, in large population centers the district may supersede extensively the distinct municipal ownership which has prevailed in the past.

In line with such district developments, future municipal ownership, particularly of electricity, will also involve integration with other levels of public organization. For example. the Tennessee Valley Authority (q.v.), a federal agency, owns and operates the generating and transmission properties and furnishes bulk electricity for distribution to many municipalities and cooperatives. A like system is under development in the Pacific Northwest in connection with the Bonneville and Grand Coulee hydroelectric projects.

For the future, to make electricity available at minimum cost to all sections of the country, a comprehensive three-level system of public ownership appears desirable,—federal, state and local. The federal would include the hydro plants, large supplementary steam stations strategically located, and main transmission lines connecting all parts of the country and delivering main load power to the states. The latter would own and operate supplementary generating stations and the secondary transmission lines, and furnish wholesale power for distribution by municipalities, special districts and cooperatives. Municipal or district ownership would thus be an integral part of a general system of public organization.

In Other Countries.—Municipal ownership outside of the United States can be referred to only in a limited way. In Canada the situation is largely the same as in the United States. Of special interest has been the Hydro-Electric Commission of Ontario, which is a special public corporation of the Province, producing and transmitting power for distribution by the municipalities. It delivers electricity wholesale at cost, while the cities in turn distribute at cost, and the rates to consumers have been famously low. In Mexico and in the Central and South American countries, public ownership has not been prominent.

In Europe, municipal ownership, together with other types of public organization, has been much more extensive than in the United States. The difference may be accounted for mainly by two historical circumstances. First, government in Europe has developed largely under the "sovereign" concept, without theoretical restrictions on what could be done; the cities have undertaken varieties of enterprises that are foreign to our traditions of proper municipal functions. Second, the cities have had much longer periods of struggle with the needs and pressures of community life. Apart from theories, they learned from protracted experience that the utility industries are best provided through municipal organization.

In contrast, large cities emerged in the United States comparatively in a short span of years, under the force of private industrial expansion, to which the utility services were incidental. Particularly in electricity and transportation, it was only after the cities were reaching maturity that we began to feel seriously the consequences of entrusting public functions to private organization under monopoly conditions. While our prevalent sentiment strongly favors private business forms, we are also realistic and, under practical pressures and conflicts, we shall doubtless make such utility adjustments as will appear warranted upon consideration of the relative advantages of private and public organization.

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MUNICIPAL REFORM ACTS, English. The body of laws passed by the English Parliament since 1833 dealing with municipal franchises, suffrage charters, etc. In the 14th and 15th centuries the municipal suffrage fell gradually more and more into the hands of restricted bodies of men. Notorious abuses crept into the system and the Parliamentary Reform Act of 1832 left the municipalities well nigh untouched as regarded charters, suffrage, etc. In 1833 a royal commission made an extended report on existing abuses, showing that most municipalities were ruled by venal cliques, funds were wasted or worse, public service was negligible, municipal courts were corrupt, etc. New legislation based on the commission's report was enacted in 1835 known as the Municipal Corporation Act, under which 178 boroughs were reformed and about 125 others created. The more flagrant abuses were corrected and means were provided by which other abuses might be eliminated. The franchise was extended to all property owners and occupiers of property of £10 ($50) valuation or over and a uniform system of administration was provided under which an elected council of a size proportionate to the population of the borough was made into a bicameral body, the upper chamber to be composed of aldermen elected by the council. The mayor was to be chosen from among the councilors or aldermen by vote of both these bodies. In great part these features still constitute the municipal constitution of England, although various modifications have been made by subsequent act of Parliament. The Consolidated Municipal Code was passed in 1882 and six years later cities and towns with 50,000 or over population were constituted distinct counties, with municipal councils discharging the functions ordinarily exercised by county councils.

MUNICIPALITIES. Municipalities are as old as civilization itself. The story of the nations of antiquity that flourished in the valleys of the Nile, Tigris and Euphrates is in large part the narrative of what went on in the imposing cities of Thebes, Memphis, Babylon and Nineveh. History gives us little accurate knowledge of these populous centers of the ancient world and the student of municipal government gains little from a scrutiny of the autocratic systems by which they were ruled.

Greece.—Real city life may be said to have been born in Greece. Largely due to geographical and topographical conditions which made community isolation inevitable, ancient Greece never became a unified nation. It was merely a geographical term applied to a group of independent, usually self-governing cities with the areas of land adjacent to them. The Greek city-state was the sole unit of government. The city was the state and the state was the city. A man was a foreigner in any city but his own. There were no distinctions between the duties and functions which in modern times we call national or state and those which were municipal. It is therefore perfectly proper that we should derive our words "politics," "political," and the similar terms by which we describe our public policies, institutions and concerns from *polis,* the Greek word for city. The Greek cities differed widely in government. In Sparta the governing power remained consistently autocratic or oligarchical, while in other Greek cities, notably Athens, the form of government fluctuated between autocracy and democracy.

Rome.—Early Italian history, like that of Greece, is the record of the development and struggles of a large number of city-states. The history of Rome as a nation is the history of the conquest or establishment of numerous cities bound together into one gigantic, unified system by the dominating power of Rome. As in Greece, city life and national life tended to merge. The government of the city of Rome itself, beginning with monarchy, progressed through various stages of democracy and representative government which were never completely lost even under the autocratic forms of the empire. There was little in the government of the cities outside of Rome, however, which could be called truly popular, and such democratic features as existed in the earlier period tended to diminish or disappear as the empire became more centralized. The political and civil rights conferred by Rome upon these tributary cities were usually made the basis for the imposition of heavy taxation. It is from the word *municipium* applied by the Romans to these dependent and partially self-governing cities that we derive our word municipality. In complexity of organization and in diversity of functions it may be safely said that municipal government and life at Rome at the height of its development rivaled that of the modern metropolis.

Medieval Cities.—During the Dark Ages municipalities seem to drop out of sight for the time being. The remnant of their powers and functions which was not lost in the general chaos was taken over largely by the church. The development of the feudal system in Europe, beginning with the 10th century, was destined to exert an important influence upon the life and position of municipalities. Its immediate result was a diminution of their already weakened power. The feudal lord who lived upon his

estate in the country held the cities within his domain as vassals, exercising over them the same feudal prerogatives as over the individuals on his land. In spite of feudal oppression the medieval cities prospered as centers of trade and commerce. With prosperity came wealth and with wealth came the power to bargain or to fight with the feudal barons. Many of the larger cities of Italy, such as Florence, Venice, and Pisa, were able to purchase something like independence, while the cities of northern Europe more frequently freed themselves by the sword. This was true of the powerful free cities of northern Germany, which during the 11th and 12th centuries cemented their commercial interests in the formation of the Hanseatic League. When the struggle for municipal rights was won either by barter or in battle, the cities secured the fruits thereof in a written treaty of peace or bill of rights called a charter. These charters, limited as they frequently were in the scope of the municipal freedom they guaranteed, may be said to have laid the foundations for modern constitutional government.

England.—English municipalities were subjected to the same feudal oppression which the more prosperous towns on the Continent suffered. They were not at first incorporated and had few political or civil rights and little if any self-government. They were small in area and population. London which was the metropolis then as now, had about 40,000 inhabitants at the beginning of the 15th century. As feudalism lost its grip these towns or boroughs became incorporated, and gained in power and independence usually because the extension of privileges made easier the collection of taxes by the feudal lord. It was for this mercenary reason that Edward I gave the English boroughs representation in the historic national parliament called in 1295. The political power which the cities thus acquired was of great potential value to the crown in the struggle it was then waging with the nobles. The establishment of the rule that no corporation was lawful without royal sanction gave the crown the chance it desired to dominate municipal affairs and control the selection of the borough representatives in Parliament. Finding that popular elections afforded an uncertain basis of control, the crown finally built up a sufficiently subservient municipal organization by creating a mayor and council selected in the first instance by the king and endowed with the power of self-perpetuation. It was not until the passage of the Municipal Corporations Reform Act of 1835, made necessary by the inefficiency and corruption in municipal life, that English city government ceased to be oligarchical and took on the general form it now bears — that of a representative governing body holding office for short terms and elected by popular vote.

United States.—American municipal history dates back to the chartered municipal corporations established in the English colonies in the 17th and 18th centuries. The oldest of these charters seems to have been the one given to New York in 1686. The charters were granted by the provincial governors and in the main the government consisted of a popularly elected board of councilmen and aldermen and a mayor appointed by the governor. Although not originally subject to the control of the colonial legislatures, these municipalities finally became so and found themselves under the necessity of applying to the legislatures for additional grants of power, especially in the matter of taxation. After the American Revolution the state legislatures assumed that position of complete supremacy over American cities which they have ever since held.

Relation Between the City and the Central Government — England.—While cities are the organs for local self-government their functions do not end there, and the modern municipality finds itself bound to the state or nation within which it lies by a complex web of political, legal and governmental ties. The place of the city in the English administrative system may be sketched as follows: The city is a corporation created by Parliament. The municipality which desires a charter petitions for it and its petition is granted or rejected in accordance with a procedure which assures a fair consideration of the merits of the case. Needed amendments to the charter must be secured in the same way. The charters thus granted are similar in general outline but vary widely in the details of municipal organization and power. Powers are usually conferred upon English cities which are broad in scope and which create a system of local legislative autonomy. While Parliament remains the ultimate source of all English municipal authority, there has never been a disposition on its part wantonly to interfere in the affairs of single cities after the fashion of American legislatures. This is due partly to the control over and responsibility for legislation in Parliament which is centered in the Cabinet, making "log-rolling" and "pork-barrel" legislation impossible; it is also due to the essential nature of English municipal organization, politics and traditions which have prevented the English city from becoming the prey of partisan exploitation. Not only does the English national government exercise legislative power over the English city in the manner described, but it also exerts an administrative supervision over it. The most important agency for this central administrative control is the local government board. In a wide range of matters connected with municipal debts, municipal ownership, poor relief, and health, it is necessary for the city to secure the approval of this board for its projects. Administrative supervision of English cities is not centralized in one department however, but the board of education, the board of agriculture, the board of trade and the home office have varying degrees of authority over the municipal activities falling within their respective jurisdictions. The result of this central administrative control has been wholesome. There has been no serious infringement of municipal autonomy but a valuable check on municipal extravagance and inefficiency. The administrative agencies mentioned have been given wide powers and have been able to settle many of the questions of municipal administration and power which in the United States have been fertile sources of ill-advised interference by the legislature in municipal affairs. In short, the English system may be said to be one of legislative decentralization, in view of the whole legislative power given to English cities, and administrative centralization. (R.E.C.)

United States.—Much of interest has occurred in this country during the 20-year span, 1926–1946 in the municipal domain. In general, the technique of government has improved. But

the ideology of the national party system which regards the cities as appanages of the national parties persists and makes extremely difficult and evanescent putting improved methods into effect, or making possible a real merit system and life careers in local affairs for those most qualified to participate actively in them. The commission form of government, the precursor, at the beginning of the century, of the city manager form, is being found unworkable because of conflicts of jurisdiction among the commissioners and is being generally discarded. The city manager form (now preferably referred to as council-manager form, because giving recognition to the importance of the council in the plan) is supplanting the earlier form and spreading until it is utilized by more than 725 cities and towns, large and small. In the period 1941–1946, New England accounted for almost half the increase.

Some municipalities have conducted interesting experiments in efforts to solve their multiple problems. Thus, a few have tried to exert the power of excess condemnation; that is, appropriate more property than that absolutely required for the immediate project. The idea is for the city to acquire some of the enhanced value of property in the vicinity resulting from the improvement, to sell off some or all of such property as an assembled tract, and to control the neighborhood so as to make it harmonize with the principal object of the improvement. This method has been used successfully for years abroad; as, for example, the Kingsway in London. But in this country the effort has met with so much opposition, sometimes successful on constitutional grounds, that very little has been done with it.

The same may be said of setback procedure, whereby a city anticipating, with reasonable certainty, it will have to widen a thoroughfare at some time in the future, but not ready or able presently to do so, establishes a setback line beyond which owners are prohibited for a period of years from erecting substantial, permanent-type buildings. From the city's point of view, there is great economy in setback procedure, since, when condemnation is undertaken, large and costly buildings, or parts of them, need not be appropriated. For the landowner, however, such a caveat may amount to a severe interference with the use of his property. His opposition, therefore, is apt to be vigorous and has so often been effective that, in many instances, the experiment has been thwarted.

With limited access highways or freeways, the cities have had more success. These are similar to the strada or express highways common abroad. In order to avoid obstructions by traffic from intersecting highways and from the ordinary use of the street by abutters, there are no intersections at grade. The abutter has his right of access taken away and is required to reach the circulatory system of highways by other means

Cities are coming to realize slowly that beauty is not a matter of whim and luxury, but has a certain practical value. One of the most interesting developments in municipal law is the groping toward a formula that will permit legal protection from ugliness. In some places, prohibition of overhanging signs and severe restriction on size and character of billboards, or even prohibition of them, and likewise requirements that buildings in historic centers, such as the Vieux Carré in New Orleans, shall conform to the spirit of such centers, have been sustained.

These are examples merely of experiments that cities are obliged to make. Concomitantly, the conception of what is a public purpose has been liberalized in the courts. No public funds may be expended except for a public purpose. Formerly, public housing was often said by the courts (for example, in Massachusetts and Ohio) not to be a public purpose, because available only to certain groups. In the 1936–1946 decade, however, such housing was sustained, even in Massachusetts, to provide temporary low-cost housing in view of the housing shortage for returned veterans.

Many new functions have been imposed upon municipalities and they have had to meet rising costs, while, at the same time, their revenues and population have remained stationary or have been, in many instances, materially reduced. During the depression years, the strain of extraordinary relief problems accompanied by reduced income was particularly severe and often menaced their existence. The condition was aggravated by arbitrary tax limitations imposed by constitutions or statutes of the state, or through unfair and inadequate allocation of state collected funds, such as from automobile, gasoline, intangible, income or sales taxes. The movements to the outlying country and the tendency to create business cells in various sections of the city, displacing a single previously prevailing important business center, resulted in blighted areas, necessity of increased services and greatly diminished values of important tax revenue producing districts.

Among new functions imposed on the cities may be mentioned: establishing and maintaining airports, regulation of them and of the surrounding territory; establishment of city radio stations, municipal garages, parking lots, trailer camps, abattoirs, milk and ice stations, a city newspaper for official notices, public housing, advertising, greatly expanded zoning and planning with efforts to maintain these in terms of region, sometime even embracing territory in more than state of location; regulation of buses and bus terminals, as well as taxicabs and jitneys; adult education, pensions, credit systems, health and hospital care for employees, withholding from them of federal income tax and for required bond purchases. The number of functions assumed by municipalities in this country has not equaled that in England, Sweden and other countries. It has not been unusual, however, for municipalities in the United States to have public ownership of utilities, such as water supply, telephones, street railway, gas and electric production and distribution, municipal forests, pawnshops, cemeteries, universities, bands and orchestras, zoological gardens, extensive parks and recreation centers. Traditional activities have been expanded.

Accompanying this expansion, new problems have arisen to be met somehow. As illustrative only, and by no means all-inclusive, may be mentioned the growth of public employee unions with demands for recognition of such as bargaining agent for all employees, a closed shop, strikes or threats of strike involving suspension of vital services. Then there is the political pressure which such organizations can invoke so as sometimes to bring about undesirable legislation and

wage increases so unreasonable as to impose a severe strain on the credit of the city (for example, the transport union in New York City subways) even to the extent of impairing its credit; federal encroachments, such as income tax on salaries, persistent effort to tax income of municipal bonds, federal taxation on so-called proprietary function activities; interpretations of the United States Constitution protecting civil liberties to an extent sometimes preventing ordinary regulation of control of streets; and extension of the constitutional bankruptcy power to include municipal bankruptcies; taking by the federal government of much previously taxable property for federal purposes, such as public housing which entails furnishing of city services, but making the project nontaxable; federal regulations interfering with free public bidding and limiting cities' rent charges of their own properties and allowing federal building not complying with city regulations. Various so-called authorities have been created to conduct, with other than the regular city officials, some intra-municipal function, usually with funds derived only from revenues of the operation. While the revenue bonds which they issue are not general city obligations, these obligations should be taken into account in determining the overlapping debt of the local subdivision, since every community has a maximum of debt-servicing ability.

On the other hand, new conditions, instrumentalities, conceptions, mechanical appliances, have helped the cities. Two-way radios on police cars, motorized fire and police departments, bulldozers, tractors and road making and surfacing materials, dump trucks, consolidated purchasing, automatic check signers and stamping machines, punch cards for tabulation, photostat, microfilms,—all are examples. Then, too, reduced return on capital and the great demand for municipal bonds because interest on them is exempt, under present law, from federal income tax have enabled cities to borrow often at less than half the rate they formerly had to pay. Federal instrumentalities and decisions have lightened the cities' burden in public utility rate cases and sometimes with the threat of municipal ownership (q.v.), have resulted in materially lower charges for essential services. An authoritative ruling that, to determine the rate base, using the "prudent investment theory" instead of the ancient "cost of production less depreciation" formula is not an illegal denial of due process, alone has saved the cities hundreds of thousands of dollars in rate controversies before state public utilities commissions. Also, on the asset side are to be listed the leagues of municipalities, mayors conferences, International City Managers Association, various bureaus of governmental research, municipal reference libraries, agencies for the improvement of local government, such as the National Municipal League and the National Civil Service League, and their publications. These give to officials desirous of conducting municipal affairs economically and well the best experience of what has been done in other municipalities and the incentive to emulate successful achievement wherever it has occurred.

In no sphere of activity is there more stirring and greater opportunity for highest peacetime service than in the local governments. What is needed is not merely the making of studies and giving information which, if used, can make conduct of the affairs of cities more efficient and economical. Merely knowing how, and exhortations in behalf of the merit system and the possibility of careers in local administrations are not enough. As a high duty of citizenship, sentiment must be created and maintained, that will require these public corporations to be administered as effectively as the best private corporations are conducted. Only then will what James Bryce termed many years ago "the one conspicuous failure of the United States" be erased. (M.S.)

Ordinance Power.—One of the powers which is invariably granted to municipalities is the power to pass ordinances which shall have the effect of law. The legislature may not, under our state constitutions, delegate its legislative power; but since a city is regarded as an administrative subdivision of the state, the courts have uniformly held it to be proper to endow it with a share of the state's legislative power. The power to pass ordinances is hedged about by many limitations express or implied, which may be summarized as follows: First, where the procedure to be followed in passing an ordinance is set forth it must, save where the procedure prescribed is found to be directory, not mandatory, be adhered to or the ordinance will be void. Second, ordinances must not be passed in excess of the power delegated to the city. Third, there must be no violation of the provisions of the national or state constitutions or statutes. Fourth, since every power not expressed to do the very thing is granted to a municipality under the implied condition that it will be reasonably exercised, any ordinance will be void which is unreasonable by being oppressive, discriminatory, unduly restrictive of trade, in contravention of common right or public policy. The invalidity of part of an ordinance does not vitiate the entire ordinance if the valid and invalid portions are separable, and it can be said the ordinance with the invalidity eliminated can stand and would have been passed.

Power of Taxation.—The power of the American city to tax must be given either by express or implied grant. It is usually specifically conferred, but if not it may sometimes be implied from the grant of other powers for the exercise of which revenues are necessary. When not limited by provisions of the state constitution, the state legislature has complete control over the city's power of taxation. It may in its discretion extend, curtail or revoke it in general or with reference to special taxes, subject to one restriction. It may not take away the power of a city to tax so far as such taxing power is the only means of paying an existing debt. The amount of the taxes which a city may raise for municipal purposes may be left to its discretion, but very commonly the city tax rate is limited either by the statutes or constitution of the state. The rules governing the procedure of assessment and collection of municipal taxes are usually set forth in the enabling legislation and must be strictly followed. The courts will compel a city against its will to exercise its taxing power to the extent necessary to satisfy claims of its creditors.

Police Power.—The power to pass ordinances for the protection of the public health, safety, morals and general welfare of the municipality is commonly conferred upon cities by express grant. It may sometimes be implied, however, from a general grant of power to pass certain ordinances. It is under this authority

that municipalities make enactments relative to the preservation of peace and order, sanitation, fire protection, regulation of amusements and occupations and the control of vice. When exercised by the city the police power is subject to all the usual constitutional restraints against arbitrary and discriminatory enactments. The city is incapable of parting with its police power by making any grant, concession, exemption or contract. Its police ordinance may deal with subjects already covered by state law provided the ordinance does not conflict with the statute. The power to pass police ordinances carried with it by implication the authority to establish and enforce reasonable penalties. Such ordinances may be enforced either by penalties inflicted upon individuals, injunction, or by summary destruction of private property which is a public nuisance.

Municipal Contracts.—The power to make contracts is given to all municipalities by express grant or by implication. Such contracts have the same general legal character as contracts between individuals but the city must not exceed its power. If the procedural requirements in the city charter are not complied with, the contract is void. Where cities enter into contracts for the securing of services or goods, it is commonly required that the city must call for sealed bids based upon plans and specifications and that the contract must be let to the lowest responsible bidder. If it can be clearly shown that a city did not have the requisite authority to make a given contract, such a contract is void. Cities are, however, bound by the principles of common honesty and in cases where its contracts are illegal because of hidden defects of procedure or noncompliance with other formal requirements, the city may still be bound. It may elect to ratify such contracts and ignore the irregularities, or, under what is known as the doctrine of estoppel, it may be prevented by the courts, if not void, from setting up its own illegal acts for the purpose of freeing itself from its just obligations. The contracts of a municipality are enforceable in court before judgment like other contracts and neither the city nor the state legislature may by ordinance or statute impair their obligation. Thus, the statute of limitations may, in almost all cases, be invoked against a city. Municipalities are subject to injunction, in proper cases, and to contempt proceedings for violation of injunctions. But execution against essential city property is not permitted to satisfy judgments. The remedy for enforcement of these is usually by mandamus to compel the levy of a tax sufficient to satisfy the judgment.

Miscellaneous Powers.—The American municipality enjoys several powers which do not call for elaborate discussion. It may appropriate and spend money for purposes within its authority and in accordance with the procedure outlined in its charter. It may, within these same limits, acquire, manage and dispose of property. It may construct public improvements and in so doing may use the power of eminent domain and levy special assessments. Its power to incur debts, own and operate public utilities and services and grant franchises are treated in separate articles. See ASSESSMENTS; FRANCHISES; MUNICIPAL DEBTS; PUBLIC UTILITIES.

Liability of Municipalities.—A municipality is not like a sovereign state, immune from suit without its consent. On the other hand, since in the performance of many functions it is an agent of the state, its legal liability is not so wide as that of a private corporation. The rules governing the civil liability of the city are, accordingly, complex. In the first place, its liability upon all contracts which it has legally made is absolute and may be enforced in the usual way. Secondly, the city is not liable in damages for the torts or legal wrongs resulting from the performance of its governmental powers and functions, except in cases of nuisance. This immunity rests partly on the theory that the city performs these functions as an agent of the state which is immune from suit, and partly on the theory that it is contrary to public policy to expose the revenues of the city to the drain which an unrestricted liability might entail. This immunity extends to the injuries resulting from negligence or misconduct of the city's officers and agents, or from faulty construction, repair or maintenance of its property used for governmental purposes. By governmental functions or powers are meant those pertaining to protection of public peace, health, safety, education, and charity, in contrast to the commercial or quasi-private enterprises on which modern cities may embark. The municipality is never liable, furthermore, for the tortious acts of its officers when they have exceeded their legal authority. In such a case usually the injured person may sue the officer individually and recover damages. The state legislature may create by statute municipal liability which would not otherwise exist. In the third place, the municipality is liable in tort for the injuries resulting from performance of nongovernmental or commercial functions such as the operation of certain utilities, as well as from the use of property not used for governmental purposes. Furthermore, a legal obligation rests on the city to exercise reasonable care in keeping its streets, highways, bridges, and viaducts, safe for ordinary use and it is accordingly liable for the injuries resulting from a breach or neglect of this duty. On the whole the modern tendency is to broaden rather than to curtail civil liability of the municipality. (R.E.C.)

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MUNJISTIN (purpuroxanthin carboxylic acid), an orange-coloring matter closely allied to purpurin and to alizarin, which occurs in munjeet (East Indian madder), and has the formula $C_{14}H_5(OH)_2O_2COOH$. It may be changed into purpuroxanthin by boiling with alkalis; also by heating it above 448° F., its melting point. It dissolves in boiling alcohol, separating again, upon cooling, in the form of brilliant golden flakes. Munjistin gives an orange-yellow color when used as a dye with aluminum mordants, which, however, is not fast either as to light or soap. With iron mordants it gives a brownish purple, which is fairly permanent. Munjistin is one of the compo-

nents of commercial «purpurine,» also known as «Kopp's purpurine.»

MUNKACS, now **MUKAČEVO,** Czechoslovakia, town in Carpathian Ruthenia, located on the Latorcza River and on the Bátyu-Munkács-Lavoczne-Stryj state railway. Its industries consist of vineyards, coarse cloth making, spirit distilleries, petroleum refining, lumber, cattle and grain trade. In the vicinity the noted «Hungarian diamonds» (rock crystal) are mined. Close by are productive alum and iron mines. Built on a high rock in the plain is the historic fortress, usually utilized as a state prison, that was first built in 1359. It was surrendered (1688) to the Austrians after withstanding a siege of three years under the brave leadership of Helen Zriny, wife of the patriot Emmerich Thökölys. Franz Rákóczi II (1703) was defeated here by the Austrians under Nigrelli and the place was surrendered (1708) to the latter. Alexander Ypsilanti was imprisoned here from 1821–23, and the famous painter Munkacsy was born here. Pop. about 20,000.

MUNKÁCSY, moon'kächē, **Michael,** Hungarian painter: b. Munkács, Hungary, now Czechoslovakia, 10 Oct. 1846; d. Endenich, near Bonn, 1 May 1900. His real name was Lieb, but he is known only under the assumed name derived from that of his birthplace. Beginning life as a carpenter, he met the strolling portrait painter, Szamossy, in Gyula, who was so much struck by the artisan's interest in art that he gave him painting lessons. Munkácsy proceeded to paint portraits and genre pictures, taking his subjects from common country life. One of these early canvases, 'A Country Idyll,' was purchased by the Art Union of Pesth. He eventually put himself under the instruction of the battle-painter, Franz Adam, at Munich. He made rapid progress and the Hungarian government awarded him the first prize for genre paintings thrice in succession and he was thus enabled to take up his residence at Düsseldorf and to study under Knaus and Vautier. The first great picture he painted was 'The Last Day of a Condemned Man,' (in the collection of Mrs. W. P. Wilstach, Philadelphia) exhibited in the Paris Salon in 1870. This was followed in 1871 by 'Wartime' (an episode in the Hungarian war. The succeeding year he made Paris his home and his pictures began to attract growing attention. He painted many small genres of singular power and character, such as 'Going to School'; 'The Kitchen Politician'; 'The Butter Woman'; 'The Pawn Shop' (1874) (Metropolitan Museum, New York); 'The Workshop' (1875): but as his strength and mastery of his art grew he rose to loftier subjects, religious and historical. In 1877 he painted 'Milton in his Blindness Dictating Paradise Lost,' to which was awarded the gold medal at the Paris Exposition. It is now in the Public Library, New York. Great as was the sensation created by this picture, a historic genre of remarkable coloring in gray and black and of profound insight and power of characterization, an even deeper impression was produced by his 'Christ Before Pilate' (1882), which some critics consider the greatest religious picture of its century. This vast canvas is startling in its freshness of conception, its living action, the mingled grandeur and pathos which the artist has infused into his treatment of the central figure, as well as its masterly composition and technique. It has been exhibited in all quarters of the civilized world and was bought by John Wanamaker of Philadelphia for $120,000. It was followed by his dramatic 'Christ on Calvary,' the religious intensity of which is heightened by the accurate fidelity to differing national types with which the spectators of the Crucifixion are portrayed; a piece of realism whose suggestiveness is obvious. In 1886, he produced 'The Last Moments of Mozart,' now in the collection of Gen. Russell Alger, Detroit, Mich. The present owner paid $50,000 for this pathetic picture, in which the composer is listening to his still uncompleted requiem, sung at his bedside by his favorite singers, the night before his death. The last three years of his life this painter suffered from mental alienation and closed his days in a sanitarium. In addition to the works already mentioned, 'The Music Room' and 'The Two Families' are in the Metropolitan Museum in New York; 'The Prowlers of the Night' is in the Pennsylvania Academy, Philadelphia, and 'The Story of the Battle' is in the Walters Gallery, Baltimore. Consult Tait, T. R., 'Michael Munkácsy' (in *American Art Review,* Vol. II, Boston 1881).

MUNKAR. See MOHAMMEDANISM.

MUNN, Charles Clark, American novelist: b. Southington, Conn., 1848; d. 8 July 1917. Bred on a farm which he left at 17, for 30 years he was engaged as a commercial traveler. From 1910 he was editor of the *Commercial Travelers' Magazine.* He was the author of several popular novels, including 'Pecket Island' (1900); 'Uncle Terry: a Story of the Maine Coast' (1900); 'Rockhaven' (1902); 'The Hermit' (1904); 'The Girl from Tim's Place' (1906); 'Boyhood Days on the Farm' (1907); 'Myrtle Baldwin' (1908); 'The Castle Builders' (1910); 'The Spice of Life' (1911); 'The Heart of Uncle Terry' (1915); 'Camp Castaway' (1916).

MUNN, George Frederic, American artist; b. Utica, N. Y., 1852; d. 1907; began his early studies in art under Charles Calverly, the sculptor and also in the National Academy of Design, New York. Afterward he entered the art schools at South Kensington, England, and there won a gold medal, the first award of the kind to an American. His clay model of the Farnese Hercules won the award. He also was the winner of a silver medal at the Royal Academy for life drawing, and in 1876 entered the studio of George F. Watts. He traveled in Brittany, where he painted and sketched and was a frequent exhibitor at the Dudley Gallery, London, and elsewhere. Among his best-known works are 'Wild Flowers,' 'Roses,' 'Meadow Sweet' and 'A Sunny Day in Brittany.' Consult Munn, Margaret Crosby and Cabot, Mary R., 'The Art of George Frederic Munn,' with an Introduction by Sir Johnston Forbes-Robertson (New York 1916)

MUNN, Orson Desaix, American publisher: b. Monson, Hampden County, Mass., 11 June 1824; d. New York, 28 Feb. 1907. He was educated at the academy in Monson, was a clerk and country storekeeper there until 1846, and then bought the *Scientific American,* which he made one of the leading scientific papers of the

country. Other periodicals owned by him were the *Scientific American Supplement* (1876–) and *Architects' and Builders' Edition* (1885–), now *American Homes and Gardens*. He was also head of Munn and Company, patent solicitors.

MUNRO, Dana Carleton, American historian: b. Bristol, R. I., June 7, 1866; d. New York City, Jan. 13, 1933. He was graduated from Brown University in 1877, then studied (1889–1890) at the universities of Strasbourg and Freiburg. He was instructor and assistant professor of Roman and medieval history at the University of Pennsylvania (1893–1902), professor of European history at the University of Wisconsin (1902–1915), and professor of medieval history at Princeton University (1915–1933); he was chairman of the department of history there (1915–1928). From 1894 to 1902 he was editor of *Translations and Reprints from Original Sources of History,* and published *Medieval History* (1902); *A Source Book of Roman History* (1904); *Syllabus of Medieval History* (1910); *German Treatment of Conquered Territory* (1918); *A Guide to the Study of Medieval History* (1931).

His son, Dana Gardner Munro (1892–1942), was a historian and diplomat. He served in the Latin American division of the United States Department of State from 1921 to 1925, and in 1929 became chief of that division. He was United States minister to Haiti (1930–1932); and professor of Latin American history and affairs at Princeton University from 1932.

MUNRO, Hector Hugh, pseudonym Saki (sä'kĭ), British author: b. Akyab, Burma, Dec. 18, 1870; d. Beaumont-Hamel, France, Nov. 13, 1916. A refreshingly imaginative satirist whose career was cut short by death in action with the Royal Fusiliers in World War I, he is best known for fictional pieces distinguished by gaiety of dialogue and narrative. Educated in grammar schools at Exmouth and Bedford, England, he returned to Burma in 1893 and was commissioned in the Burma police. The following year he reappeared in England, where he delighted readers of the *Westminster Gazette* with political sketches in the Lewis Carroll manner, issued under the name of Saki (cupbearer in the *Rubáiyát of Omar Khayyám*), and later published in 1902 as *The Westminster Alice.* From 1902 to 1908, he traveled in the Balkans, Russia, Poland, and France, as foreign correspondent for the *Morning Post.* Meanwhile, after being sidetracked into his only serious study, *The Rise of the Russian Empire* (1900), he turned to writing the short stories, published as *Reginald* (1904) and *Reginald in Russia* (1910), on which his reputation rests. These collections as well as *Chronicles of Clovis* (1911) and *Beasts and Superbeasts* (1914) reveal Saki's inviting whimsical humor and biting wit at their best. While not neglecting his penchant for political satire in these stories, he frequently portrays blithely irrepressible young men and queer and exotic animals in fantastic settings. With his fondness for flaying the pretentiously self-righteous and negatively dull, Saki reveals a flippant annoyance with adults, and a contrasting sympathy and understanding for their victims, children. Stylistically, his lack of conventional plot structure is usually more than compensated for by his fertility of invention and mastery of the unexpected phrase.

His other works include: *When William Came* (historical fantasy picturing life in Britain under German rule, 1913); *The Unbearable Bassington* (novel, 1912); *The Square Egg* (1924, with a biographical sketch by E. M. Munro); and several plays, including *The Death-Trap; Karl-Ludwig's Window;* and *The Watched Pot* (with Charles Maude).

MUNRO, Wilfred Harold, American historian: b. Bristol, R. I., Aug. 20, 1849; d. Providence, R. I., Aug. 9, 1934. He was graduated (1870) at Brown University, receiving (1873) the A.M. degree. He spent 1873 in South and Central America. From 1875–1879 he was principal at Le Roy (N. Y.) Academic Institute, and was president of De Veaux College from 1881–1889. He studied at the universities of Freiburg and Heidelberg (1890–1891), when (1891–1899) he became associate professor of history and director of university extension at Brown University, and professor of European history (1899–1911), then emeritus professor. He published *Legends of Mount Hope* (1915); *Tales of an Old Seaport* (1917); *Among the Mormons in the Days of Brigham Young* (1927); editor, *Works of W. H. Prescott* (1905–1906).

MUNRO, William Bennett, American political economist: b. Almonte, Ontario, Canada, Jan. 5, 1875. He was graduated (1895) at Queen's University, Canada, receiving the degrees M.A. (1896) there, LL.D. at Edinburgh (1898), Ph.D. at Harvard (1900). He studied (1900–1901) at the University of Berlin and was (1901–1904) instructor of history and political science at Williams College, then, successively, instructor in government (1904–1906), assistant professor (1906–1912) and professor of municipal government (1912–1925) at Harvard University; Jonathan Trumbull professor of American history and government (1925–1929), and Edward S. Harkness professor of history and government (1929–1945), and since 1945 treasurer, California Institute of Technology. His writings include: *The Government of European Cities* (1909); *The Initiative, Referendum and Recall* (1911); *The Government of American Cities* (1912); *Principles and Methods of Municipal Administration* (1916); *The Government of the United States* (1919); *Municipal Government and Administration,* 2 vols. (1923); *The Governments of Europe* (1925); *Makers of the Unwritten Constitution* (1929); *American Government Today* (1930); *Municipal Administration* (1934).

MUNROE, Charles Edward, American chemist: b. Cambridge, Mass., May 24, 1849; d. Forest Glen, Md., Dec. 7, 1938. He took degrees at Harvard and George Washington universities, and taught in both institutions. He was professor of chemistry at the United States Naval Academy (1874–1876). He invented indurite, the first smokeless powder used in big guns by the United States Navy, the discovery of the formula of which he made while engaged in chemical research at the Naval Torpedo Station, Newport, R. I. (1886–1892). He also discovered the "Munroe effect," casting a new light on the nature of the detonation wave of nitroglycerine. He taught chemistry at Harvard (1871–1874); and was consulting expert to the United States Geological Survey, the United States Bureau of Mines, and the Civil Service Commission.

MUNROE, Henry Smith, American mining engineer: b. Brooklyn, N. Y., March 25

1850; d. Litchfield, Conn., May 9, 1933. He was graduated (1869) at Columbia and received (1877) the degree Ph.D. He was (1870–1871) assistant geologist of the Ohio State Geological Survey; assistant chemist, United State Department of Agriculture (1870–1872); assistant geologist and mining engineer of the Geological Survey of Yesso, Japan (1872–1875). In 1875–1876 he was professor of mining and geology at the University of Tokio; then successively adjunct professor of surveying and practical mining (1877–1891); professor of mining (1891–1915), and emeritus professor in 1915 at Columbia University. He was also dean of the faculty of applied sciences (1897–1899) and member of the university council (1895–1915). He was manager (1881–1884), then vice president (1890–1892) of the American Institute of Mining Engineers, and was (1908–1909) president of the Mining and Metallurgical Society of America and (1909) president, Society for Promotion of Engineering Education.

MUNSEE INDIANS, an American tribe of the Delaware family, originally one of the three great divisions of that race. They were sometimes called the Wolf tribe of the Delawares. They resided along the Delaware River, and in New York, Pennsylvania and New Jersey. During the Revolution many of the Munsees removed to Canada, where at Thames, Ontario, there are some survivors. At Green Bay, Wis., is another tribal remnant and a third remnant is found in Kansas. See also DELAWARE INDIANS.

MUNSELL, Joel, American printer and antiquarian: b. Northfield, Mass., April 14, 1808; d. Albany, N. Y., Jan. 15, 1880. He established himself in Albany in 1827, and was publisher and editor of the *New York State Mechanic* from 1841 to 1843. At various times he was the publisher of the *Unionist,* the Albany *Daily State Register, Morning Express* and *Statesman,* and other journals. Munsell made a close study of the art of printing, in its history and application, and his collection of works on the subject, the largest in America, was in part purchased by the state for the New York State Library. He contributed papers to the *Transactions* of the Albany Institute, of which he was a founder, and published *Outline of the History of Printing* (1839); *The Every-Day Book of History and Chronology* (1843); *Annals of Albany,* 10 vols. (1850–1859); *A Chronology of Paper and Paper Making* (1856); and *Manual of the First Lutheran Church of Albany, 1670–1870* (1871).

MUNSEY, mŭn'sĭ, **Frank Andrew,** American editor and publisher: b. Mercer, Me., Aug. 21, 1854; d. New York, Dec. 22, 1925. He became manager of a Western Union telegraph office in Augusta, Me. He went to New York in 1882 to become editor and publisher of *The Golden Argosy,* a juvenile weekly, which he afterward changed into a monthly for adults under the style of *The Argosy. Munsey's Weekly* appeared in 1889 and after issuing this for one year he transformed it also into a monthly calling it *Munsey's Magazine.* He added other magazines, and later went into the newspaper field, buying the New York *Evening Sun, Daily News, Press, Sun, Herald, Telegram,* etc., and papers in other cities. He was a pioneer in the publication of cheap illustrated magazines, *Munsey's* being the first magazine to be sold at ten cents a copy. At one time or another he owned and published various other magazines including the *Scrap Book, Quaker, Puritan, Woman, Live Wire, Cavalier,* and *Railroad Man's Magazine.* He was the author of several books: *Afloat in a Great City* (1887); *The Boy Broker* (1888); *A Tragedy of Errors* (1889); *Under Fire* (1890); *Derringforth* (1894). He left the bulk of his fortune (estimated at the time of his death at $40,000,000) to the Metropolitan Museum of Art.

MUNSON, James Eugene, American inventor: b. Paris, N. Y., May 12, 1825; d. New York, 1906. He was educated at Amherst College, and in 1857 removed to New York, where he was court stenographer for 30 years. He invented the "Munson System" of shorthand, a machine for operating the typewriter by telegraph and a typesetting machine. He published *The Complete Phonographer* (1866); *Dictionary of Practical Phonography* (1875); *A Shorter Course in Munson Phonography* (1900); *Phonographic Dictation Book* (1904); *Munson's Pocket Dictionary of Phonography* (1906).

MUNSON, Thomas Volney, American horticulturist and plant breeder: b. Astoria, Ill., Sept. 26, 1843; d. Denison, Tex, Jan. 21, 1913. His early education was obtained in the rural district schools, followed by a course in an Academy at Lewiston. He subsequently took a course in a commercial college after which he entered the University of Kentucky, whence he was graduated in 1870. Shortly after completing his education he married and removed to the vicinity of Lincoln, Nebr. In 1873 he became interested in the improvement of the various species of the native American grapes and planned to do systematic work in the way of developing new varieties by cross-pollenation and hybridization. The experiments thus undertaken were doomed to failure because of climatic rigors and a visitation of the Rocky Mountain locusts. Undismayed, he sought a new location, settling at Denison, Tex., in 1876. There climatic conditions were much more favorable to the prosecution of such experiments and, moreover, wild grapes were more abundant and profuse. He engaged in the nursery business and in the breeding of new varieties of grapes and also growing them upon a commercial scale. During the ensuing 25-year period, he produced and experimentally fruited no less than 150,000 new varieties of grapes, many of which were far superior to those hitherto in common cultivation. Only the very best of these were selected for propagation and dissemination and so rigid and exacting was the process of elimination that but 50 varieties were retained for introduction and cultivation as a permanent addition to American viticulture. He became recognized as a botanist as well as a viticulturist, a volume entitled *Native Trees of the Southwest* having been prepared under the direction of the United States Department of Agriculture. But his specialty was always the grape and he became the recognized authority on the native wild grapes of North America. His horticultural and scientific work in hybridizing and perfecting the American grapes won recognition abroad as well as at home. In appreciation of his service in producing and introducing resistant stocks with which to re-

store the phylloxera infested vineyards of France, the French government conferred upon him the diploma and decoration of the Legion of Honor, with the title of «Chevalier du Merit Agricole,» in 1888. He wrote 'Classification and Generic Synopsis of the Wild Grapes of North America' (issued as Bulletin No. 3 of the Division of Pomology, United States Department of Agriculture, Washington, 1890). The most complete botanical display of the whole grape genus ever made was prepared by Mr. Munson and exhibited at the World's Columbian Exhibition at Chicago in 1893 and has since been preserved by the United States Department of Agriculture at Washington. He was the founder and for many years the president of the Texas Horticultural Society and was a member of a number of learned societies, including the American Horticultural Society, the National Agricultural Association of France, the American Pomological Society, the American Breeders' Association and the American Association for the Advancement of Science. His volume 'Foundations of American Grape Culture' (1909), embodied the practical results of more than 30 years of patient, painstaking investigation, experimentation and observation and must long remain the leading treatise of its class. His work, which may be justly said to have been monumental in its significance and beneficence, was continued until his death.

MUNSTER, Ireland, the southwest and largest of the four provinces of that country, bounded on the north by Connaught, on the east by Leinster, and on the west and south by the Atlantic Ocean. It has an area of 9,316 square miles and is divided into the counties of Clare, Cork, Kerry, Limerick, Tipperary and Waterford. Pop. 969,902, 94 per cent Roman Catholics.

MÜNSTER, mün'stĕr, Prussia, the capital of Westphalia, a city and episcopal see, in a plain on the Aa, at the junction of several railways and on the Dortmund-Ems canal, 78 miles northeast of Cologne. The site of its mediæval ramparts has been converted into promenades. The principal edifices are the 13th century cathedral, the church of Saint Lambert, the Rathaus, exchange, museum, theatre, the Pauline Library, etc., and the university, founded in 1788. The manufactures include woolen, linen and cotton goods, leather, sugar, starch, beer, etc. Münster originated in a monastery around which a settlement arose in the 12th century; it was long governed by martial bishops. The most notable event in its long history occurred in 1532–35 when the city fell into the hands of the Anabaptists (q.v.). Pop. about 106,000.

MUNSTERBERG, mün'ster-bĕrg, **Hugo,** German-American psychologist: b. Dantzic, Germany, 1 June 1863; d. Cambridge, Mass., 16 Dec. 1916. He was graduated at the Dantzic Gymnasium in 1882, and pursued post-graduate studies in physiology, philosophy, natural sciences and medicine until 1887. He received the degree of Ph. D. at Leipzig in 1885 and that of M.D. at Heidelberg in 1887. After this he was instructor and assistant professor of psychology in the University of Freiburg at Baden, Germany. In 1892 he came to America at the invitation of Harvard University, Cambridge, Mass. He was professor of experimental psychology and director of the Psychological Laboratory in Harvard from that time until his death. His scholarly work was partly psychological, partly philosophical. After 1900 he gave special attention to the new field of applied psychology, in particular to the application of psychology to education, medicine, law, commerce and industry. He was a member of the Psychological Association (president 1898), of the Philosophical Association (president 1908), the Washington Academy, of the American Academy of Arts and Sciences, etc. He was organizer and vice-president of the International Congress of Arts and Sciences at the Saint Louis World's Fair 1904, vice-president of the International Psychological Congress in Paris 1900, vice-president of the International Philosophical Congress at Heidelberg 1907, etc. In 1910–11 he was Harvard exchange professor at the University of Berlin and during that year founded the Amerika-Institut in Berlin. During the whole period of his American stay he worked for the improvement of the relations between the United States and Germany, writing in America for a better understanding of Germany and in Germany for a higher appreciation of America. The outspoken views of Professor Münsterberg on the issue of the War of 1914 raised storms of controversy about his head. He appeared as probably the most eminent supporter of German policies in America, and as such was most bitterly condemned by the Entente Allies and their friends, while to the pro-Germans he appeared almost an idol. While supporting German policies, Professor Münsterberg denounced many of the activities of the Teutonic hyphenates in this country. He condemned the forming of an alien party within the United States as «a crime against the spirit of true Americanism,» and said that its results would reach far beyond the time of the war. Professor Münsterberg's early writings in Germany were exclusively devoted to experimental psychology. During his sojourn in America he published the following works, some of which have been translated into many languages: 'Psychology and Life' (1899); 'Grundzüge der Psychologie' (1900); 'American Traits' (1902); 'Die Amerikaner' (1904; revised 1912); 'Principles of Art Education' (1905); 'The Eternal Life' (1905); 'Science and Idealism' (1906); 'Philosophie der Werte' (1907); 'On the Witness Stand' (1908); 'Aus Deutsch-Amerika' (1909); 'The Eternal Values' (1909); 'Psychotherapy' (1909); 'Psychology and the Teacher' (1910); 'American Problems' (1910); 'Psychologie und Wirtschaftsleben' (1912); 'Vocation and Learning' (1912); 'Psychology and Industrial Efficiency' (1913); 'American Patriotism' (1913); 'Grundzüge der Psychotechnik' (1914); 'Psychology and Social Sanity' (1914); 'Psychology, General and Applied' (1914); 'The War and America' (1914); 'The Peace and America' (1915); 'The Photoplay, A Psychological Study' (1916). He was also a large contributor of psychological and philosophical articles in the scientific magazines and of social, political and practical psychological articles in the popular periodicals.

MUNTJAC, a small East Indian deer representing the genus *Cervulus,* which resembles

the musk-deer in many points, especially in the male's having long, sharp upper canine teeth or tusks, which are effective weapons. These little deer, only about 22 inches high at the shoulder, live in hilly jungles. The bucks have lyrate, single-pronged antlers on tall pedicels; the does lack antlers. Six species are known in India (where they are called Kakars) and parts of southeast Asia. Popularly they are called barking deer from their cry of alarm. An alternate generic name is *Muntiacus*. The best known species is *M. muntjac*.

MUNZER, münt'sĕr, **Thomas,** German religious reformer and fanatic: b. Stolberg am Harz, c.1489; d. by execution, Mühlhausen, Thuringia, May 30, 1525. An Anabaptist, he joined Luther at Wittenberg in 1519 and the same year was a member of his entourage at the Leipzig debates. He soon disagreed with Luther on theology and became increasingly radical in his socio-political views as well, claiming direct communion with the Holy Spirit. While he was pastor at Zwickau (1520–1523) he tried to propagate his radical views at Wittenberg. His demagogic preachings and attempts to excite rebellion among peasants and workers through advocacy of the overthrow of the social order and establishment of a godly communist state resulted in his expulsion from Zwickau, Allstedt and Mühlhausen. At the outbreak of the Peasants' War (q.v.) Münzer returned to Mühlhausen with Heinrich Pfeiffer, another preacher, took control of the town council and established a communist theocracy. Philip, landgrave of Hesse, defeated the peasant forces at Frankenhausen, May 15, 1525, and Münzer was among the leaders executed.

MUNZINGER, mo͝ont'sĭng-ĕr, **Werner,** Swiss explorer and linguist: b. Olten, Soluthern Canton, April 21, 1832; d. Aussa district, northeastern Ethiopia, Nov. 15-16, 1875. He went to Egypt in 1852, led a trading expedition to the Red Sea (1854), settled briefly at Massawa, then made an expedition to East Africa (1855–1861). Second in command of the Heuglin expedition, on the leader's death he headed it. In 1872 he was appointed by the Khedive governor general of the eastern Sudan. On an expedition to find out whether Menelik, king of Shoa, later Menelik II (q.v.), emperor of Ethiopia, would consider an alliance with Egypt, Munzinger and his wife were killed by Galla tribesmen. He wrote grammars of native tongues and travel accounts.

MURAD, name of five Ottoman sultans:

Murad I (1326–1389), reigning from 1362 until his death, was the first of the Ottomans to extend conquests to Europe, making Adrianople his European capital; completed organizing the Janizaries (q.v.). He took Sofia (1382) and was killed in his victory of Kossovo.

Murad II (1403–1451), ruling from 1421–1451, patron of writers and scholars, reunited the Ottoman state, fought Hunyadi and Scanderberg and subdued the Morea (1446).

Murad III (1546–1595), who ruled from 1574–1595, continued war with Austria, and seized (1590) large areas of the Persian Empire. The decline of the Ottoman Empire is usually dated as beginning with his reign.

Murad IV (1609–1640), sultan from 1623 to 1640, curtailed the power of the palace troops, and captured Baghdad from Persia (1638).

Murad V (1840–1904) ruled for a few months in 1876. For most of his early life he was confined by a jealous uncle, Sultan Abdul Aziz. On the latter's deposition Murad acceded, but was deposed as insane (Aug. 31, 1876), and confined until his death.

MURAENA. See Morays.

MURAL PAINTING is that branch of painting and design which is concerned with the enrichment of the walls and ceilings of buildings. Other techniques of architectural decoration used for the same purposes include mosaic, stone, or wood inlay, sgraffito, and bas-relief sculpture. Tapestry is woven material hung with similar intent.

A mural painting must always be related in design to the building of which it is a part. Its function in some instances may be only ornamental; but a fine work of mural art transcends the purposes of mere decorative embellishment: it may record the past, glorify the present, or symbolize aspirations of the future as well as playing its part in a geometric architectural unity.

Principles.—The general principles of good architectural design must govern the construction of a mural painting in its abstract, or design, elements. Architecture is concerned with the creation of hollow volumes or complexes of volumes, in materials which are suitable to the time, place, and uses of each structure. Mural decoration is only a further development, in terms of meaningful ornament, of the expression of the architectural idea in space and volume. Good ornament contributes to making the building seem psychologically suitable to its uses; the ornament may be called functional because people work and play better in appropriately decorated rooms; but a mural painting may also educate, remind, uplift, entertain, inspire fear or hope or any feeling which can be expressed in visual symbols.

Since the functions of buildings and rooms are various, it follows that many different kinds of mural painting exist. A bank, a factory, a gymnasium, a hospital, or a nursery, each has its own requirements. Mural painting may vary from the intimate to the monumental.

One of the qualities of good architecture is its relative permanence, and this affects the attitude of the mural painter as to technique, style, and subject matter. The muralist is always more concerned than is the easel painter with the lasting values of his work. He is slower to experiment with novelties, while being intensely interested in new methods which may add durability to his painting. He is the philosopher and historian among painters, and also the scientist and engineer. He is usually a deliberate, steady, and craftsmanlike worker, because a large mural demands sustained effort combined with consistency in style. A successful work must reflect calmness, co-operativeness, sympathy, and understanding for the feelings and viewpoints of many different people: the mural painter is a "public" artist, in his way a public servant.

For these reasons it is considered that a mural work using illustrative content should confine itself to truly epic subject matter. Passing or trivial events do not deserve presentation in monumental, enduring form. Perhaps the journalistic cartoon might be thought of as the proper antithesis to true mural painting. Murals whose painters have attempted to express current political

fervor have seldom stood the tests of time. In dealing with history in the making, the mural painter must be something of a prophet and seer to distinguish the enduring from the temporary.

Methods of Mural Painting.—Permanence and suitability to architectural surroundings are chief factors in the mural painter's choice of the medium to be used for a particular work. This choice will otherwise be dictated by the style of painting which the artist finds most adaptable to the expression of his idea. New media develop as the artists of a period find the established methods inadequate for their needs, and for this reason they are best studied in their historical contexts.

A widening knowledge of the history of art has brought about the appreciation of many little known styles and techniques of earlier times. Prehistoric man painted on the walls of caves in Altamira and the Dordogne. Of a much later time are the Buddhist paintings done on the walls of the cave temples of Ajanta in and prior to the 7th century A.D. In early Egypt and in Crete most murals were painted using flat color and linear silhouette, the earliest known being the famous *Geese of Meidum* belonging to the Egyptian Old Kingdom (2900–2750 B.C.). Of all the ancient works studied by painters of the modern era, probably those of the Egyptians, Greeks, and Pompeians have been most influential in forming Western mural styles.

Prehistoric cave painters made their drawings directly on the rough sandstone with natural earth pigments, much as pastel is used today: in most cases preservation is due to the accidental formation of a transparent film of limestone deposited by water seepage over their surfaces. Early painters mixed adhesive gum with their pigments, probably gum acacia or gum arabic in the case of Egyptian mural works.

Cretan painting, such as that in the Palace of Knossos, c.1500 B.C., presents some of the earliest known examples of the use of fresco, which was to become one of the most important media employed in architectural decoration during many centuries. In this manner of painting the pigment is ground in water or lime water and applied to a surface of fine plaster before the plaster has become completely crystallized. The pigment is bound to the plaster surface through the interlocking of slowly forming crystals of lime carbonate, as the lime oxide returns to its original form upon exposure to the carbon dioxide of the air. An area of about a square yard is prepared and completed at a time, this being considered a day's work by the *frescanti.* Succeeding sections of plaster will show a fine indentation where they join; the indentations are planned to follow the edges of color planes in the design.

The traditional palette of the fresco painter is limited to the natural earth colors, such as yellow ochre and terra verte; the burnt earths, such as Venetian red; and a few other lime-fast colors, such as cobalt blue. Few organic dyes or synthetic colors are fast in the presence of lime. Pigments prepared by grinding potters' glazes or frit pigments found some use as early as Egyptian times. True fresco becomes more luminous with age, due to the increasing transparency of the plaster surface as the lime crystals become completely carbonated.

The process described above is that of true fresco, which requires that when a mistake has been made, the outer coat of that particular section of plaster must be removed and renewed. Retouching has sometimes been done with the use of *fresco secco,* or dry fresco, in which the binder is albumen or casein distemper; but it has seldom proved permanent. The Italians distinguish true fresco as *"buon fresco."*

True fresco and dry fresco both were practiced by the Greeks, Romans, and Pompeians, although the Roman artists preferred the harder materials of mosaic and stone inlay. True frescoes also appear in early Christian and Byzantine churches; but they rise to their greatest heights in works of the Italians of the Renaissance, beginning with the painter Cimabue. This fine fresco work followed a period in which mural painting had for a time been superseded as wall decoration by the mosaics of the Byzantines, as seen in Saint Sophia, at Ravenna, and at St. Mark's in Venice; and by the stained glass of the Gothic north.

Two great schools of art developed at this time in northern Italy, producing murals done in both fresco and tempera. These were of the school of Giotto and his followers, whose works may be seen in the lower church of St. Francis at Assisi, in the churches of Santa Croce and Santa Maria Novella at Florence, and in the Arena Chapel at Padua; and the school of Siena. Artists of both schools traveled widely and influenced art in other regions. The work of the Sienese remained essentially medieval in character, while the art of the Florentines, followers of Giotto, changed to meet the needs of the new and spreading doctrine of humanism. Masaccio's mural painting, *The Tribute Money* in the Brancacci chapel of the church of Santa Maria della Carmine at Florence, signaled a further development in style from Giottesque painting; and during the 15th century other distinctive styles developed in Umbria, Rome, and northern Italy.

As men's attention became diverted from the medieval preoccupation with extra-worldly matters to an examination of the world around them, painting kept pace with scientific observation. Artists, re-imbued with the Greek ideal of man as the center of all things, painted and anatomized the human figure, developed theories of vision which became laws of light and shade and mathematical perspective. Piero della Francesca of Umbria, in his magnificent frescoes at Arezzo depicting the *Visit of the Queen of Sheba to Solomon,* demonstrated his scientific knowledge of architectural geometry and anatomy in common with Greek idealization of the human figure, which had become the Florentine goal in painting. Luca Signorelli, in his murals of the *Last Judgment* in the Cathedral at Orvieto, exhibits knowledge of the anatomy and movement of the human figure rather than concern with religious symbolization.

Two fresco painters who emerged from the Florentine group executed works in Rome in the first half of the 16th century which may be said to have exerted more influence upon the art of the Western World than any other paintings until comparatively recent times. One of these was Raphael Sanzio, whose Umbrian studies under Perugino are thought to account for his rich use of color. Raphael's Vatican frescoes known as the *Stanze* have long been models for students of classic work. Michelangelo Buonarroti, who considered himself primarily a sculptor, became a prisoner of war in the attack of Pope Julian's forces upon the Florentine Republic and was ordered, in spite of his protest, to decorate the ceiling of the Sistine Chapel in fresco. As an

architect, engineer, and sculptor, Michelangelo was in disagreement with the round-vaulted ceiling. He used his Florentine knowledge of space drawing to destroy its architectural effect. Instead we see a series of flat, bas-relief sculptural panels symbolizing the Creation, divided by painted beams, supported in turn by painted pilasters. The power and magnificence of the work is unquestioned. It remains a *tour de force* of the art of fresco, but it is also a great monument to a rebellious spirit, by which the mural painter demonstrated his refusal to approve the architecture of which his work was a part.

The style of Florentine painting was developed in terms of the use of fresco and tempera; both media encourage careful, planned work with reliance upon clearly drawn outlines, in a color range somewhat more limited than that of oil paint. The tempera medium was much used for smaller works of both Sienese and Florentine schools, executed upon wood panels first coated with gesso, a preparation of plaster and glue, employing egg yolk as a binder.

Early Flemish painters of northern Europe adopted as binding media linseed oil (oil of flaxseed) and varnishes prepared from pine pitch, in creating miniatures and small paintings to harmonize with the rich wood-paneled interiors of their region. Wall spaces which in the southern countries would call for large mural decorations here were needed for light-giving stained glass. The deep, enamel-like brilliance of underpainting and overglazing was well suited to their purposes.

It is believed that Domenico Veneziano, a Florentine traveler, introduced the northern craft of oil painting to the Florentines; but not until the sensuous Venetians rebelled against Florence's intellectual abstraction did the rich effects of oil painting become exploited in the mural decorations of Italy. Titian, a successful fresco painter early in his career in the Scuola del Santo at Padua, later became a virtuoso in the oil paint medium. His *Assumption* for the church of Santa Maria Gloriosa dei Frari, Venice, is the first oil painting to contain human figures as large as those in the biggest frescoes. Unfortunately Titian's murals for the Palace of the Doges were destroyed by fire; they were considered by contemporaries to be his greatest.

Titian's vigorous and glowing work was carried forward by Jacopo Robusti, known as Tintoretto. The careful, craftsmanlike processes which characterized the methods of the Florentines could not compete with the free, direct painting and the ease of correction of errors offered by the oil method.

Many baroque palaces of the time were richly decorated after the Venetian manner. Paolo Cagliari, known as Veronese, excelled in creating scenes of pompous splendor; his ceiling for the Doges' Palace, and various paintings for the church of San Sebastiano were typical examples of the mural work then most acceptable. Peter Paul Rubens, basing his style upon the works of Veronese, Michelangelo, and Raphael, carried the international baroque manner through all of Europe's capitals. Among his mural commissions were the decorations for the Luxembourg Palace for Marie de' Medici and the ceiling of Whitehall in England. In Spain, Domenikos Theotokopoulos, called El Greco, executed somber, emotionally intense decorations which combined Byzantine abstraction with Venetian breadth. His *Burial of the Count of Orgaz* in the Church of Santo Tomé at Toledo, is one of his best known works.

The French baroque style may be represented by the frescoes done in the Church of Val de Grace by Pierre Mignard, who headed the official French Academy under Louis XIV.

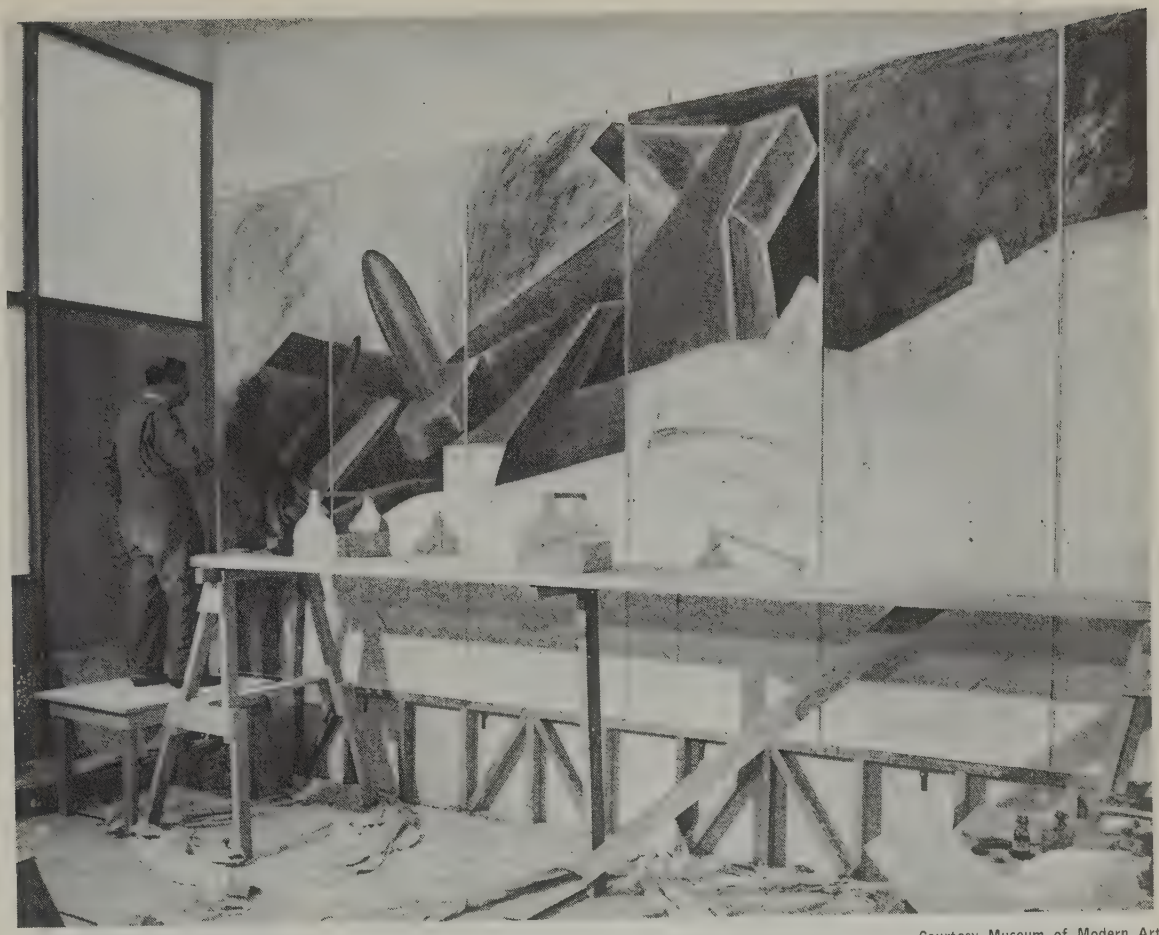
Mural painting enters a lighter phase in the rococo period which followed. Representative of his times as a mural decorator was François Boucher, whose work appears in Versailles, in the Bibliothèque Nationale at Fontainebleau and in the château of Madame de Pompadour at Bellevue.

Neither the neoclassic period nor the era of romanticism which followed were good ones for mural work; but Jacques-Louis David among neoclassicists and the romantic Théodore Chassériau, who influenced Puvis de Chavannes, left enough impression upon later muralists to deserve mention.

Mural painting in England and Germany paralleled French work to some extent and included experimentation with fresco, oil, and tempera media and also spirit-fresco, a kind of wax painting, and water-glass. In Germany the names of Peter von Cornelius, Peter von Hess, Julius Schnorr von Carolsfeld and Wilhem von Kaulbach come to the fore. In Engand a revival of mural decoration was carried forward in Victorian times by Thomas Gambier Parry, Charles West Cope, Sir Edward Poynter, and Frank Brangwyn, whose murals, executed for the San Francisco Panama-Pacific Exposition in 1915, are now set into the walls of the Veterans' Memorial Theater in San Francisco. These last are excellent examples of the influence of Impressionist light painting upon the art of the mural.

Most innovations have represented attempts to reproduce the quality of classic fresco without bowing to its limitations. Since the end of the Renaissance period, with the increasing separation in interests of painter and architect, a great majority of mural decorations have been executed for buildings already in use, making fresco inconvenient. In addition, reinforced concrete construction is chemically inimical to fresco unless elaborate precautions are taken to insulate the fresco plaster from metal or concrete. Oil paint as a medium is sensitive not only to free alkali from plaster, but also to moisture; careful priming is necessary. Also to be considered is the fact that many modern buildings are relatively impermanent; a work of art which is an integral part of the structure is difficult to save when it is torn down. It is little wonder that the French method of *marouflage* has been used by modern muralists for many years: affixing to a wall a canvas previously painted in the studio. This practice has indeed often obscured the difference between easel and mural painting; many a mural has been executed by an artist who may never have seen the building in which it would go, and who might be only vaguely aware of the color and scale of the rooms or walls involved. This is said to be true of the murals done by Puvis de Chavannes for the Boston Public Library, and of the abstractions more recently contributed by Fernand Léger to the auditorium of the United Nations building in New York City.

The first true mural paintings executed in the United States were those done by John La Farge for the Trinity Church in Boston in 1876. With the work of this painter and his group began the development of American mural painting as a consciously distinct art. Associated with La



Courtesy Museum of Modern Art

José Clemente Orozco (Mexican, 1883–1949) at work on the six-panel fresco, "Dive Bomber and Tank," in 1940.

Courtesy Museum of Modern Art

The completed "Dive Bomber and Tank" mural by Orozco.

Mural painted by Per Krohg (1889–), the Norwegian artist, for the Security Council chamber. The decoration and fittings of the room were offered as a gift to the United Nations by the Norwegian government.

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Farge in this enterprise and others were William Morris Hunt, Edwin Austin Abbey, Henry O. Walker, Kenyon Cox, John Singer Sargent, and Edwin Blashfield. In his book, *Mural Painting in America* (1913), Blashfield stresses the debt of American mural painters to the training of Paris and the continued study of Renaissance masters, as well as modern influences like their favorite, de Chavannes.

These painters borrowed not only the style, but also the systems of symbols used by classic and European muralists. Greek and Roman deities or Biblical personages sometimes appear incongruous as symbols for forces of the modern world. Figures from American history in classic garb or in classic nudity appear in many mural paintings of the time. Only in later years did costumes of the period become acceptable in monumental works.

After admitting the neoclassic and eclectic nature of this first American school of mural painting, Blashfield goes on to say: "The style of Perugino and Pinturricchio is very beautiful, and may be used to great advantage in America, but it is not final; no style is." With public approval of the work of this group, which appeared in the 1891–1893 Columbian Exhibition in Chicago, their style became established in spite of Blashfield's wise prediction. So long as America's leading architectural firms were dominated by the official style of the French Beaux-Arts Academy, mural painting in large public buildings conformed to the classic-baroque tradition, even after most easel painters had long since discarded it.

As European styles of painting changed, so did those of America, and American mural painting responded, although slowly. Romanticism, with emphasis on emotion, is reflected in the works of John Singer Sargent. Impressionism, characterized by concern for atmosphere and light, is well represented in American mural painting by the works of the followers of the Englishman, Frank Brangwyn. But Cubism and Expressionism often involving obscure personal symbolism and formal ideas not yet understood by the public were for some time confined to the field of easel painting.

In the 1920's, attention was once more focused upon monumental mural painting by a group of artists for whom the Mexican revolution provided both theme and opportunity. The first important murals done by Diego Rivera appeared in the Mexican National Preparatory School, executed in encaustic. Here also José Clemente Orozco painted his first great frescoes. Work by David Alfaro Siqueiros, also done at this time, represented a successful attempt to combine fresco with encaustic. In spite of his unquestioned powers, Siqueiros' work displays a revolutionary violence and indifference to the accepted limitations of true mural work as to technique, form, and content.

These ambitious works were only the first of a tremendous series of monumental decorations by Mexican painters. Rivera and Orozco also executed commissions in the United States, among which are those by Orozco at Detroit and at Pomona College in California, and by Rivera in the Stock Exchange of San Francisco. Rivera's projected frescoes for Rockefeller Center in New York City were never completed because of a disagreement with his sponsors regarding a representation of Lenin in the design.

This fresh impetus given to mural painting by the work of the Mexican painters strongly influenced many artists of the United States for the duration of the government art projects set up in the 1930's under the Roosevelt administration. An unexampled flow of many kinds of art work was produced, much of which took permanent form as mural decoration in public buildings throughout the country. On the Pacific slope, notably, muralists made use of rediscovered antique methods of architectural decoration, such as mosaic in its many forms, and the unique cut stone work, or *opus sectile,* to be seen in the Alameda County Court House, Oakland, California.

The Public Works of Art Project of the Treasury awarded commissions through competitions in which a large number of competent artists participated. Among the works thus produced are the murals by Anton Refregier for the Rincon Branch of the Post Office at San Francisco. These consist of a series of casein paintings which may well be accepted as a norm of modern mural style. They present various symbols of the social progress of the State of California in a manner which is both contemporary and eclectic in the best sense.

Under the Federal Art Project of the Works Progress Administration appeared many other works, such as the highly praised murals by Philip Guston, *Maintaining America's Skills,* for the New York World's Fair.

Although government art sponsorship lasted for only eight years, by this encouragement so many artists received training in mural painting, and understanding and public demand were so increased, that opportunity for the contemporary muralist in the United States has been greatly expanded. Almost no public building of any pretensions is now planned without considering the desirability of integrated architectural decoration, whether sculpture, mosaic, inlaid stone or true mural painting.

See also AMERICAN ART; ARCHITECTURE; ART; PAINTINGS OF THE GREAT MASTERS; UNITED STATES—*Art and Architecture.*

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MURANO, mōō-rä'nô, town in the Province of Venice and situated on an island in its

lagoons, one and a half miles north of Venice. It contains the very ancient basilica, San Donato Cathedral, which was repaired as early as the 12th century; a 16th century Renaissance church (San Pietro Martire) with its altar painting by Bellini. The town has for centuries been world-renowned for its glass industry (see GLASS), the wonderfully artistic delicate blown-glass ware being highly valued in the collections of connoisseurs. It also has a glass-industries museum. The noted Venetian pearls also are manufactured here. Consult Molmenti, 'Le isole della Laguna Veneta' (Venice 1895).

MURAT, mü-rä, **Joachim,** French marshal and some-time king of Naples: b. Bastide, Lot, France, 25 March 1771; d. Pizzo, Calabria, Italy, 13 Oct. 1815. He was the son of a prosperous innkeeper of La-Bastide-Fortunière, near Cahors, France, and had a remarkable career. While studying for the priesthood at Toulouse he enlisted in a cavalry regiment but was soon dismissed for insubordination. He served in the constitutional guard of Louis XVI; then entered the 12th regiment of mounted chasseurs and rose by his zealous Jacobinism to the rank of lieutenant-colonel. He attached himself to Napoleon in 1795, and followed him to Italy and to Egypt. In these campaigns he frequently distinguished himself, and in 1799 Napoleon appointed him general of division. He clung close to the great leader and returned to France with him from the disastrous Egyptian campaign. At a time when everything depended on prompt action he rendered Napoleon most valuable service by dispersing the Council of Five Hundred at Saint Cloud, on the memorable 18th Brumaire. In gratitude and as a reward Napoleon entrusted him with the command of the Consular Guard, and shortly after (20 Jan. 1800) gave him his youngest sister, Caroline, in marriage.

Murat had command of the cavalry at the battle of Marengo and expelled the Neapolitans from the Papal States. In 1803 he was made a member of the *Corps Legislatif*, and in 1804 was the governor of Paris. On the establishment of the Empire Murat became one of the popular idols, and was showered with honors. He was made marshal of the empire, grand-admiral, and prince of the imperial house. His services in the campaign of 1805 against Austria, in which he entered Vienna at the head of the army, were rewarded in 1806 with the grand-duchy of Cleves and Berg. He participated in the battles of Austerlitz, Jena, Eylau and Friedland. In the war of 1806 with Prussia, and of 1807 with Russia, he commanded the cavalry, and in 1808 he commanded the French army which occupied Madrid, and quelled the insurrection there in May. He expected to receive the crown of Spain, as Charles IV had invested him with royal authority; but Napoleon, who destined Spain for his brother Joseph, placed him on the throne of Naples, 15 July 1808. He then took the title of Joachim I. Ferdinand IV (q.v.), however, continued to rule in Sicily under English protection. Murat proved a beneficent king and instituted some reforms, but he was, after all, but the tool of Napoleon. He shared the hardships and reverses in the disastrous Russian campaign of 1812, and returned to Naples discouraged and discontented. In 1813 he again fought for Napoleon, whose cause he deserted after the battle of Leipzig. He entered into a treaty with England and Austria in 1814 which guaranteed him his throne on condition that he would join the coalition against Napoleon. He pretended to keep this treaty by attacking Eugène Beauharnais in a half-hearted manner. He took up arms again in 1815 for Napoleon; but being defeated by Generals Neipperg and Bianchi he was forced to leave Italy, and took refuge in Toulon. His offers of aid were spurned by Napoleon. After the overthrow of Napoleon he escaped to Corsica, declining the offer of an asylum in Austria which was made to him by Metternich, and set sail for the Neapolitan territory with a view to the recovery of his kingdom. He foolhardily landed at Pizzo on 8 October, but was immediately captured, tried by court-martial, condemned and shot. Murat was vain, unstable and full of ambition. As a cavalry leader his dashing bravery inspired his men with almost superhuman courage. As king, he proved himself sincerely eager to initiate genuine reforms, and did much to abolish banditry. Consult Attridge, A. H., 'Joachim Murat' (New York 1911); Espitalier, A., 'Napoleon and King Murat, 1808–15' (New York 1911); Helfert, 'Joachim Murat, seine letzten Kämpfe und seine Ende' (Vienna 1878); Johnston, C. H. L., 'Famous Cavalry Leaders' (Boston 1908); Johnston, R. M., 'Napoleonic Empire in Southern Italy' (2 vols., New York 1904); Lumbroso, A., 'Correspondance de Joachim Murat' (Milan 1899); Murat, Count, 'Murat, lieutenant de l'empereur en Espagne' (Paris 1897); Romano, G., 'Ricordi muratiani' (Pavia 1890); Sorel, A., 'L'Europe et la révolution française' (8 vols., Paris 1885–92).

MURAT, Napoleon Achille, French American author: b. Paris, 21 Jan. 1801; d. Wasceissa, Leon County, Fla., 15 April 1847. He was the son of Joachim Murat, king of Naples, and before his father's overthrow bore the title of Prince of the Two Sicilies. When his father lost the throne he sought refuge in Austria, where he received his education. In 1821 he came to the United States, and after an extended tour through the country bought a large estate and settled near Tallahassee, Fla., where he devoted himself to farming and literary work; he also gave largely to and was active in philanthropic enterprises. He became a United States citizen, and in 1824 was made alderman of the city of Tallahassee, in 1825 mayor and in 1826 postmaster. He accompanied Lafayette during most of his visit to the United States. He married, in 1826, Mrs. Catherine Gray, a daughter of Byrd C. Willis of Virginia and a grandniece of Washington. He refused many offers of political advancement, and lived quietly on his estate. In 1828 he published in the Paris *Revue Trimestrielle* a series of letters on political parties in the United States, which were later published as 'Lettres d'un Citoyen des Etats Unis à ses Amis d'Europe'; in 1838 he published 'Esquisses morales et politiques sur les Etats Unis d'Amérique'; and 'Exposition des Principes du Gouvernement républicain tel qu'il a été perfectionné en Amérique' (Exposition of the Principles of Republican Government as Perfected in America). This latter work was very popular

among those of republican sympathies in Europe, was translated into several different languages and passed through over 50 editions. Consult MacConnell, 'The Prince and Princess Achille Murat in Florida' (*Century Magazine*, New York 1893).

MURAT, Napoléon Lucien Charles, Prince of Ponte Corvo, French politician, second son of Joachim Murat: b. Milan, 16 May 1803; d. Paris, 10 April 1878. He left Italy for Austria with his mother in 1815; started for the United States in 1824 to join his uncle Joseph, but was shipwrecked on the Spanish coast, and held prisoner for a time; arrived in Boston in 1825; and in 1827 married an heiress of Bordentown, N. J., Georgina Fraser, who was soon afterward reduced to school teaching for her living. Murat returned to Paris in 1848, sat in the Constitutional Assembly and in the Legislative Assembly (1849), was Minister to Turin (1849–50), had his debts paid and received a pension of $30,000 a year under Napoleon III, and in 1859–60 made a feeble claim to the crown of Naples, but received no support from France. His vote in the Senate, where he sat from 1852 to 1870, for the temporal power of the Pope, alienated from him the French Freemasons, whose grand-master he had formerly been. He retired to private life after the revolution of 4 Sept. 1870.

MURATORIAN FRAGMENT, or **CANON OF MURATORI,** a fragment from an ancient Bible treatise discovered in the Ambrosian Library at Milan by Lodovico A. Muratori and published (1740) in his 'Antiquitates italicæ.' It contains an imperfect list of the books in the New Testament, and is considered highly important as testimony of at least a list of some of the works considered canonical at the time of writing, which is supposed to be late in the 2d century. The much-damaged documentary fragment is in barbaric Latin, probably translated from the Greek. The books are named in their order and start with mention of the Gospel of Saint Mark on its first line which is broken and probably contained mention of Matthew as Saint Luke's Gospel is mentioned as third. Saint John, the Acts, 13 epistles of Saint Paul are cited (omitting Epistle to the Hebrews), the Revelation of John, Jude, two epistles of John (James is omitted, also Peter), but the Apocalypse part of John and that of Peter are accepted, as is also Wisdom of Solomon as being written by his friends. A translation is to be found in H. W. Gwatkins, 'Selections from Early Christian Writers' (New York 1893) and Lietzmann's 'Kleine Texte für theologische Vorlesungen, No 1' (Bonn 1902). Consult Kuhn, 'Das muratorische Fragment' (Zürich 1892); Tregelles, 'Canon Muritorianus' (Oxford 1867).

MURAVIEFF, moo-rä-vē-ĕf', Russian noble family, originally settled in the grand-duchy of Moscow, but in 1488 receiving from Ivan Vassilievitch holdings in Novgorod. Its chief members are Nikolai Jerofeyevitch, d. Montpellier 1770, governor of Livonia and author of the first Russian algebra. Mikhail Nikititch, b. Smolensk, 25 Oct. 1757; d. Saint Petersburg, 29 July 1807; was chosen tutor to the grand-dukes Alexander and Konstantin in 1785, rector of the University of Moscow (1796), and Secretary of State to the Ministry of Public Instruction (1801); and wrote a manual of ethics, which is classic in Russia (1810, 1815). Nikolai Nikolaievitch, son of the governor of Livonia: b. Riga, 1768; d. Moscow, 1 Sept. 1840; was educated at Strassburg; entered the navy 1788; was captured in 1790; was transferred to the army in 1796; and from 1797 to 1823, with the exception of service against Napoleon in 1812–14, he was at the head of a private military school near Moscow, which was bought by the government in 1816. His son, Alexander Nikolaievitch, b. 1792; d. Moscow, 1864; was sent to Siberia for his part in the conspiracy of 1825; was pardoned; served in the Crimean War and became major-general; and as governor of Nijni Novgorod did much for the abolition of serfdom. Another son, Nikolai Nikolaievitch, b. Saint Petersburg, 1793; d. there, 4 Nov. 1866; entered the army at 17; served in the Caucasus; was sent to Khiva 1819; distinguished himself in the war with Turkey, 1828–29, and in the Polish campaign, 1831; in 1832 treated with Mehemet Ali; was disgraced and retired in 1838, but reinstated in 1848; and in 1855 commanded the army in the Caucasus, taking Kars. He wrote a valuable book about his travels in Khiva (1822), and on the campaign in the Caucasus in 1855 (1876). His brother, Mikhail Nikolaievitch, b. 1795; d. Syrez, near Luga, 10 Sept. 1866; fought against France (1812–13); took part in Decembrist uprising and was jailed for five months; became major-general in 1830; was military governor of Grodno; was a member of the Council of State, 1850–62; opposed the emancipation of the serfs; used such cruelty in putting down a student rising in 1861 that he was forced to resign; but in 1863 was sent to Wilna as governor-general, and won from the Poles the name of the Hanger or Executioner by his pitiless severity; and in 1866 was president of the commission which examined Karakasoff, who attempted to assassinate Alexander II. His memoirs were published by his grandson, Mikhail Nikolaievitch, b. 7 April 1845; d. 21 June 1900; Ambassador to Berlin (1885), to Copenhagen (1893); and from 1897 to his death Foreign Minister. He did much to solve the Cretan question, published the invitaton to The Hague Peace Conference (1898), and forwarded Russia's interests in China. Another Nikolai Nikolaievitch, Count Muravieff Amursky, b. Saint Petersburg, 1809; d. Paris, 19 Nov. 1881; fought in the war with Turkey, 1828–29; became governor-general of eastern Siberia in 1847; in 1858 concluded the Treaty of Aigun with China, by which Amur was ceded to Russia, and thus won the title Amursky; and in 1859 arranged a treaty with Japan at Yeddo. The last 20 years of his life were spent in Paris. The Muravieff-Apostol branch of the family, so called because of its intermarriage with that of Apostol, a Cossack hetman, is most prominently represented by Ivan (1769–1851), who translated Aristophanes, Horace, Sheridan, etc., into Russian: and by his son Sergei (1796–1826), who took part in the conspiracy of 1825 and was executed in Saint Petersburg.

MURCHISON, mẽr'kĭ-sŏn, Sir **Roderick Impey,** Scottish geologist: b. Tarradale, Ross,

Scotland, 19 Feb. 1792; d. London, 22 Oct. 1871. He was educated at the military college in Great Marlow and at the University of Edinburgh; entered the army in 1807 and served under Wellington in the Peninsular campaign, but retired from the army with the rank of captain of dragoons in 1815. He then took up the study of science at the advice of Sir Humphry Davy and spent years in scientific investigations, particularly in that of geology. In 1825 he became a member of the Geological Society of London, of which he was president in 1831–32 and in 1842–43. His investigations extended through France, England and Wales and he reclassified Palæozoic rocks, giving to his new system the name Silurian in 1835. He also identified the Devonian system. In 1841 he was commissioned by Emperor Nicholas to make a geological survey of Russia and was engaged in that work until 1844, making discoveries which enabled him to present to the scientific world the Permian system. He was one of the founders of the British Association for the Advancement of Science and presided over it in 1846. He was several times elected president of the Royal Geographical Society and from 1862 until his death was continuously re-elected. In 1855 he was appointed director of the British Geological Survey. He was knighted in 1846, became a knight commander of the bath in 1853 and a baronet in 1863. The Emperor of Russia conferred on him the grand crosses of Saint Anna and of Saint Stanislaus. He published 'Geology of Cheltenham' (1834); 'The Silurian System' (1839); 'Geology of Russia in Europe and in the Ural Mountains' (1845); 'Geological Atlas of Europe' (1856), etc. Consult Geikie, 'Memoir of Sir Frederick Murchison' (1875).

MURCHISONITE, a flesh-red variety of the mineral orthoclase, which exhibits golden-yellow reflections when viewed from certain directions. It occurs at Dawlish and Exeter, England, and is named for its discoverer, Sir Roderick I. Murchison.

MURCIA, mėr'shĭ-ą (Sp. moor'thē-ä), Spain, the capital of the ancient kingdom and modern province of same name, 30 miles northwest of Cartagena, on the Segura, which divides the town into two unequal portions, connected by a handsome bridge. The city is surrounded by a brick wall and is entered by three principal gates. The streets are generally broad, straight and well paved. Among the public buildings the most important is the cathedral, its principal façade a fine combination of Corinthian and composite architecture. It was begun in 1353. In the plaza stands the capacious episcopal palace, built in 1752, one of the finest edifices of its class in Spain, and in close proximity to it the colleges of Saint Fulgentius and Saint Isidore, which form one range of buildings. The bishop takes his title from Cartagena, from which town the see was transferred. The other public edifices and institutions consist of the College of Saint Leander, which is an academy of music connected with the cathedral; the hospital of Saint John, with which is connected a hospital for convalescents; a house of refuge, a foundling hospital, the town-house, an institute for advanced education, a school of design, an ecclesiastical seminary, several nunneries, a bullring, two theatres, an old Moorish granary and a good botanical garden. There are manufactures of coarse cloths and baize of different colors; of silk-stuffs, especially taffeta and plush; linens, hats, gloves, saltpeter; also silk spinning-mills, dye-works, potteries, tanneries, soap-works and about 30 flour-mills. Considerable commerce is carried on in silks and other manufactures, as well as in grain, etc. Pop. about 150,000.

MURDER. See HOMICIDE.

MURDOCH, mėr'dŏk, **James Edward,** American actor: b. Philadelphia, Pa., 25 June 1811; d. Cincinnati, Ohio, 19 May 1893. He made his début as an actor in Philadelphia in 1829, playing Frederick in 'The Lover's Vow,' and in 1833 acted with Fanny Kemble during her American tour. In 1838 he appeared in New York as Benedick in 'Much Ado About Nothing.' He played Pythias to Edwin Forrest's Damon and in 1842 retired from the stage to study. He reappeared in New York in 1845 as Hamlet and for 15 years played with considerable success in the United States and England. During the Civil War he devoted himself to caring for the wounded soldiers and in giving entertainments for their benefit. Later he became professor of elocution at the Cincinnati College of Music. His best rôles were Hamlet, Mercutio, Benedick and Claude Melnotte, in which he had few equals. He published with William Russell 'Orthophony' (1845) and 'The Stage' (1885).

MURDOCK, Joseph Ballard, American rear-admiral: b. Hartford, Conn., 13 Feb. 1851; d. Manchester, N. H., 20 Mar. 1931; graduated from U. S. Naval Academy (1870); served on North and South Atlantic stations (1870–74); and was carrying out coast surveys from 1875–79. From 1880–1903 he was instructor of physics at the naval academy. During the Spanish-American War he was executive officer of the *Panther* and became a commander in 1901, captain in 1906, rear-admiral 1909. He commanded the *Rhode Island* in the cruise of the fleet (1907–09) around the world and was commandant at the navy yard, New York, from 1909–10, having command of the second division Atlantic fleet (1910–11), and was commander-in-chief, United States Asiatic fleet (1911–12), retiring 1913. He wrote 'Notes on Electricity and Magnetism' (1884). He was recalled to active service in 1918, and in 1921 and 1923 served in the New Hampshire legislature.

MURDOCK, Victor, American legislator: b. Burlingame, Kan., 18 March 1871. He was educated at the common schools and at Lewis Academy, Wichita, and became managing editor of the Wichita *Daily Eagle* (1894–1903). He was elected a Republican to the 58th Congress in 1903, re-elected for 59th to 63d Congresses (1905–15) for the 8th Kansas district and was a member of the Federal Trade Commission from 1917 to 1924. In 1918 he was appointed member of the Meat Commission of the United States government. He joined the Progressives and was chairman of the Progressive National Committee from 1914–16. He wrote 'China the Mysterious' (1920); 'Folks' (1921).

MURDOCK, William, Scottish inventor: b. Bellow Mill, near Old Cumnock, 21 Aug. 1754; d. Sycamore Hill, near Soho, 15 Nov.

1839. He went in 1777 to Birmingham, where he obtained employment in the famous engineering establishment of Boulton and Watt, located in the industrial suburb of Soho. A demand for Watt's pumping engines came from the Cornish mines and Murdock was soon sent there to superintend the erection and fitting of these engines. In 1800 he was made manager of the works of Boulton and Watt, later becoming a partner.

His invention of coal-gas lighting remains his most conspicuous achievement. In 1792 he began his experiments regarding the illuminating properties of gases produced by distilling wood, peat, and coal. By 1800 he had an experimental gas apparatus in operation at Soho, and in 1802 this form of illumination was employed to celebrate the news of the Peace of Amiens. In 1803 the Boulton and Watt foundry was regularly lighted by that means.

In February 1808, Murdock read before the Royal Society a paper detailing his investigations. Gaslighting fell into the hands of promoters, and in 1809 Murdock was compelled to publish a vindication of his claims in "A Letter to a Member of Parliament." It has been asserted that he invented the steam locomotive, but the three engines he made did not materialize.

MUREX, mū'rĕks, a genus of gasteropod mollusks typical of the family Muricidae, resembling the whelk; shell spiral, rough, with three or more ranges of spines simple or branched. Murices are remarkable for the beauty and variety of their spines. They were in high esteem from the earliest ages on account of the purple dye that some of them yielded. *M. pomum,* which is not so spiny as some of its congeners, is found on our coasts from Cape Hatteras to Texas. It is two to three inches long. The oyster drill (*Urosalpinx cinerea*), which uses its buccal ribbon to bore into oyster shells, is closely allied to *Murex.* See also PURPLE SHELL.

MUREXIDE, mû-rĕk'sīd, in chemistry, the hydrogen-ammonium salt of a hypothetical acid called purpuric acid, the acid itself not being known in the free state. Murexide has the chemical formula $C_8H_4O_6N_5NH_4.H_2O$; about 1855 it was largely used as a dye. The colors that it gives are fast so far as light is concerned, and are quite brilliant; but they tarnish quickly when exposed to sulphur dioxide gas, and hence are more or less fugitive in houses where coal gas is burned. As a dye, murexide has now been replaced by coal-tar colors. It may be prepared by oxidizing a mixture of uric acid with nitric acid, evaporating to dryness and moistening the reddish residue with ammonia or ammonium carbonate. The beautiful purple red of murexide is at once developed. This reaction is used in urine analysis as a test for uric acid. Murexide crystallizes in short four-sided prisms, brownish red in color with green and yellow iridescence, dissolves in water to a beautiful purple solution, the color changing to blue upon the addition of potash. The commercial supply of murexide, when it was used as a dye, was prepared from the uric acid of guano. A dye similar to murexide, and perhaps identical with it, was obtained by the ancients from a gland of the murex, or purple-fish, whence the name "murexide."

MURFREE, mûr'frē, **Mary Noailles,** nō-ī', (pseudonym CHARLES EGBERT CRADDOCK), American novelist: b. near Murfreesboro, Tenn., Jan. 24, 1850; d. there, July 31, 1922. Except for a few years in St. Louis, her life was spent in her birthplace. Her careful studies of life in the mountains of Tennessee, where her summers were usually spent, are reflected in nearly all of her books. Her earliest short stories appeared in the *Atlantic Monthly* in 1878 and were followed by others over the signature of "Charles Egbert Craddock." In 1884 these stories were published under the title *In the Tennessee Mountains* (q.v.). Until her identity was revealed in 1885, they were supposed to be the work of a masculine writer.

Miss Murfree's other works include: *Where the Battle Was Fought* (1884); *Down the Ravine* (1885); *The Prophet of the Great Smoky Mountains* (1885); *In the Clouds* (1886); *The Story of Keedon Bluffs* (1887); *The Despot of Broomsedge Cove* (1888); *His Vanished Star* (1894); *The Mystery of Witch-Face Mountain* (1895); *The Phantoms of the Foot-Bridge and Other Stories* (1895); *The Young Mountaineers* (1897); *The Story of Old Fort Loudon* (1899); *A Sceptre of Power* (1903); *Storm Centre* (1905); *The Windfall* (1907); *The Fair Mississippian* (1908); *The Story of Duciehurst* (1914).

MURFREESBORO, mûr'frēz-bûr-ō, city, Tennessee, seat of Rutherford County; altitude 575 feet; on the West Fork of Stones River; served by the Nashville, Chattanooga and St. Louis Railroad; 33 miles southeast of Nashville. It also has an airport. The city is the central shipping point for an agricultural region. Nearby are cedar forests. The making of buckets and churns is a local industry, along with the processing of dairy products and the manufacture of rayon, silk, and hosiery. The city is the seat of Middle Tennessee State College. Rutherford Hospital is maintained by the county and is headquarters for a child health demonstration unit.

Murfreesboro was founded in 1766. From 1819 to 1825 it was the capital of the state. An important battle of the Civil War was fought here (see STONES RIVER, BATTLE OF). The battlefield is now the Stones River National Military Park. Water, power, and lighting systems are municipally owned. The city is governed by a mayor and council and has a city manager. Pop. (1940) 9,495; (1950) 13,052.

MURGER, mür-zhā', **Henri,** French poet and novelist: b. Paris, March 24, 1822; d. there, Jan. 28, 1861. For a time he was secretary to Count Aleksei K. Tolstoy. Of his career from 1838 to 1847 almost nothing is known. He was a member of an informal group of unconventional and impecunious young artists and authors who called themselves Bohemians, a name famous in general literary history. He contributed much material to numerous periodicals and at last made a reputation by his *Scènes de la vie de bohème,* which appeared serially in *Le Corsair,* 1847–1849, and in book form in 1851. In these sketches the character Rodolphe represents Murger himself. The book was dramatized in 1849 in collaboration with Théodore Barrière and served as the basis of Puccini's opera *La Bohème* (1896). Murger also wrote dramas for the Luxembourg Theatre and articles for the *Revue des Deux Mondes.* Other works are *Scènes de la vie de jeunesse* (1851); *Le Pays Latin* (1851); *Le Dernier*

rendezvous' (1852); and 'Les buveurs d'eau' (1854). Many of his lyrics are very beautiful and have been translated by Andrew Lang in 'Ballads and Lyrics of Old France' (London 1872), and his prose works, especially his masterpiece, are characterized by rare humor and pathos. His general influence, however, was unhealthy, and he personally sank into the depths of dissipation and died in a charity hospital. When a monument was lately erected to his memory there was a considerable amount of protest. Consult the appreciation in Saintsbury's 'Essays on French Novelists' (1891) and that by his fellow Bohemians in 'Les huits d'hiver' (Paris 1862). See BOHEME, LA.

MURGHAB, moor-gäb', a river of central Asia, which rises on the northern frontier of Afghanistan, in the Paropamisus Mountains, and after a northwestward course of nearly 400 miles loses itself in the desert sands surrounding the oasis of Merv.

MURIACITE. Same as ANHYDRITE (q.v.).

MURIATIC ACID. See HYDROCHLORIC ACID.

MURICHI, or **MORICHI,** a South American palm of the genus *Mauritia* (*M. flexuosa*), also known as ita-palm; it is nearly related to the *buriti* (q.v.) or wine-palm. These palms reach a height of 100 to 150 feet and grow along the Orinoco River, forming great forests near its mouth. It furnishes to the Indians of that region almost everything; and during much of the year, when the lowlands adjacent to the river are flooded, they dwell among its branches, like monkeys, for want of dry land upon which to rest or travel. «At the time of the inundations,» says Humboldt, «the tufts of the fanleaved murichi present the appearance of a forest issuing from the bosom of the waters. The navigator, traversing at night the branches of the Orinoco delta, sees with surprise the crowns of these palms lighted up by large fires. These are the habitations of the Guaranis suspended from the trunks of the trees. These people stretch mats in the air, fill them with earth and on this bed of wet clay light what fires they require for household purposes. For ages they have owed their liberty and political independence to the treacherous and miry nature of their soil, which they traverse in seasons of drought and over which they alone know how to pass in safety; to their isolation in the delta of the Orinoco, and to their living in the trees.» Consult von Humboldt, 'Voyage aux Régions Equinoxiales,' Vol. VIII (1807–27).

MURIDÆ, the family of mice and rats (qq.v.).

MURILLO, mū-rĭl'ō (Sp. moo-rēl'yō), **Bartolomé Estéban,** bär-tō'lō-mā ās-tā'bän, Spanish painter: b. Seville, 31 Dec. 1617; d. there, 3 April 1682. He began his art education under Juan del Castillo, and in 1642 sought wider experience in Madrid, where his townsman Velasquez was enjoying a brilliant career. By the latter he was dissuaded from a contemplated visit to Rome and secured facilities for studying in the Royal Galleries and in the Escorial. Here he placed himself for three years under the inspiration of Ribera, Titian, Rubens, Vandyke and Velasquez himself. In 1645 he returned to Seville where he undertook to paint 11 separate pictures for the cloister of Saint Francis in illustration of Franciscan history. These works proved the foundation of his renown. The principal pieces of this series are 'Saint James Distributing Alms' (now in the Academy Fernando, Madrid); the so-called 'Angel Piece' (in the Louvre); 'The Death of Saint Clara' (in the Dresden Gallery). These strike the note of the early Seville school, being warm in tone, and exhibit Murillo as drawing his types of beauty from the lower orders of the Spanish people. Of even more transparent coloring are his 'Saint Leander and Isidore' in the sacristy of the cathedral at Madrid; 'The Birth of Mary' (in the Louvre); and the 'Vision of Saint Anthony' (in Seville Cathedral, 1656); both of these latter belong to the middle period of his artistic development. In 1665 he began his four pictures for the church of Santa Maria pa Blanca, among them being his 'Church Triumphant'; 'The Immaculate Conception' (in the Louvre); and 'The Foundation of the Church of Santa Maria Maggiore at Rome' (in the Madrid Academy). In 1668 he painted his 'Madonna Hovering in the Clouds Surrounded by Eight Saints of Seville' (in the chapter-house of Seville Cathedral); and about 1670 his 'Holy Family with Elizabeth and The Infant Baptist' (in the Louvre). His most brilliant period was between 1670 and 1680; and in 1674 he had completed the eight vast pictures illustrating the 'Corporal Works of Mercy.' These were intended for the church of the Caridad Hospital, and are remarkable for splendor of coloring and strength of design; the faces are lifelike in expression and the composition and perspective faultless. His 'Saint Elizabeth of Hungary Nursing the Sick' (in the Madrid Museum) belongs to this period. In 1676 he executed 20 pictures for the Capuchin monastery at Seville, 17 of which are now in the local museum. It was at this time he painted the famous 'Immaculate Conception' which Maréchal Soult took to France and sold to the nation for 615,000 francs. It is now in the Louvre, and is the work by which this painter is most popularly known. While Murillo was engaged at Cadiz in painting 'The Betrothal of Saint Catherine' for the high altar of the Capuchin Church, he fell from the scaffolding and died as the result of his injuries. The work was completed by his pupil Osorio with no particular success.

Murillo left about 400 pictures, including his devotional paintings and the many representations of the 'Immaculate Conception,' one of his favorite and characteristic subjects. His most important works in the United States are the altar-piece in the cathedral of Saint Peter's at Cincinnati and 'Gallegas at the Window' in the Widener collection, Philadelphia. He was the greatest of Spanish religious painters because his Madonnas are real Spanish women and only raised by the magic of his brush into sainthood or apotheosis. But he was a great genre painter also. He knew the gypsies and beggars of Spain as well as he knew the saints. He could paint landscape and portrait, flowers and fruit, maidens and children of that Seville which he loved so well and never left for France or Italy. Unswayed by the influence of the dazzling schools of Tuscany or Flanders

he has confined himself to Spanish faces, to Spanish atmosphere and scenery, and has realized a manner and color of his own. If he sacrificed in this way anything of vigor or variety he gained far more in originality, sincerity, verisimilitude and an individuality which is truly national.

Consult Calvert, A. F., 'Murillo, a biography and appreciation' (New York 1907); Hurll, E. M., 'Murillo' (Boston 1901); Tubino, F. M., 'Murillo, su epoca, su vida, sus quadros' (Seville 1864); Lefort, P., 'Murillo et ses élèves' (Paris 1892).

MURLIN, Lemuel Herbert, American clergyman: b. Mercer County, Ohio, 16 Nov. 1861. He was graduated (1891) at De Pauw University and studied (1896) at the University of Pennsylvania and (1897) at Clark University, then in Europe (1898). He received the degree B.D. at Garrett Biblical Institute (1899). He was teacher at the public schools and in Fort Wayne College (1877–86), pastor of churches in Fort Wayne, Knightsville and Vincennes, Ind. (1886–94). From 1894–1911 he was president of Baker University, Baldwin, Kan., and president of Boston, Mass., University from 1911 to 1925. He was (1925–28) president of De Pauw University. During 1909 and 1911 he was acting pastor of the American Church at Berlin and pastor 1928–29; member of the General Conferences of the Methodist Episcopal Church in 1900, 1904 and 1916 and of the Ecumenical Conferences at London (1901), Toronto (1911) and London (1921). He is a member and officer in many educational associations and was chairman of the Governor's Commission of Higher Education in Massachusetts.

MURMAN COAST, the Arctic coast of North Russia, between Norway and the White Sea, forming the northeastern part of the Kola Peninsula. The western part is deeply indented; the eastern more regular. The town of Alexandrovsk or Murmansk, with an ice-free harbor, became a considerable community during the World War. It was connected with Petrograd by a railway, and was used as a resort by refugees from Russia and Finland. When Russia ceased to become an active participant in the war on the side of the Allies, Archangel was abandoned as a port for unloading provisions and war materials, and the Murman Coast was utilized for that purpose. With the spreading anarchy, promoted by the Soviet Government, and the German encroachments on Russian territory in 1917 and 1918, Alexandrovsk became an important port. In July, 1918, a British expedition was sent to the Murman Coast to prevent the Germans then in Finland from using it as a submarine base. It remained until September, 1919. During the last months of the war the Germans planned, with their supporters in Finland, to send an important expedition against this coast. The Armistice intervened before the initial steps could be taken. In the absence of an effective government in Russia the isolated position of Alexandrovsk and its long distance from the centres of turmoil enabled the Allies to keep unofficially in touch with the country. In 1919 the Soviet Government gained control of the coast and organized it as a part of the Soviet Republic.

MURNER, moor'nĕr, **Thomas,** German satirist and opponent of the Reformation: b. Strassburg, 24 Dec. 1475; d. about 1536. He studied at the principal universities of Europe, devoting himself particularly to theology and philosophy, and early gained a reputation for ability, marred however by a quarrelsome disposition. He led an unsteady life, preaching for some time at Frankfort-on-the-Main and other places, but incurring generally the displeasure of his congregations by the coarse personalities of his sermons, and was successively expelled from Freiburg, Treve and Venice. He became one of the most virulent opponents of the Reformation. Some of his writings against the Reformation were burned by order of the Diet of Worms; and he was compelled to flee to Switzerland, whence he was in time likewise expelled. The latter part of his history is not known. In 1506 he had been crowned as poet laureate by the Emperor Maximilian; and his 'Narrenbeschwörung' (1512), of which his 'Der Schelmenzunft' (1516) may be regarded as a continuation, is one of the most remarkable imitations of Sebastian Brant's celebrated satirical poem entitled 'Narrenschiff.' He wrote 'Chartiludium logice,' etc. (1507), and other Latin works; prepared a German version of Virgil and other translations; and was also regarded as the editor of 'Eulenspiegel.' But he is chiefly remembered by his writings against Luther and the Reformation. His most celebrated satirical work is entitled 'Von dem grossen Lutherischen Narren' (1522; new ed., 1848). Consult Goedeke, 'Murners Narrenbeschwörung' (1879); Kawerau, 'Thomas Murner und die Kirche des Mittelalters' (1890); Lappenburg, 'Murners Eulenspiegel' (1854); Ries, W., 'Quellenstudien zu Murners satirisch-didakitschen Dichtunzen' (Berlin 1890); Schatz, H., 'Stemmungen und Effekte in Murners Dichtungen' (Kiel 1909).

MUROM, moo'rŏm, Russia, town in the province of Vladimir, located on the Oka and Kovrov-Murom Railway. It has a cathedral, theatre, city bank, high school, etc. Among its industries are large linen weaving factories and trade in grain. This was a very important trading town in the 10th century. Its population is about 22,000.

MURPHEY, Archibald De Bow, American jurist: b. Caswell County, N. C., 1777; d. Hillsboro, N. C., 3 Feb. 1832. He was graduated from the University of North Carolina in 1799 and was for the three succeeding years professor of ancient languages there. He studied law and was admitted to the bar in 1802 and established a large practice. He was a member of the State senate in 1812–18 and proved himself an able legislator, advocating internal improvements and working earnestly to enlarge and improve the educational system of the State. In 1818 he was a judge of the Superior Court and in 1819–20 was a justice of the Supreme Court of North Carolina. He published 'Memoir of Improvements Contemplated and the Resources and Finances of the State' (1819); 'Reports of Cases in the Supreme Court of North Carolina in 1804–13 and 1818–19' (1821–26), etc.

MURPHY, Arthur, British dramatist: b. Clooniquin, near Elpin, County Roscommon, Ireland, 27 Dec. 1727; d. 18 June 1805. He was educated at the Roman Catholic College of

Saint Omer, France, and was subsequently employed in a London banking house. His first drama, which appeared in 1756, was entitled *The Apprentice.* In 1758 appeared *The Upholsterer,* a farce directed against politicians, which proved very successful, followed by *The Orphan of China; The Way to Keep Him; All in the Wrong; The Citizen; The Old Maid; Three Weeks after Marriage; Zenobia; The Grecian Daughter,* etc. At various times in his life he engaged in political controversies, and edited journals opposing Mr. Fox, the first Lord Holland and Wilkes' *North Briton.* He also edited the works of Fielding, wrote an essay on Dr. Johnson, translated Tacitus, and wrote a *Life* of Garrick. His plays are his best performances, and some of them, including *The Way to Keep Him* and *Three Weeks after Marriage,* long kept the stage.

MURPHY, Charles Francis, American politician: b. New York, June 20, 1858; d. there April 25, 1924. He received a public school education, and soon became interested in politics. As organizer and member of the Sylvian Club and through his fame as an athlete he gained a wide personal acquaintance. He opened a series of saloons which he held to be practically poor men's clubs. He showed decided talents as a political organizer and in 1891 became the Tammany leader of his assembly district. In 1897–1901 he was a commissioner of docks and ferries in New York, served for a time as chairman of Tammany Hall and on the retirement of Richard Croker in 1902 succeeded him as chief. In 1903 and 1905 he led his party to victory in the mayoralty campaigns, which elected George B. McClellan as mayor. In 1904 Murphy opposed the nomination of Alton B. Parker for the presidency and in 1906 supported William R. Hearst for governor, the latter's defeat being regarded as a severe defeat for Murphy. In 1909 the Tammany Hall nominee for mayor, W. J. Gaynor, was the only successful candidate on the Democratic ticket, the Fusionists having captured the remaining offices. Many thought that this reverse would compel Murphy's retirement, but to the despair of the political prophets he continued as chief. In 1910 the election of John A. Dix to the governorship was supposed to be due to Murphy's influence with the upstate Democrats and that as a result his power had become paramount in the Democratic Party throughout the state. The succeeding years brought sharp criticism to Tammany and its leader because of several scandals regarding highway and canal contracts. Boss rule now became a state issue and his opponents held up Murphy as an example of everything vicious in the boss system. This, however, came with a bad grace from Republicans, themselves the most notorious upholders of the system. In 1912 Murphy supported Wilson after the nomination of the latter although he favored Harmon and Clark in the early stages of the convention. He was a presidential elector the same year. In state politics it appears that Murphy took little part in the nomination of Sulzer; friction developed after election and Tammany was by many believed to have been the real factor in the impeachment and removal of Sulzer in 1913. The mayoralty campaign of 1913, in which Edward E. McCall was the Tammany nominee, was exceedingly bitter, and Murphy was violently assailed by the Fusionists. In 1917 the Tammany candidate for mayor, Judge Hylan, was elected by a great majority and Murphy's leadership continued unimpaired. Mr. Murphy's philanthropies were extensive, but this side of his character was known to few persons.

MURPHY, Frank, American lawyer, public official, and United States Supreme Court justice: b. Harbor Beach, Mich., April 13, 1890; d. Detroit, Mich., July 19, 1949. Devout Irish parents destined him for the church, and when he failed to enter the priesthood of the church, they ordained him, he said, to the "social priesthood." While in high school and afterwards at the University of Michigan, he worked during vacations on his father's farm and in a starch factory. In the campaign of 1912, two years before his graduation from law school, Mr. Murphy made speeches for Woodrow Wilson. After getting his degree he worked as a law clerk at $13 a week and taught English to foreigners at night for $2 a lesson. In the First World War he was a captain of infantry in France and in the Army of Occupation in Germany.

After the war Mr. Murphy did graduate study in law at Lincoln's Inn, London and at Trinity College, Dublin. When he went back to Detroit to practice, his first important case was one against two army officers and a civilian, in which he was assistant United States attorney. The defendants went to prison. In 1922 he was elected a judge of Detroit's Recorder's Court and created a "sentencing board" consisting of himself, a psychiatrist and a probation officer. He was elected mayor of Detroit in 1930, after a campaign in which the city administration was charged with corruption. In 1931 he was re-elected and faced the problem of feeding thousands of men made jobless by the closing of the automobile plants. He was widely criticized for the cost of the relief given and pioneered for work relief as a federal function, being one of he first advocates of the WPA.

In 1933, President Roosevelt appointed Mr. Murphy governor general of the Philippines, and he remained as high commissioner after the islands were given commonwealth status, until 1936, when he was called home to become the Democratic candidate for governor of Michigan. He was elected and was almost immediately faced with grave labor problems in the form of sit-down strikes in some of the automobile plants. He refused the request of some industrialists to call on the state militia to oust strikers from plants, because, he said, he believed the use of troops would lead to bloodshed. He was severely criticized in certain quarters, and in 1938 was decisively defeated for re-election. President Roosevelt then appointed him attorney general of the United States, and he qualified Jan. 1, 1939. In January 1940 the president appointed him to the United States Supreme Court to succeed the late Justice Pierce Butler, and the Senate confirmed his appointment Jan. 17, 1940. During a 4-months' leave in 1942 he served as a lieutenant colonel in the United States Army. In January 1944 he was appointed chairman of a committee to fight "Nazi persecution and extermination of the Jews." A year later the *American Hebrew Magazine* awarded him a medal as "one of the foremost exponents . . . of the fight against anti-Semitism."

MURPHY, Franklin, American manufacturer and politician: b. Jersey City, N. J., Jan. 3, 1846; d. Newark, N. J., Feb. 24, 1920. His family moved from Jersey City to Newark where he attended the Newark Academy until he was 16. Enlisting in the Federal army in 1862, he took part in 19 battles and left the army as a first lieutenant in 1865. At the close of the war he established at Newark a varnish business which has since become widely known.

Murphy began his political career in the early 1880's, occupying various minor city and state offices until 1901, when he was elected governor of New Jersey for three years. His term as governor was noted for the passage of the first state primary law (not the open primary as invented later), improvement in the child labor laws, and general improvement in labor legislation.

MURPHY, John Benjamin, American surgeon: b. near Appleton, Wisconsin, Dec. 21, 1857; d. Mackinac Island, Michigan, Aug. 11, 1916. He was graduated from Rush Medical College in 1879 and spent from 1882 to 1884 in graduate study at the universities of Vienna, Munich, Berlin, and Heidelberg. Entering practice in Chicago, he soon became known for his achievements in surgery. One of the operations he performed which was of interest to his colleagues was the making of a new jaw from metal and silver wire. In 1892 he devised a metal ball, known as the Murphy button, used for fastening the ends of intestines after a piece had been removed. This was his most outstanding contribution to surgery. As a teacher of clinical surgery, however, he was preeminent. His clinics were of the greatest interest to other surgeons.

MURPHY, John Francis, American painter: b. Oswego, N. Y., Dec. 11, 1853; d. New York, Jan. 30, 1921. With little schooling and artistically self-taught, he opened a studio in New York City in 1875. His first picture to appear in the National Academy of Design was exhibited in 1876, and in 1887 he was elected to the National Academy. His paintings, many of which hang in leading American galleries, are chiefly landscapes. His *Tints of a Vanished Past* won the Haligarten Prize in 1885. Two years later he was awarded the Webb Prize by the Society of American Artists, of which he was a member. In 1910 he was awarded the Inness Medal.

MURPHY, William Parry, American physician: b. Stoughton, Wis., Feb. 6, 1892. He received his undergraduate training from the University of Oregon, his degree in medicine from Harvard University in 1920, and for several years was on the staff of the Peter Bent Brigham Hospital in Boston. He is noted for his research work on diabetes and diseases of the blood. In 1934 he received the Nobel Prize in Physiology and Medicine, along with George H. Whipple and George R. Minot, for his discovery of the liver treatment for pernicious anemia. He is the author of *Anemia in Practice; Pernicious Anemia* (1939).

MURPHYSBORO, mûr'fĭz-bûr-ō, city, Illinois, seat of Jackson County, 24 miles west of Marion on the Big Muddy River, and the Illinois Central, the Missouri Pacific, and the Gulf, Mobile, and Ohio railroads. Situated at an altitude of 420 feet in an agricultural area, it has a large trade in farm and dairy products, and also coal and lumber. It mills flour, refines silica from nearby deposits, and makes shoes, dresses, and beer. It has a public library and a general hospital.

Murphysboro is the birthplace of Gen. John Alexander Logan, the American Civil War soldier and legislator who was the candidate for vice president of the United States on the James Gillespie Blaine ticket in 1884.

Founded in 1843, it was incorporated in 1867. Municipal government is administered by a mayor and council. Pop. (1950) 9,241.

MURRAIN, mûr'ĭn, any widely prevailing and contagious disease among domestic animals. The term is applied to various specific disorders in different localities, but more particularly to the epizootic diseases, especially those of cattle. Still more strictly it is limited to the plague commonly known as the foot-and-mouth disease (aphthous fever), which attacks cattle and other animals, causing loss of appetite, febrile disturbance, lameness, and vesicular eruptions on the feet and in the mouth, with frequent complications.

MURRAY, Earl of, English spelling of Scottish title Moray. See Stuart—*James Stewart* (1499?–1544).

MURRAY, Alexander Stuart, British archaeologist: b. near Arbroath, Scotland, Jan. 8, 1841; d. London, March 5, 1904. In 1864 he was graduated with an M.A. from the University of Edinburgh and in the following year continued his philological and archaeological studies in Berlin. Two years later he became an assistant in the department of Greek and Roman antiquities at the British Museum, and in 1886 succeeded to the occupation for which he was best known, that of keeper of the museum's department of Greek and Roman antiquities.

MURRAY, George Henry, Canadian politician: b. Grand Narrows, Nova Scotia, June 7, 1861; d. Montreal, Jan. 9, 1929. He was educated in Grand Narrows and in Boston University and was admitted to the bar in 1883. He was appointed to the legislative council of Nova Scotia in 1889, but resigned in 1891, and in the same year became a member of the provincial cabinet without portfolio, under the Hon. W. S. Fielding, and in 1896 became premier and provincial secretary of Nova Scotia under a Liberal administration. He was elected to the Dominion Parliament in 1897 and remained at the head of the Nova Scotian government until his resignation in 1923.

MURRAY, Gilbert (full name George Gilbert Aimé Murray), British classical scholar: b. Sydney, New South Wales, Jan. 2, 1866. The son of the President of the Legislative Council of New South Wales, in 1877 he came to England where he studied at the Merchant Taylors' School in London and then at St. John's College, Oxford. In 1888 he was made a fellow of New College, Oxford, and in 1889, the year in which he married Lady Mary Howard, daughter of the 9th earl of Carlyle, he accepted the professorship of Greek at Glasgow University, which position

he held until 1899. Although he is noted for his English translations of Greek dramatic works, two original plays, *Carlyon Sahib* (1899) and *Andromache* (1900) were both published and performed. From 1908 to 1936 he was regius professor of Greek at Oxford.

Professor Murray's career as a scholar has been paralleled by his lifelong concern with the problems of world peace and international cooperation. After World War I he was a member of the committee which drafted the covenant of the League of Nations and was one of the promoters of the League of Nations Union on which he sat as chairman from 1918 to 1919 and from 1923 to 1938. His many writings dealing with international problems include *Liberalism and the Empire* (1900), of which he was part author; *The Foreign Policy of Sir Edward Grey* (1915); *Faith, War, and Policy* (1918); *The Problem of Foreign Policy* (1921); *The Ordeal of This Generation* (1929); *Liberality and Civilization* (1938); and *From the League to the U.N.* (1947).

In the field of classical scholarship, Murray is best known for his critical editions of Euripides and Aeschylus and his translations of the plays of Euripides into English verse. The latter in particular represent a noteworthy attempt to render the essential rhythmic quality of Greek poetry in English rhymed heroics instead of the more customary blank verse. Several of these translations have been performed in England and America. He also translated plays of Aeschylus, Sophocles, Aristophanes, and Menander. Among his published studies in the culture of ancient Greece may be mentioned the *History of Ancient Greek Literature* (1897); *The Rise of Greek Epic* (1907); *Euripides and His Age* (1913); *Five Stages of Greek Religion* (1925); *Aristophanes* (1933); and *Greek Studies* (1946).

In 1936, his 70th birthday was honored by two publications dedicated to him by colleagues and former students—*Greek Poetry and Life: Essays Presented to Gilbert Murray on his 70th Birthday,* by C. Bailer and others and a collection of *Essays in Honour of Gilbert Murray,* by H. A. L. Fisher and S. de Madariaga. Five years later he was invested with the Order of Merit. Deeply sensitive to the forces which led to the breakdown of the Victorian "cosmos," Murray represents one of those rare persons whose study of the past impels him toward the problems of the present and future; for the Greek genius, which he described as "the spirit that in any trouble thinks and is patient, that saves and not destroys," is strikingly reflected in his efforts to find the groundwork for world peace in a century of world wars.

MURRAY, Grenville (full name EUSTACE CLARE GRENVILLE MURRAY), English journalist: b. 1824; d. Passy, France, Dec. 20, 1881. A natural son of Richard Grenville, second Duke of Buckingham, he was in the diplomatic service from 1851 to 1868, but was guilty of irregular practices, and was generally in discord with his superiors or with British residents. From 1869 he lived in France, where he was Paris correspondent of the *Pall Mall Gazette* and the *Daily News,* and an early contributor to the *Cornhill.*

Murray was one of the ablest journalists of his time and the initiator of "yellow" methods in English newspapers, being horsewhipped by Lord Carrington in 1869 for a libel that appeared in *The Queen's Messenger,* a paper he conducted. As the Comte de Rethel d'Aragon, he lived in Paris, using the title of his wife, a Spanish woman. He was a voluminous writer, and his works included *The Roving Englishman,* chapters of travel (1854); *Embassies and Foreign Courts* (1855); *The Member for Paris* (1871); *Young Brown* (1874); *Turkey* (1877); *The Russians of To-Day* (1878); *Under the Lens: Social Photographs* (1885).

MURRAY, James, Scottish soldier: b. about 1721; d. near Battle, Sussex, June 18, 1794. He was a son of the fourth Lord Elibank, and about 1740 entered the army. Coming with his regiment to America in 1757 he commanded a brigade at the siege of Louisburg (1758), and in the battle on the Heights of Abraham (Sept. 13, 1759) led the left wing of the army under Wolfe. In 1760 he held Quebec against superior numbers of the French, in the same year served with Amherst in the reduction of Montreal and was made governor of Quebec.

From 1763 to 1766 Murray was governor of Canada and in 1774 became governor of Minorca. He was compelled to surrender Fort Saint Philip to the French in 1782 after a heavy siege, and upon returning to England was court-martialed but acquitted.

MURRAY, SIR James Augustus Henry, Scottish philologist and lexicographer: b. Denholm, near Hawick, Roxburghshire, Feb. 7, 1837; d. Oxford, July 26, 1915. Graduated from London University, he was an assistant master in Hawick Grammar School from 1855 to 1858, becoming in the latter year master of Hawick Academy. For a few years he was foreign correspondent to the Oriental Bank in London, and from 1870 until his removal to Oxford in 1885, a master at Mill Hill School.

During this time Murray became well known as a philologist, serving as president of the Philological Society in 1878–1880 and 1882–1884. His life's work, however, was embodied in the *New English Dictionary on Historical Principles,* issued under the auspices of the Philological Society from the Clarendon Press, Oxford. It was he who was largely responsible for the revival of the original project of the Society for a comprehensive historical dictionary, and, under his general editorship which he assumed in 1879, this monumental undertaking was all but completed in his lifetime. He was assisted by a staff of from 20 to 30 editors, and thousands of volunteer assistants, who read every English book published before 1500 A.D. and the principal books since that date, thus obtaining many millions of illustrative references for use in the work. He had almost completed the tenth and last volume, T to Z, when he died. His aims in connection with this vast undertaking are embodied in an address to the Philological Society in 1879.

Other works by Murray are *A Week among the Antiquities of Orkney* (1861); *Dialects of the Southern Counties of Scotland* (1873); *Synopsis of Paley's Horae Paulinae* (1872); *The Romance and Prophecies of Thomas of Erildoune* (1875).

MURRAY, John, American clergyman, founder of American Universalism: b. Alton, Hampshire, England, Dec. 10, 1741; d. Boston,

Mass., Sept. 3, 1815. He was brought up in Ireland, where he joined the Methodist congregation and did some preaching, but in 1760 went to England, came under the influence of James Relly and was excommunicated by George Whitefield. Coming to America in 1770 he preached in Newport, Boston and Portsmouth his doctrines, which agree with modern Universalism only in the belief of universal salvation, but otherwise held to the dogma of the Trinity, of personal devil and of the incarnation. At the outbreak of the Revolution he was chaplain of a Rhode Island brigade for a short time, during which his resignation was demanded by the orthodox chaplains in the army.

Murray formed a Universalist church in Gloucester, and in 1783 recovered property belonging to his parishioners which had been seized by the parish authorities, who acted on the ground that the Universalists had no corporate existence; the success of this suit was a distinct advance in congregational freedom in New England. He wrote *Letters and Sketches* (1812) and an *Autobiography,* continued and edited by his wife (1816).

MURRAY, John, the name of several successive generations of proprietors of a London publishing house. The founder was JOHN MACMURRAY (1745–1793), a descendant of the Murrays of Athol, who commenced business as a publisher in London in 1768, dropping the prefix to his name.

His son JOHN MURRAY (Nov. 27, 1778–June 27, 1843) began business in 1799, early attained success and became the friend of, as well as publisher for, some of the chief writers of the day, including Byron, Moore, Rogers, Campbell, Crabbe, Washington Irving, George Borrow and Benjamin Disraeli. He started the *Quarterly Review* in February 1809 in opposition to the Whig *Edinburgh Review,* of which Gifford, S. T. Coleridge and Lockhart were editors, and Scott and Southey contributors. By 1817 the *Quarterly* was a great success.

In 1824 Murray was involved in the controversy with Moore regarding the destruction of Byron's *Memoirs;* and in 1826 undertook the publication of the *Representative,* a daily newspaper, which, after running six months, was discontinued.

The succeeding JOHN MURRAY (April 16, 1808–April 2, 1892) was the projector of the famous series of guidebooks that bears the firm's name. He carried on the *Quarterly Review,* begun by his father, and in 1887 began *Murray's Magazine,* which ran until 1891. Darwin's *Origin of Species* was published by his firm in 1859.

SIR JOHN MURRAY (Dec. 18, 1851–Nov. 30, 1928) continued as head of the family firm and edited the *Correspondence* of Byron in 1922. He was succeeded by his son SIR JOHN MURRAY (b. June 12, 1884), who in 1952 still maintained the family connection with the firm.

MURRAY, SIR John, British marine zoologist and oceanographer: b. Coburg, Ontario, March 3, 1841; d. Kirkliston, near Edinburgh, March 16, 1914. Educated at Edinburgh University, in 1867 he accompanied for biological purposes an expedition to Spitzbergen and Greenland, and from 1871 to 1876 he served under Sir Wyville Thomson as one of the scientific staff of the *Challenger* expedition. From 1876 till 1882 he was chief assistant editor of the scientific reports published in connection with that voyage, and in the latter year became editor-in-chief, liberally supporting the work out of his own means. He made bathymetrical surveys of the freshwater lochs of Scotland in 1897 and explored the North Atlantic in 1910, the results of the latter exploration being published in *The Depths of the Sea* (1912).

MURRAY, John Clark, Canadian educator: b. Paisley, Scotland, March 19, 1836; d. Montreal, Nov. 20, 1917. He was educated in the universities of Edinburgh and Göttingen, and in 1862 accepted the chair of philosophy in Queen's University, Kingston, Canada. From 1892 he was professor of moral philosophy in McGill University, Montreal. He published *Outlines of Sir William Hamilton's Philosophy* (1870); *The Ballads and Songs of Scotland* (1874); *A Handbook of Psychology* (1885); *An Introduction to Ethics* (1891).

MURRAY, Lindley, American grammarian: b. Swatara, Lancaster County, Pa., April 22, 1745; d. Holgate, near York, England, Jan. 16, 1826. Desiring a literary career against his father's wishes, he compromised on the study of law and practiced as a barrister. After the Revolution he quitted the bar for a commercial speculation, and having realized a fortune, went in 1784 to England for reasons of health, and settled at Holgate, near York. His first publication was *The Power of Religion on the Mind* in 1787.

Murray's *English Grammar* met with an enormous success, being almost universally introduced as a textbook in England and the United States, and for years was regarded as the standard authority. It passed through nearly 50 editions in its original form. A corrected edition by the author was published in 1816, and his abridgment (1818) of this went through 150 editions, each of 10,000 copies. His work was far from accurate, however, and was soon superseded; but it helped to promote the systematic study of grammar.

Among Murray's other writings were *English Exercises* and *English Reader* (1799), and a *Spelling Book* (1804), which went through 44 editions. He was also a botanist and his gardens were renowned.

Consult Murray, Lindley, *Memoirs of the Life and Writings of Lindley Murray,* preface and continuation by Elisabeth Frank (Philadelphia 1827).

MURRAY or **MORAY, SIR Robert,** Scottish statesman: b. around 1600; d. London, July 4, 1673. He was educated at the University of St. Andrews in France and was honored by the favor of Cardinal Richelieu. Knighted in England in 1643, he returned to France where he fought with his regiment of Scots guards in Germany. As the secret envoy entrusted with the treaty negotiations between Scotland and France, he planned the escape of Charles I from Newcastle, of which plan, however, Charles did not avail himself. After the Restoration he became the lord of the exchequer for Scotland as well as deputy secretary in June 1663, and from then until 1670, he, the duke of Lauderdale, and the king ruled Scotland.

Murray was one of the founders of the Royal Society, the oldest scientific society in Great Britain, founded in 1660. He presided at its

meetings for over a year and made numerous reports on points connected with geology and natural history.

MURRAY, William (1st Earl of Mansfield), British judge and parliamentary leader: b. Abbey of Scone, March 2, 1704–1705; d. Highgate, London, March 20, 1793. Inheriting from his Jacobite parents a strong sympathy for the royal prerogative, he attended Christ Church, Oxford, where he developed a remarkable declamatory talent. After his graduation in 1727, he began a lifelong rivalry with William Pitt by defeating him in a competition for the best Latin poem on the death of George I. His success at the bar was rapid; he became solicitor general in 1742; attorney general in 1754, privy councilor in 1756; and in the same year was sworn in as lord chief justice of the Kings Bench and created baron Mansfield of Mansfield. In 1876 he became earl of Mansfield.

Often unpopular for his judgments, Murray was bitterly attacked in Junius' *Letter to the King*. During the Gordon riots of 1780 his house was burned and a year earlier he had proposed a coalition of all parties to control the American rebellion. Although his name is not associated with any outstanding statutory contributions, he was an able judge and, in a case before the Kings Bench in 1771, he was outspoken against the institution of slavery.

MURRAY, city, Kentucky, seat of Calloway County, 37 miles south-southeast of Paducah on the East Fork of the Clarks River, served by state highways and the Nashville, Chattanooga, and St. Louis Railroad. It is located at an altitude of 475 feet in an agricultural region, producing dark tobacco, corn, clover, and livestock. Among its varied manufactures are tobacco, dairy and concrete products, pottery, lumber, and hosiery. It also has feed and flour mills. Nearby is Kentucky Lake, which provides recreational facilities for boating, fishing, and camping. The city has an airport, two hospitals, and is the seat of Murray State Teachers College, founded in 1923.

Murray's most famous son was the inventor Nathan B. Stubblefield (1860–1928), whose early experiments in the technique of radio broadcasting have earned him the reputation of being a precursor of Marconi. Incorporated in 1844, the community was named for John L. Murray, who was congressman from this district around 1830. Municipal government is administered by a mayor and council. Pop. (1950) 6,035.

MURRAY, city, Utah, in Salt Lake County, just south of Salt Lake City on the Jordan River near Wasatch Range, and served by the Denver and Rio Grande Western and the Union Pacific railroads. Situated at an altitude of 4,350 feet, it is a smelting town, with lead mining nearby, and serves as a trading center for an agricultural area producing sugar beets, alfalfa, and potatoes. Among its manufactures are canned foods, flour, textiles, and lumber.

Murray was incorporated in 1902 and has a commission form of government. Pop. (1950) 9,006.

MURRAY, river, Australia, rising in the Australian Alps, its sources being partly in New South Wales, partly in Victoria. It flows for a long distance westward, forming the boundary between these two colonies, then passes into South Australia, where it takes a southern direction and falls into the Indian Ocean at Encounter Bay, 39 miles southeast of Adelaide, after passing through a large shallow sheet of water called Lake Alexandrina. Its total length is about 1,300 miles. Its chief affluents are the Murrumbidgee and Darling. It is navigable by light draft steamers in the wet season for the greater part of its course to Albury, 190 miles northeast of Melbourne.

MURRAY STATE COLLEGE, a coeducational institution in Murray, Kentucky. It was founded in 1923 by Dr. Rainey T. Wells and is located on a 60-acre campus, having modern dormitories and classrooms, veterans housing units, and the largest college auditorium in Kentucky. It offers the degrees of Bachelor of Arts and Bachelor of Science, and a B.S. in Home Economics, B.S. in Agriculture, Bachelor of Music Education, Bachelor of Music, and M.A. in Education.

The yearly enrollment averages about 1,500 students.

MURRE, mûr, an auk (q.v.) of the genera *Uria cepphus,* and related groups; a guillemot. They are small, black-and-white, web-footed, diving, fish-eating birds, which abound on all rocky northern coasts, breeding on sea-fronting ledges, where each pair produces a single, large, pyriform, variously colored egg, which is not placed in a nest but incubated in turn by the parents, who lift it from the ground upon their webbed toes and warm it between their downy legs.

MURRHINE VASES are antique vessels, distinguished for costliness of material and beauty of execution. They were brought by Pompey from Asia to Rome, and bore an immense price. Some antiquarians have supposed them to have been made of a mineral of the class of sardonyx or agate, or of a kind of porcelain or glass.

MURRUMBIDGEE, mûr-ŭm-bĭj'ē, a large river of New South Wales, Australia, rising in the Gourock Range above Numeralla, about 40 miles from the Pacific Ocean. It flows at first northward, but the greater part of its course is westerly; and after receiving the Lachlan from the north, near Nap Nap, it turns toward the south to join the Murray below Balranald. About 1,000 miles long, it is navigable only in the wet season for 500 miles by light-draft steamers.

MURSHIDABAD, moor-shĭ-dä-bäd', town, India, in the Presidency division of West Bengal, 116 miles north of Calcutta, on the Bhaghirathi, a branch of the Ganges. It is a straggling collection chiefly of mud houses occupying an extensive area, but has several substantial brick buildings, chief of which are the beautiful Nawab's palace dating from 1837, the imambara and a Moslem mosque. Two miles south of the city is Motijihl or Pearl Lake and the site of the historic palace of Suraj-ud-Dowlah. On the opposite bank of the river connected by a ferry is Azimaganj containing the old cemetery of the Nawabs, a mausoleum, and a mosque. The city is noted for its ivory carving, its embroidery in gold and silver lace, silk weaving, and

the manufacture of hookah pipes and musical instruments. It is still a busy centre of trade but less so than during the 18th century when it was the capital of Bengal and a very populous city, the rise of Calcutta causing its decline. Pop. about 10,000; district, about 1,500,000.

MUSA, Ibn Nusair, moo'sa ĭb'n noo-sir', Arabian general: b. 640 A.D.; d. 716 or 717. He became (704) governor of North Africa which he conquered in its entirety as far as the ocean between 706–709. He sent (711) Tarik to Spain but the expedition was so successful he became jealous of his assistant officers and hindered the expedition while he started himself (712) with an army which carried everything before it. He was recalled and had a most brilliant triumphal procession through Africa to Damascus, where the caliph, Suleiman, accused him of great embezzlements, deprived him of his command, and he was either condemned to pay a heavy money indemnity, or, as other writers say, was put to death. Consult Burke, 'History of Spain' (Vol. I, 1895); 'Cambridge Medieval History' (Vol. II, New York 1913).

MUSACEÆ, the banana family, a group in the Order *Scitamineæ,* comprising the largest of herbaceous plants, generally destitute or almost destitute of true stems, yet resembling trees in appearance, and sometimes rivaling palms in stateliness, the long sheating bases of the leafstalks combining to form a false stem. The blade of the leaf has many fine parallel veins proceeding from the mid-rib to the margin. The flowers are congregated on spadices, which are protected by spathes. The fruit is either a three-valved capsule or fleshy. The species are not numerous; they are natives of warm climates, in which they are widely distributed, and are of great value to the inhabitants of tropical countries; the fruit of some, particularly of the genus *Musa,* being much used for food, while the fibres of the leaves are employed for cordage and for textile purposes. See BANANA; FIBRE.

MUSÆUS, mū-sē'ŭs, in Greek mythology, a poet, seer and priest, said to have been the son of Eumolpus and Selene, or, according to others, the son and pupil of Orpheus. He was the reputed author of a number of poems, oracles, purificatory verses, hymns, etc., of which we possess but a few fragments, and those of doubtful authenticity. A later Musæus, who flourished about the end of the 5th century A.D., was the author of a beautiful little poem in Greek, entitled 'Hero and Leander.' See HERO; HERO AND LEANDER.

MUSCARDINE. The common European dormouse (q.v.).

MUSCARINE, a coal tar color introduced by Durand and Hugenin, and having the empirical formula $C_{18}H_{15}N_2O_2Cl$. It is a brownish violet powder, slightly soluble in cold water, but dissolving readily in hot water with the formation of a violet-blue solution. Powdered zinc decolorizes its aqueous solution, but the color returns on exposure to air. Muscarine produces a blue color upon cotton that has been mordanted with tannin and tartar emetic.

MUSCARINE, an alkaloid having the chemical formula $C_5H_{15}NO_3$, and occurring in certain mushrooms, notably in the «fly agaric» (*Agaricus muscarius*). It is also formed in the putrefactive decay of flesh. It may be obtained in the form of deliquescent crystals which are without taste, and insoluble in ether, though readily soluble in water and in alcohol. Solutions of the alkaloid are strongly alkaline, and precipitate ferric and cupric salts in the form of hydrates. Muscarine is exceedingly poisonous. It contracts the pupil of the eye, slows the pulse by prolonging the diastolic state of the heart, and induces salivation, vomiting, intestinal spasms and general muscular weakness, followed by death. Atropine acts as an antidote to muscarine by producing antagonistic physiological processes. The «fly agaric» takes its name from the fact that flies that alight upon it are killed, either by the muscarine or by another alkaloid, neurine, which the fungus also contains.

MUSCAT, mŭs-kăt', **MUSKAT,** or **MASKAT,** Arabia, the capital of Oman, on the Gulf of Oman, commanding the entrance to the Persian Gulf. It is a fortified seaport of considerable commercial and strategical importance; the seat of the Imam or Sultan of Muscat; by arrangement it has a British political resident and since 1898 is used as a coaling station by France. Its appearance by no means corresponds with its wealth and importance. Large buildings are few, and the sultan's palace (a plain edifice), the governor's house, and a few minarets, alone rise above the mass of flat-roofed huts or houses. The streets are extremely narrow and its situation at the foot of high cliffs, and nearly surrounded by bare rocks, renders it one of the hottest places in the world. A sufficient supply of water is obtained from wells about 40 feet deep. About three miles distant is the town of Matrah with docks for building and repairing shipping. As it stands in an open plain, exposed to the seabreeze, it is cooler than Muscat, so that many of the wealthier merchants of the latter place have their dwellings at Matrah, and spend only the hours of business in the neighboring city. The combined population of Muscat, Matrah and intervening villages has been variously estimated at 25,000 and at 60,000.

Muscat was occupied by the Portuguese under Albuquerque in 1507. In 1651 it fell again under a Mohammedan ruler. In the latter half of the 18th century it attained, under a ruler who bore the religious title of Imam, considerable importance as a seaport. In 1808 Seid Saïd succeeded to the sovereignty, having assassinated his cousin, Bedr. His sovereignty embraced also a stretch on the east coast of Africa, extending from the neighborhood of Cape Delgado northward as far as the equator. In like manner a large portion of the coast of the Persian Gulf acknowledged his sway, so that, including Oman and the African islands Zanzibar, Monfia or Mafia, and Pemba, the coasts ruled by him, for the most part only commercially, could not have had an extent of less than 3,000 miles. In 1840 Seid Saïd removed the court and seat of government from Muscat to Zanzibar, and in 1856 died on the return voyage from the former place. His son Meied succeeded him as Sultan of Zanzibar and ruler of the African territory, and another son acquired Muscat. Seyyid Turki became ruler of Muscat in 1871, and on his death in 1888 a son succeeded him.

MUSCAT AND OMAN, sultanate. See OMAN.

MUSCATATUCK, mŭs-kă-tŭt-ŭk′, river, Indiana, formed in western part of Jefferson County by the junction of Graham and Big creeks and flows 50 miles southwest and west to the eastern fork of the White River, three miles south of Medora, Indiana.

MUSCATEL, mŭs-kă-tĕl′; mŭs′kă-tĕl, a sweet wine, is made of muscat grapes, usually with the addition of a small quantity of brandy, without allowing the must (unfermented grape juice) to reach fermentation, in order to conserve the sugar content of the wine. The grape thrives best in volcanic soil.

The wine is supposed to have originated on the Greek island of Samos, where it is still made. Its most celebrated brands are those of Malaga, Sitges, and Tarragona in Spain; the Moscatel Branco of Portugal; the Muskotaly grown in several parts of Hungary; as well as the Roussillon of France, produced in the department of Pyrenées-Orientales. Italy's Lacryma Christi, grown on the slopes of Vesuvius, is famous for its excellent taste.

The muscatel of Montefiascone owes its strange name Est Est Est to an ancient story: the German bishop of Regensburg, Sigmund Fugger, sent his valet out to taste the wines of a number of inns and mark *est* on the wall wherever he found a good wine, and *est, est* where the wine was very good. When the valet tasted the Montefiascone muscatel he became so enthusiastic that he wrote over the inn door, *est! est!! est!!!*

Other fine Italian muscatels are the Salento, and the Greco di Gerace of Calabria; and the Canelli of Piedmont. The Zibibbo, grown on the island of Pantelleria, and two Sicilian wines, the Noto of Syracuse, and the Zucco of Palermo, are also exported to the United States, and enjoy great popularity among Italian-born Americans.

The climate and the volcanic soil of California are favorable for growing muscat grapes, and a good muscatel wine is produced there; its color ranges from straw to amber. See also WINE AND WINE MAKING.

MUSCATINE, mŭs′kă-tēn, city, Iowa, and Muscatine County seat; altitude 552 feet; on the Mississippi River; 25 miles southwest of Davenport; on the Chicago, Rock Island and Pacific, and Chicago, Milwaukee, St. Paul and Pacific railroads. It is at a bend in the river where the waters change from a westward to a southward current. As is usual along the west bank of the Mississippi, the city is on high bluffs which command an extended view of the river. High Bridge here connects Illinois and Iowa. Muscatine is in a fertile agricultural region in which there is considerable woodland. Muscatine Island, just below the city, is famed for its watermelons and fine vegetables. The chief industries of the city are connected with the manufacturing of machine shop products, pearl buttons, food preserving, sashes and doors, lumber, alcohol and fusel oil, rolling mill products, and overalls. It has a large trade in its manufactured articles, farm and dairy products, hogs, lumber and fruit. Muscatine was first settled in 1833 as a trading post. In 1836 the town site was surveyed and called Bloomington. The name became Muscatine in 1849. By this time, the town was becoming an important lumber center. Huge rafts of logs were floated down the river to the sawmills here. It was a military post during the Civil War with Camp Strong, on the island, a concentration point. Samuel L. Clemens (Mark Twain) lived in Muscatine for a time, and Ellis Parker Butler, author of *Pigs Is Pigs,* was born here. The city government is operated under its original charter granted in 1838, revised in 1852. Pop. (1950) 19,041.

MUSCHELKALK, mŏŏsh′ĕl-kälk, a German name, signifying shell lime, applied to geological beds of middle Triassic or New Red Sandstone period, occurring in the Alps, in northwestern Germany, Alsace and Lorraine, Swabia, Franconia, Hesse, Thuringia and upper Silesia. The name is due to the many fossil remains of Cephalopoda, Encrinites and Mollusca in general found in the limestone mass of these beds. The Muschelkalk is divided into lower, middle and upper. The beds contain valuable minerals such as salt, marl and gypsum.

MUSCICAPIDAE, mŭs-ĭ-kăp′ĭ-dē, a large family of oscine passerine birds, consisting of the Old World or true flycatchers. The typical genus is *Muscicapa,* including the common European spotted flycatcher.

MUSCIDAE, mŭs′cĭ-dē, family of flies from the Latin *musca,* a fly. The most familiar examples are the horsefly and the blowfly. They belong to the order Diptera and their wings have the characteristics of the family, being naked, furnished with a single pair; the proboscis is used for sucking, ending in two fleshy lobes. The flagellum of the antennae is generally plumed with hairs on both sides (the tsetse, however, on one side only). Upper surface of thorax has a transverse suture and the feet have a pair of adhesive pads. Their presence is almost universal, as they thrive in the cold northern latitudes as well as in tropical climes. The eggs are laid and hatched in filth. The species reaches a large and varied assortment.

MUSCLE. See MUSCLES.

MUSCLE SENSATION, a loose and vague phrase, otherwise muscle sense, to express the sum of sensations that come from the joints, skin, muscles and tendons in the act of making muscular movements. It is also applied to a generalized dull sensation which results from the stimulation of a muscle, either from electrical discharge or from fatigue following the long-continued stimulation of either a voluntary or involuntary muscle. The perceptions of muscular sense are usually grouped under (1) those of posture, the sensations occurring while standing, sitting or maintaining some unusual position being characteristic and recognizably different for each relative position of limbs; (2) those of the passive movement, in which a limb is moved by another person; (3) those of the active movement; (4) those of resistance to movement. The case of passive muscular sense is not to be confused with that of the so-called static sense, which is a sensation of change of direction, which one gets while being transported through space, or turned or inverted, and is mediated through the

semi-circular canals of the ear. The muscle-sense is of much importance in imparting information concerning the relative position of the different members of the body, and its loss in this particular (asterognosis) constitutes a valuable symptom in the diagnosis of certain nerve disorders. The muscle-sense is all-important in maintaining bodily equilibrium. Each joint in the body possesses a varying degree of delicacy in this function of equilibrium. Thus the shoulder-joint is considered to be 40 times as delicate in this respect as the joints of the fingers. Angle of bending and speed of movement are both important in the interpretation of these joint-sensations. Muscle-sense in all its bearings has close relations to accuracy and skill in all limb-movements, as seen in musical performances, marksmanship, ball-playing, billiards, golf, etc., in all sports and games requiring delicate muscular adaptations. The muscle-sensations may become a seat of a great deal of autoerotic pleasure, even exclusive of merely genital masturbation, as may be seen in certain forms of dancing. In persons who take an undue interest in athletics there is frequently in addition to the exhibitionistic motive a large factor of gratification of the lebido (q.v.) through merely muscular contractions, the development of muscular strength feeding the unconscious desire for power and superiority in a sphere which frequently excludes real social aims. Consult Henri, 'Année Psychologique' (Vol. V, 1899, with full bibliography); Baldwin, 'Dictionary of Philosophy and Psychology'; Schäfer, 'Physiology' (1900); Kempf, 'The Autonomic System and the Personality' (New York 1919).

MUSCLES. The organs called muscles are made up of a collection of muscle-cells, which have for their function the accomplishment of bodily movements. These movements may be gross, as in walking, or very minute, such as take place in the contracting movements of the arteries or veins; they may be voluntary, brought into action by wishes and called «willed» impulses made possible by the brain structures, or they may be involuntary and brought about by acting through the vegetative nervous system (q.v.). The muscular movements necessary in writing are illustrative of the voluntary type; the heart-beat, of the involuntary variety. In point of evolutionary development the involuntary movements may be said to have preceded the voluntary, and hence in regard to complexity of structure the involuntary muscle-cells are simpler than the muscle-cells that perform voluntary movements, and to these two types of cells students of minute anatomy have given the names of unstriped or involuntary muscle, and striped or voluntary muscle. The muscular tissue of the heart is of intermediary character. It is a striped involuntary muscle. Muscle-tissue, like protoplasm, is strongly contractile, but unlike ordinary protoplasm, which can contract in all directions, muscle-substance can contract in only one direction. The simplest type of muscle-substance is seen in many lower animals. In these the muscle-cells are elongated spindles with sharpened points and with a single elliptical to rod-shaped nucleus, situated about the middle of the fibre. They show a faint longitudinal striation, vary in length from 40 to 500 microns (1–600, 1–50 of an inch) in length, and 3 to 8 microns (1–8000, 1–3000 inch) in diameter. These muscle-cells in man correspond to the unstriped muscle-cells, are bound together in bundles or flattened plates by an inter-cellular cement-substance and are found more particularly in the walls of the intestine, the trachea, bronchi, blood-vessels, bladder, ureter, uterus, in many of the organs of the body, and in glandular structures. They have a rich blood-supply and a nervous network of sensory terminal filaments, as well as fibres from the vegetative (old term was sympathetic) nervous system. The pains of an intestinal colic, of a gall-stone, of childbirth, are all due to forcible contractions of these involuntary muscle-cells in the respective organs. The more prominent muscles of the body, such as those that move the various bones, the muscles proper and such as are eaten as roast beef are of the striped variety. These are a modification of the simple spindle-cells. In man they originate in the mesoderm, muscle-sub tance commences to form in the interior of some of the cells; these elongate, many nuclei are formed and the final result is a bundle of much elongated cylindrical cells 12 centimeters (2 inches) long and from 10 to 100 microns (1–2500 to 1–250 inch) broad. Each cell is covered by a special sheath, the sarcolemma, and within is made up of very intricate and minutely structured protoplasm, the most striking feature of which is its banded or striated appearance; hence the name striated. Just within the sarcolemma a number of flattened elliptical muscle-nuclei are found. In insects striped muscle-tissue can be studied to best advantage. Occasionally branched forms of striated muscle are found. Blood-vessels are numerous in striped muscle and lymphatics and nerves are also abundant. Special types of nerve-endings and muscle-plates, are characteristic of voluntary muscle. Striped muscle is probably a combination of types of muscle. The sarcoplastic substance is thought of as of unstriped muscular origin, and it is probably innervated by the vegetative nervous system. This type of innervation is that which keeps its metabolism in order, and also contributes to what is known as muscle-tonus. The emotions act through this part of the muscle probably. The other part of the muscle, called the anisotropic disc, is probably innervated by the sensori-motor system and is that part of the muscle which carries out willed or wished actions.

Heart-muscle differs from ordinary striped muscle by having shorter oblong cells, which are branched. There is no sarcodemma and the cells contain but one or two nuclei, which are situated in the centre of the muscle-substance. Blood-vessels, lymphatics and nerves are plentiful in the heart-muscle.

Groups of these muscle-cells, with connective tissues, tendons and fat, make up the gross muscles of the human body. The voluntary muscles are all attached to bony structures; the involuntary muscles are found in the softer parts. Contraction and expansion are the expressions of their functions, each set of muscles being provided with antagonists, and it is characteristic that in response to pleasure-giving stimuli movements of expansion result, whereas under painful stimuli contraction is marked. Modern psychological theories have been

founded on this fundamental principle, emotional states being interpreted as being founded on visceral muscular activities. The forms of external stimuli that can cause muscular action are usually classed as mechanical, chemical, thermal and electrical. Excess of stimulus brings about a condition of fatigue in muscle. This is accompanied by diminished muscular power, by pain or discomfort, by diminished reflex excitability and by vague symptoms in the body indicative of some perversion of metabolism.

Muscles are classified in various ways, according to structure or according to their function, or by their positions and situations in the body. For example, some muscles are attached to bones, which they move after the fashion of levers. Such muscles are said to arise or take origin from definite points of bones and are generally inserted into bones by tendinous prolongation of the muscular substance. The insertion is the moving point, and the origin the fixed point of the muscle. The tendons of muscles vary in length and breadth. They represent inelastic bands of fibrous tissue, the fibres of which insensibly merge into and become continuous with their attached muscular fibres. When the tendinous fibres of muscles become greatly broadened out, so as to form fibrous webs or membranes, which separate or enclose muscles, or which afford extensive surfaces for their attachments, the term aponeuroses is then applied to them. Such aponeurotic expansions are seen in the terminations of the muscles of the abdominal wall, in the scalp and in other situations. The limit or extent of the action of a muscle is determined by the length of its fibres, whilst its degree of force or strength depends on the number of the fibres. Other muscles are not attached to bones as levers, but on the contrary surround and enclose cavities, which they limit or expand as required. Such hollow muscles are exemplified in the heart and uterus, in the muscular fibres of blood-vessels, in the muscles of the digestive tract, in the iris of the eye, etc.

The nature, mode and effects of muscular action may be briefly considered in connection with the present subject. The muscles which have the most active functions are those most abundantly nourished. Every action on the part of a living being results in the production of a certain amount of waste material, evinced by perceptible differences in the chemical composition of the tissue. And when it is remembered that the nervous and vascular supply of muscle is also concerned in muscular work and waste, the entire question is seen to assume aspects of a very intricate and complicated nature. Increased exercise of muscles — as seen in gymnastic exercises, or in the exercise of certain trades (for example, the arms of the blacksmith and the lower limbs of the ballet-dancer) — demanding increased nutrition, results in the increased growth of the muscle and in the formation of new tissue. This result, it is evident, can take place only when the nutrition of the tissue keeps pace with or slightly outstrips its waste and wear.

The property of contractility distinctive of muscular tissue, and through which its functions are manifested, is generally, though not always or invariably, brought into action through the stimulus of the nervous system, or more widely speaking, through stimuli conveyed to the muscular fibres through the nerves. The subject of the various kinds of muscular actions involves both physiological and mechanical considerations. The voluntary muscles thus constitute moving powers for the bones as levers; and in the living body examples of the three kinds of levers which mechanical science distinguishes are found. In the familiar action of the biceps muscle, which flexes or bends the fore upon the upper arm, is seen an instance of a lever of the third kind, in which the power (represented by the insertion of the muscle on the radius or bone of the fore-arm) is placed between the fulcrum (at the elbow-joint) and the weight (in the hand). The lever of the second order may be illustrated by the raising of the body upon the toes, as in the act of making a step forward in walking. Here the weight (represented by the body pressing on the ankle) is placed between the fulcrum (formed by the fixed toes) and the power represented by the muscles of the calf. The head moving on the spine illustrates a lever of the first order; the fulcrum being represented by the atlas vertebræ, the power by the muscles of the neck and the weight by the heavier portion of the skull situated in front of the spine. See ANATOMY.

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MUSCLES, Diseases of. Very little is known of the diseases of muscles themselves. Muscle-tissue, in common with other types of tissue, undergoes certain forms of degeneration, fatty, mucoid, gelatinous, calcareous, etc., but of the diseases of the muscular tissues themselves there are few well-defined types. The reason for this lack of definite information bearing on diseases of the muscles is largely due to the close relationship that the nervous system bears to the muscular system. This renders it almost impossible to distinguish between a disease of the muscle and a disease of the nerve structures which are distributed to that muscle. Thus, at the present time, it is held that many of the forms of muscular atrophy and some of the forms of muscular dystrophy are forms of the diseases of the nervous mechanism of the muscle rather than disease of the muscle itself. In former times these were classed as diseases of muscle.

Myositis, simple inflammation of the voluntary muscles, is a form of acute or subacute inflammation in the muscle, due probably to some infectious organism. It is characterized by stiffness of the muscles and with swelling in the muscle-substance. It is usually progressive, the muscles of the body becoming stiff hard and fragile, and undergoing fatty degeneration. Myositis is probably a very rare affection, and it is not yet known whether it is a primary or a secondary condition. Ordinary muscular spasms or muscular cramps are in reality localized neuralgias in the muscle, and should be considered as of nervous rather than muscular origin. Lumbago is one of the conspicuous examples of a neuromuscular affection. It is probably located in the sarcoplasm of the muscle, and results from disturbance of the vegetative nervous system control of the muscle. It may be a result of emotional upsets.

or follow undue exercise. Myoclonia or Friedrich's disease, and myotonia, or Thomsen's disease, are two forms of disease affecting the muscular system.

Myositis ossificans is a very rare chronic affection of muscles, during which the muscles become harder and harder, and finally develop bone-like transformations, so that the patient becomes like the ossified man of the circus. As a matter of fact most of these cases drift into museums and circuses. Very little is known as to the cause of the disease, and treatment is unavailing. Consult Jelliffe and White, 'Diseases of the Nervous System' (3d. ed., 1919).

MUSCLE SHOALS, a 37-mile stretch of rapids in the Tennessee River in northern Alabama, 259 miles above the point where that stream empties into the Ohio at Paducah, Ky. This section of the river has a total vertical fall of 134 feet, creating an extremely rapid current, and has been a barrier to river traffic since the canoes of the first fur traders were portaged around it.

In 1824 the State of Alabama began work on a canal around the shoals to aid navigation, the cost being paid from the sale of 400,000 acres of public lands granted by the government. This canal was opened in 1836. In 1875 Congress appropriated more than $3,000,000 for a new and more adequate canal, which remained in use until 1918, although it was never entirely satisfactory, since it, like the first, did not provide for year-round navigation.

When the United States entered the World War in 1917 the country was faced with the possibility of a shortage of nitrates for use in the manufacture of high explosives, and in that year the Government, under Section 124 of the National Defense Act, began constructing equipment at Muscle Shoals to provide this element.

The original project included two dams (one of which was called Wilson Dam) and two nitrate plants. One of the nitrate plants was completed in 1918. The Armistice ended the need for nitrates and work on Wilson Dam was not completed until 1925.

Wilson Dam is 4,860 feet long, and rises 137 feet above foundation. It is equipped with two navigation locks, each 300 by 60 feet. Lack of appropriations occasioned numerous interruptions in its construction by the Corps of Engineers of the U. S. Army. Despite these interruptions, it was completed at a cost of $47,000,000. Wilson Dam is now equipped to generate approximately 260,000 h.p., and has an ultimate capacity of more than 610,000 h.p. when all units are installed.

In March 1921 the Government invited offers from private firms for the disposition of Muscle Shoals, and in July, Henry Ford submitted a proposal, agreeing to purchase the plant and to manufacture fertilizer in accordance with Government requirements. His plan called for a 100-year lease of the power and for additional expenditure by the Government. Ford later modified his offer, Congress took no action on it, and he withdrew it in 1924.

Senator George W. Norris introduced his first bill for Government operation of these properties in April 1922. The Norris bill was passed but vetoed by President Coolidge in 1928 and again by President Hoover in 1931. In the meantime, power generated at the dam was sold to private companies operating in that area.

The Norris bill was reintroduced in the first session of the 73d Congress in 1933, following the election of President Roosevelt, and in May 1933 this bill, with several amendments, passed both houses of Congress and was signed.

Later in 1933 all Government property at Muscle Shoals was placed under the supervision of the Tennessee Valley Authority. Recognizing the need of the nation for phosphatic fertilizer, the Authority remodeled a portion of Nitrate Plant No. 2 and the production of fertilizers was begun.

The power from Wilson Dam is being used for TVA construction, for the production of phosphate fertilizers by the Authority, and surplus energy is being marketed in line with the terms of the Act passed by Congress creating the TVA. A large part of this power is being sold wholesale to municipalities and to county-wide co-operative associations.

Wilson Dam eliminated only 15½ miles of shoals. With the completion, however, of the Pickwick Landing Dam in southwestern Tennessee, below Wilson Dam, and of the Wheeler Dam in northern Alabama, at the head of Wilson Lake, the entire stretch of shoals will have been eliminated as a hazard to navigation and a nine-foot channel for navigation provided.

References.—King, Judson, 'A Brief Chronology of Muscle Shoals Legislation' (1916–1933); 'Facts About TVA Dams' (Tennessee Valley Authority publication); 'U. S. Statutes' (1916); *Congressional Record;* Campbell, T. J., 'The Upper Tennessee' (Knoxville 1932); Hart, J. K., 'Education for an Age of Power' (New York 1935); Bauer, Harry C., 'Bibliography of the Tennessee Valley Authority' (Knoxville); Alabama Muscle Shoals Commission, 'Report of the Muscle Shoals Commission' (1927); Alabama Muscle Shoals Commission, 'Minority Report of J. Lee Long on Muscle Shoals' (Montgomery 1927); Owen, M. 'Muscle Shoals and the Public Welfare' (1929); Clary, M., 'Inside Story of Muscle Shoals' (privately printed, 1926).

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MUSCULAR SYSTEM, Development of. Two main forms of muscle-tissue (see Muscles) exist in the human body, the striated muscle-tissue, which makes up the muscles of the bony framework of the body, and which responds to willed or wished impulses passing through the brain structures, and also to vegetative stimuli of the unstriated muscle-tissue, which chiefly responds to automatic stimuli of unconscious nature by means of the vegetative or sympathetic nervous system. Some control of vegetative functions may be exercised by conscious processes. (See Nervous System). The heart-muscle is regarded as an intermediate form, resembling striated muscle-tissue, but in its development more nearly allied to the more primitive unstriated muscle-tissue. Non-striated muscle-tissue is formed by a direct transition of certain cells in the middle germinal layers (see Embryology) or mesenchyme. At first these muscle-fibres are irregularly distributed, but later they are collected into small bundles or into layers, and become associated with the individual organs with which they functionate. Striped muscular tissue develops from the same layer, but the details of development, as is the case in the histogenesis of the

heart muscle, are extremely complicated. The cells at first develop a meshlike structure or reticulum. This reticulum develops small discs, which later become small columns of muscular tissue. The columns at first develop at the periphery of the cell, and gradually fill in around the nucleus, which in the heart-muscle lies in the center of the cell, whereas in the muscles of the skeleton the nucleus is pushed to one side, or disappears, new nuclei appearing just beneath the sarcolemma-sheath. The skeletal muscles develop in regular order from the different segments (somites) of the mesoderm. In the early stages the distribution is very symmetrical, but later it becomes extremely uniform by reason of the irregular welding of different segments of the bony skeleton. There remains, however, a regular association of the muscular myotomes and their embryonic nerve supply, and the homologies of structure may be traced by the nerve-supply, although the muscles themselves may have shifted from their original position. This is a question of highly technical nature, but has many practical bearings in modern medicine. Thus the great broad muscle of the back, the latissimus dorsi, which arises from the seventh and eighth cervical segments, but later migrates and is fastened all the way down the spine as far as the crest of the hip bone, is supplied by a nerve which also develops from the seventh and eighth cervical nerves. The development history of each skeletal muscle can thus be traced by means of its nerve supply. The whole process is one of extreme intricacy and should be studied in special monographs.

Evolution of Muscular Tissue.—As in the development of the muscular system in man there has been a gradual evolution of the plan of muscular arrangement, so in the animal series there has been a gradual development of a muscular system from the very simplest types of contractile protoplasm. Even in plants definite movements may occur which may be very slow or very rapid. Yet no muscular tissue proper has ever been found in plants. Many of the lowest plants, the *Algae,* are motile and are provided with vibratory cilia, but these minute hairs, although capable of rapid motion, cannot be regarded as muscular organs. In the contracting protoplasm of the lowest animals, the rhizopods, although movements take place, there is no muscle tissue. Nor is muscle tissue found in the next higher group, the *Infusoria,* although very actively moving forms are known, for example, the familiar microscopic animal *Paramecium.* The bell animalcules, *Vorticella, Stentor,* etc., have stalks that coil and uncoil with great rapidity, but they contain no muscle tissue proper. They do, however, contain what are termed myronemes, and spironemes, which are longitudinally striated and have as many functionate as muscular organs. In another genus of infusorians (*Bursaria*) there is a contractile band about the body of the animal. It has been regarded as a true sphincter muscle. It has not the structure of the developed unstriped muscle cell. In the closely allied sponges (*Porifera*) certain elongated cells with rod-shaped nuclei are found, and may be considered the ancestral forms of the unstriped muscle cell, although it is not until the group of the *Coelenterates* is reached that true unstriped muscular tissue is present in its more advanced forms. In many of the hydroids a form of external neuromuscular cell is found. This is a type of cell half nerve, half muscle, but not resembling true muscular tissue. In the jelly-fishes of this order both neuromuscular tissue and true unstriped muscle fibers are found. In the sea-anemones unstriped muscle is abundant. It is mostly developed, however, from the external layers of the body, and thus embryologically is not comparable to the muscle tissue that in practically all the animals higher than the coelenterates is formed in the middle germinal layers of the developing animal. In one of the higher coelenterates, the common water-hydra, some muscle cells are found imbedded in the deeper tissues of the body, thus foreshadowing the higher type of muscular tissue. In the next great family of animals, the *Echinodermata,* to which the sea urchins, star-fishes and sea cucumbers belong, unstriped muscular tissue is common, but no evidence of striated or striped muscle is yet present. In the worms the muscular tissue is unstriped and abundant. In the mollusks, the foot of the soft clam, the muscle of the oyster, are made up of unstriped muscle fibers. A higher order, the *Arthropods* or *Crustaceans,* including the crabs, lobsters, etc., contains a well-developed muscular system, which is made up of striated muscle, practically the first appearance of this type of muscle in the animal kingdom. In these animals, moreover, there is a type of development of the muscles that anticipates the regular segmented type, metameres or myomeres, of higher animals. See also ANATOMY, COMPARATIVE.

From the crustaceans onward both types of muscle tissue are found. In the low vertebrates, *selachians* and *fishes,* typical heart-muscle cells, striated and with central-lying nuclei, are found.

Consult McMurrich, James, *Development of the Human Body, with full bibliography* (1902); Bayliss, *Principles of General Physiology* (1915); Parker, George, *The Elementary Nervous System* (1919).

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MUSES, goddesses of the liberal arts and sciences; originally nymphs of inspiring fountains. At first three Muses only were known: Melete, Mneme, and Aoide. Four Muses are sometimes mentioned as the daughters of Zeus and Plusia, Melete, Aoide, Arche and Thelxinoe. At other times there are said to have been seven, at others eight in number. Nine Muses are also enumerated as the daughters of Pierus, king of Emathia, but these were not the nine generally recognized. The latter were Clio, Euterpe, Thalia, Melpomene, Terpsichore, Erato, Polyhymnia, Urania, and Calliope. Among the adventures of the Muses their three contests with the Sirens, with the daughters of Pierus and with the bard Thamyris, in all of which they were victorious, are particularly famous. The customary occupation of the Muses was singing and dancing. Separate attributes were not till a comparatively late period assigned to the individual Muses. Calliope became the Muse of epic poetry. She was the most distinguished among the Muses, the protectress of kings, whom she endowed with eloquence and song

Clio became the Muse of history; Enterpe of lyric poetry and music, particularly of wind-instruments; Thalia of comedy; Melopomene of tragedy; Urania of astronomy; Erato of lyric and erotic poetry; Polyhymnia of the sublime hymn; and Terpsichore of the dance. They are commonly represented as beautiful virgins, adorned with wreaths of palm leaves, laurel, roses or the feathers of the Sirens. They dance in a circle, together with Apollo, who in later times was styled Musagētēs, or leader of the Muses. Their worship extended from Greece to Italy. In Rome they had a separate temple, and a grove was sacred to them. The swan, the nightingale and the grasshopper were also sacred to them.

MUSEUM OF ART, Metropolitan. See ART, METROPOLITAN MUSEUM OF.

MUSEUMS are institutions for the preservation, study and display of natural objects, or of those made by man, while as a sequence of study comes the publication of information thus derived. The word museum originally signified merely a grove or other locality sacred to the Muses, but with the development of the museum the word has undergone a parallel course of evolution until it has come to have its present meaning. The next use of the term was for an institution devoted to the study of philosophy, literature and art, but not including the preservation and display of objects; in this sense it was applied to the famous Museum of Ptolemy Soter at Alexandria. While this was in the nature of a university, there is some reason to believe that collections of plants and animals were attached to the institution so that it may be regarded as the prototype of the more modern botanical and zoological garden. In modern sense public museums are of comparatively recent establishment, and as educational factors, of later date than art galleries and libraries, although like these having their beginnings in the gratification of the desires of private individuals. The origin of the art museum is to be found in the collections of statuary, paintings and other works of art, made by kings, nobles and men of wealth; the germs of the modern museum of natural history were the cabinets of miscellaneous curiosities brought together by students, merchants, or men of leisure. Many of these collections subsequently developed into important public museums, the most striking example, and the one most frequently cited, being the British Museum (q.v.), which was the final outgrowth of the cabinet and library of Sir Hans Sloane. In the United States the Museum of Comparative Zoology, at Cambridge, Mass., has grown from the collection made by Louis Agassiz (q.v.) for his own use, until it has become one of the most important museums in this country. Even the United States National Museum, if not the direct outgrowth of a private collection, was indirectly due to the labors of individuals, for its nucleus is to be found in the specimens gathered by the National Institution (later the National Institute), a body organized with the avowed purpose of directing the bequest of James Smithson (q.v.) and engaging in pursuits in accordance with its terms.

The lineal successors of the cabinets of private collectors were the museums of scientific societies where specimens were gathered for purposes of study and display, and while these still exist they have largely given place to museums supported by the State or municipality. Private collections are more numerous than ever, but these are rarely formed with any intention of displaying their contents to the public, although there are some notable exceptions, as in the museum of the Hon. Walter Rothschild at Tring. Ultimately, however, a large proportion of these private collections find their way to public museums through the liberality of their owners, or by bequest.

Another step toward the establishment of public museums was the formation of collections of objects of more or less popular interest and their exhibition to the public on the payment of a fee. Notable examples of these abroad were those of Sir Ashton Lever and Charles Bullock, which flourished in London during the latter portion of the 18th century and first part of the 19th. It is interesting to note that one of the earliest cabinets formed in the United States, that of Mr. Arnold, of Norwalk, Conn., was sold to Sir Ashton Lever, while later on the "Leverian Museum" was sold and its specimens scattered among the great museums of Europe.

Early American Museums.—In this country the principal recent museums of this character were the Boston Museum and Barnum's Museum in New York, in both of which the idea of amusement predominated, the first named being a rather incongruous introduction to a theatre. Both, however, contained some really valuable specimens of natural history and Barnum was among the first to exhibit living fishes. Of a very much earlier date and more scientific in their aims were the museums conducted by Charles Willson Peale and his son, Rembrandt Peale, in Philadelphia, established in 1785 as the Philadelphia Museum, and from 1822 to 1828 installed in Independence Hall. This museum is of particular interest from the fact that many of Peale's ideas as to the arrangement and educational value of museum collections were in advance of his time. In his use of painted backgrounds and the addition of nests and eggs to the exhibits of mounted birds we have the germ of the elaborate habitat groups shown in modern museums.

The modern "dime museum" with its exhibit of "freaks" is a survival of this phase of museum development, and the catalogues of some celebrated old collections will show that they comprised many very similar objects, as well as those of real value from a naturalist's standpoint.

Government Museums.— The final step in the establishment of public museums, the transferral of collections from private to governmental ownership, may be said to date from the founding of the British Museum in 1753. At first admission was by ticket and limited to 30 persons per day; in 1810 the museum was made accessible to the public for three days a week, and not until 1879 was it open to the public daily. The United States National Museum was only formally created in 1876, although so early as 1846 the government possessed collections which were in the custody of the Smithsonian Institution. Exploration has done so much for museums that it may almost be included among the causes that have led to their

formation. The colonization of America brought to Europe many examples of new plants and animals, while the Dutch East India voyages did the same for southern Asia, and it is surprising to see how large a number of species from these regions was described by Linnæus and others so early as 1760.

In more recent times the Wilkes Exploring Expedition of 1838–42 and the government surveys for a route for the Pacific Railroad had a very decided influence on the origin and growth of the United States National Museum, and there is scarcely an institution that has not been benefited in a similar way. It is but a step from expeditions in which scientific results were subordinate to practical ends to those undertaken solely for scientific purposes, and the systematic exploration of our Western Territories for fossils by such institutions as the American Museum of Natural History and the Carnegie Museum, and by Yale, Princeton and other universities, has become a matter of almost daily news. Another most important factor in the development of museums has been national or international exhibitions. These have had a direct effect in bringing together collections illustrative of natural or industrial resources, and a more indirect influence in stimulating methods of arranging and displaying such material. The London Exhibition of 1851 led to the establishment of the South Kensington (now Victoria and Albert) Museum, and the ethnological museum of the Trocadero was one of the outcomes of the Paris Exposition of 1889. Our own Centennial Exhibition was the direct cause of the erection of a building for the United States National Museum and of the founding of the Pennsylvania Museum of Art, while from the Chicago Exposition came the Field Columbian Museum, the Chicago Art Institute and the Philadelphia Commercial Museum. Other causes play minor parts in influencing the lines of growth of museums both small and great. Thus the extensive colonial possessions of Great Britain have been largely instrumental in making the vertebrate collections of the British Museum, the greatest in the world, while the museum at Leyden is not far behind owing to the former extensive commerce of Holland. In the United States the large deposits of fossil vertebrates in the West, their general accessibility, the imposing appearance of many of the specimens and the important results to be derived from their study have given a great impetus to the formation of palæontological collections, while special attention has been given to the preparation and exhibition of this class of material. The display of fossil vertebrates in the American Museum of Natural History is unrivaled, and other notable exhibits are to be found in the Museum of Yale University, and in the Carnegie, Field and United States National museums. The National Gallery of Art and the Freer Collection, installed in a building of its own, both forming parts of the United States National Museum, were respectively the gifts of William T. Evans and Charles L. Freer.

Popular Display of Specimens.—What may be termed the popularizing of museums has but recently taken place, and while the display of objects has always been regarded as one of the functions of museums, it is a branch which has received particular attention only during the past 30 years. Originally the larger part of the specimens of birds and mammals were placed on exhibition, but it became evident that this meant the injury or even loss of many, and that the public cared little for large monotonous series of stuffed animals. At present the number of objects on exhibition is relatively small compared with those in the reserve or study series, and there is a very general effort to display at least a part of the specimens amid their natural surroundings. The influence of the private collector has probably had much to do in bringing about this change, and the British Museum, under the administration of Dr. Günther, was the first of the great museums to introduce groups of birds, with their natural surroundings, as a part of its exhibition series. These were largely added to under the directorship of Sir William Flower, who took great interest in the problem of rendering museums attractive and instructive, while, following this example, the American Museum of Natural History took the lead in this direction in the United States. To the museum of Leyden, Holland, however, belongs the credit of having before this departed from the tradition that mammals must be stuffed in stiff and formal attitudes and caused some to be mounted that bore some resemblance of life. Change in the character of the exhibits has been accompanied by equal changes in the matter of labeling and to some extent in the publications issued by museums, so that from being merely storehouses of material for the benefit of a few they have become great schools of instruction for the many.

School Work of Museums.— In direct line with what may be termed passive educational work by means of carefully arranged and well-labeled exhibits is the active participation of museums in the work of public schools of all grades by means of circulating loan collections, the giving of lectures at museums or sending lecturers to the schools, and the loaning of series of lantern slides to illustrate such subjects as natural history, geography, history or technology, and in this connection motion pictures have been found most helpful.

The initiative in this line seems to have been taken by the Buffalo Academy of Sciences in 1872 and the Davenport Academy of Sciences in 1878, in both cases by means of lectures given at the museum. The Public Museum of Milwaukee appears to have been the first to loan definitely selected material; the American Museum of Natural History, under the administration of Professor Bickmore, the first to give systematic courses of lectures more or less correlated with school work. This latter institution was also the first to establish a department of public education (instruction) for the sole object of co-operating with the public schools.

Following in the lead of these institutions, or acting independently many other museums have actively engaged in school work, notably the Commercial Museum of Philadelphia, Chicago Academy of Sciences and the Educational Museum of the Saint Louis public schools. This last, the first to be devoted exclusively to school work, though founded by the board of education in 1904 as an outcome of the exposi-

tion of that year, is a museum of distribution rather than of exhibition, its work being the loaning of specimens, charts, models and similar objects to the public schools.

Classification.— Museums may be grouped or classified by their contents, or according to the purposes for which they were established. Following the first method Dr. Goode has divided them into museums of art, history, anthropology, natural history, technology and commerce. A museum may be established for any of these great subjects as a whole or for one of the many branches in to which they may be subdivided. Thus a museum of natural history may comprehend both animals and plants, or one of the other of these primary divisions; it may include the animals of a single continent, a single geographical region or be restricted to those of one locality; it may be devoted to some large group, as mammals, birds or insects, to some minor division, as birds of prey, butterflies, etc., and may or may not include fossil species. Technology may be greatly subdivided, and while the favorite and more striking subjects are shipbuilding and railroads, there are also museums of hygiene and textile fabrics, while the United States National Museum contains collections illustrating the development of electrical apparatus. And technology may trespass on art in the matter of ornament, or, like art, be included in a historical collection illustrating the progress of mankind or of one nation.

According to the purposes for which they are founded Dr. Goode distinguishes national museums; local, provincial or city museums; college and school museums; professional or class museums; and museums or cabinets for special research owned by societies or individuals. This scheme of classification is open to the objection that it confuses purpose with ownership or administration, since, for example, national and municipal museums are not merely for the display of objects found within their boundaries, but for those belonging to the nation or city.

College and school museums have for their immediate purpose the formation of collections that shall aid students in understanding various problems connected with science, technology or art, but they are usually extended beyond this and become more or less general in their character. This has been the case with the museums of Harvard and Yale universities and is notably true of many foreign museums, such as that of the Royal University of Prussia, which is the national museum. The professional museum is for the illustration of some special occupation or line of research such as mining, medicine or even psychology, which has a museum at Florence founded by Mantegazza. The largest institution of this kind is the Museum of the Royal College of Surgeons, London, which has developed from the private collection of John Hunter.

The Army Medical Museum, Washington, had its inception during the Civil War as a museum of pathology and military surgery, but its scope has been so extended that it offers a fairly comprehensive history of the progress of medicine and surgery. The library established in connection with this museum has grown to be the first medical library in the world.

Modern European Museums.—Europe naturally has the greatest number of governmental museums, the capital of almost every state claiming at least one museum of natural history and an art gallery, and often anthropological and technological collections as well. Paris, with some 30 museums, probably leads in the matter of national collections, while Berlin and Vienna have respectively about 20 and 15 museums. Turkey forms a notable exception to the above statement, for Friedlander's Directory contains no mention of a Turkish museum, although a commercial museum has been established at Constantinople. Great Britain has the largest number of local museums, those devoted to the preservation and display of objects illustrating the natural history and archæology of the immediate vicinity, and, as a whole, these are better administered than those of other countries, great care being devoted to labeling, arranging and otherwise making the collections interesting and instructive to the public.

Europe in general and Germany in particular possess many technological museums devoted to the illustration of such subjects as mining, pottery making, weaving, shipbuilding, machine construction and operation and similar topics. Perhaps the most important of these is the Deutsche Museum of Munich, which among other exhibits has a considerable number of working models of such machines as locomotives, so constructed that a large number of the parts is visible, and may be set in motion by the visitor.

Modern American Museums.— There are now nearly 600 museums in the United States, about three-fourths of them attached to colleges or under the supervision of societies, but comparatively few of these are active or important. Nearly half of the whole number are entirely or chiefly devoted to natural history and about 10 per cent to art, though this proportion seems on the increase and the past decade has witnessed the establishment of several important museums of art. A considerable number of museums are general in their character, including both art and natural history.

About 25 per cent of our museums include or are devoted to history, but here again few are active, though there are noteworthy exceptions, such as the Essex Institute of Salem, Mass., and the Historical museums of Chicago and Buffalo, the latter of which makes a specialty of publication.

The United States is strangely poor in technological museums or even in extensive technological collections, though these are steadily on the increase. There is, for example, no museum of naval architecture in this country, the nearest approach to it being the collection of the United States National Museum, in which certain phases of the subject are well represented.

Our oldest existing museum, as well as the first public museum in America, is the Charleston (S. C.) Museum, founded by the Charles-Town Library Society in 1773, later incorporated in the College of Charleston and recently passing to municipal control, thereby taking on a new lease of life. Next to this is the Peabody Museum of Salem, the successor of the East India Marine Society Museum, founded in 1799; it also includes the natural history collections of the Essex Institute.

The Museum of Comparative Zoology, Harvard University, holds the first place among college museums. It is not confined to zoology, as its name might imply, but covers the entire field of natural history. The mineralogical collection dates back to 1793 and is probably the oldest of its kind in America, while the botanical section includes the Gray Herbarium. The nucleus of the Museum of Comparative Zoology was the private cabinet of Louis Agassiz, which was purchased by subscription for $12,000 in 1852. In 1858 an allowance was made for the maintenance of the museum and in 1859 the State of Massachusetts assumed an interest in the institution, at the same time appropriating $100,000 for its increase; $71,000 was also raised by private subscription. In 1876 the State assigned its rights to Harvard College and since that time the museum has been maintained by the university, although the great increase in its collection was principally due to the liberality of Alexander Agassiz, who expended over $1,000,000 for that purpose. An important museum of anatomy is attached to the Harvard Medical School. The Museum of Yale University contains the Marsh collection of fossil vertebrates, comprising many types, as well as the largest collection extant of fossil footprints, while brachiopods and sponges are well represented. In other departments are a fine series of modern corals and many rare archæological specimens. The Museum of Yale University is temporarily in storage and there is no immediate prospect of a new building — nevertheless the collections exist. The Museum of Princeton University possesses large and important collections of fossil mammals from Patagonia and our Western States, a good collection of North American birds and many examples of ancient and modern art. The Museum of Archæology, University of Pennsylvania, has the best collection of Babylonian antiquities in America and is also particularly strong in America archæology; also attached to the university is the Wistar Institute of Anatomy. To Amherst College belongs the Appleton Cabinet of fossil footprints, containing the specimens described by Prof. E. Hitchcock, and the University of Kansas is rich in Cretaceous vertebrates and large North American mammals. On the Pacific Coast Stanford University and the University of California both have museums; at present these are largely working collections, but both have art collections apart from these.

Among the most important as well as oldest museums under the control of scientific societies are those of the Academy of Natural Sciences, Philadelphia, and the Boston Society of Natural History; the first dating from 1812, the latter from 1831, although it was the successor of the Linnæan Society, founded in 1814. Each contains large collections of birds comprising many types of species described by our earlier ornithologists. A notable addition to the list of American scientific museums is the Museum of the American Indian, Heye Foundation, opened in New York City in 1922. It houses a remarkably complete collection of ethnological specimens relating to the American Indian, as well as the James B. Ford Library.

There are few museums in the United States directly owned or administered exclusively by municipalities, as are public libraries, almost the only one being the Public Museum of the city of Milwaukee, but there are many to which the city has contributed or does contribute, either by grants of land, erection of buildings or annual appropriations for financial support, and there is a growing tendency toward this co-operation between city and citizens as the educational value and practical importance of museums are recognized. About 15 per cent of our museums belong in this class, including many of the largest and most active, the chief among them being the American Museum of Natural History.

There is, however, a large and constantly growing number of State museums, that of New York standing first, while those of Ohio, Illinois and Pennsylvania are most important. The scope of these State institutions is somewhat general, comprising natural history and history, this latter being usually treated in a somewhat desultory way.

In the category of museums supported by endowment or by private funds and municipal aid are to be found all the art museums in the United States, not one having been established by the national government or that of any State. Local museums are practically lacking in the United States; for most of the smaller museums, even, make the attempt to cover the same ground as the larger institutions when they could achieve much better results by confining their attention to the immediate vicinity. In conclusion it may be said that while public museums are not so numerous in the United States as might be expected from the size, resources and wealth of the country, the last 25 years has not only witnessed a great increase in their number but in the growth and educational efficiency of those already established.

Bibliography.— For detailed information as to museums and their administration, cases, labels and the arrangement of exhibits, consult 'Museums Association, Report of Proceedings, etc.' (London 1890 to 1900); since that date 'Journal of the Museums Association' and 'Proceedings of the American Association of Museums' from 1907; the museums of the United States are listed in 'A Directory of American Museums,' published by the Buffalo Society of Natural History, 1910; those of Great Britain and her colonies in 'Directory of Museums in Great Britain and Ireland' London 1911). For the history of the Smithsonian Institution, United States National Museum, classification and administration of museums, consult 'A Memorial of George Brown Goode' (Report of the United States National Museum for 1897, Part 2, Washington, D. C.).

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The volume of museum literature in the shape of reports, bulletins, general guides and special leaflets is today very considerable and many museums issue regular periodicals for the information of their sustaining members and the public.

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MUSGRAVE, William Everett, American physician: b. Farmington, Tenn., 12 Sept. 1869. He was graduated (1901) at George Washington University and became (1902–09) pathologist of the Bureau of Science at Manila, P. I., then chief of clinics and later director of the Philippine General Hospital and dean of the College of Surgery, University of the Philippines. He was (1903–04) president of the Manila Medical Society and (1905–06) president of the Philippine Islands Medical Association. He edited the California *State Journal of Medicine and Better Health.* D. 9 Mar. 1927.

MUSH, moosh, Armenia, the chief town of the Mush sanjak, vilayet of Bitlis, 79 miles south of Erzerum, near the Kara-su, the eastern affluent of the Euphrates. It is built on a plateau 4,800 feet above sea-level, rising on the south side of a mountain-girt and fertile plain. It is an ill-built, unclean town, peopled by Turks and Armenian Christians. It has Gregorian and Roman Catholic bishops and an American Protestant mission and schools. A thriving trade is carried on in the tobacco, grape vine, wheat and other agricultural products of the adjacent plain. Mush is mentioned by Xenophon and Moses of Khorene, and came into prominence in 1894, owing to the massacre of Armenians at Sasun in the neighborhood. Pop. about 20,000.

MUSHROOM, a popular term loosely applied to many species of higher fungi, especially such as have a cap (pileus) upon an erect stalk. Primarily, the mushroom is *Agaricus campestris* (see FUNGI), the only species cultivated upon a commercial scale. Though more than 700 species of mushrooms have been proved edible within the last half century, and though many others will doubtless be proved harmless, the novice should be cautious in trying new species. Each unfamiliar kind should be subjected to rigid examination first by smell, and malodorous ones discarded; then by taste, a small piece being nibbled but not swallowed. If no ill results follow in the course of several hours, a small piece may be swallowed. If no evil effects follow, but the flavor raw is unpleasant, cooked morsels may be cautiously tried, and results noted. Each individual must decide what species agree with him, because some systems will not endure kinds innocuous to others. Nervous fear of fancied bad symptoms must be controlled, or real illness may be induced by the imagination.

Several species are popularly reputed virulent which do not produce any marked effect upon the health for several hours, and which are widely feared as deadly. Since the two commonest of these (*Amanita muscaria* and *A. phalloides*) are often mistaken for the common mushroom, the novice should never gather any toadstools in the woods under the impression that they are the proper mushroom, which grows in pastures, lawns, etc., and not in shady places. Further, all species with yellow or white gills should be avoided until known to be edible. The common mushroom has pink gills when young, and purplish-brown or black gills when mature.

Several of the thousand species of the genus *Agaricus* are valued for food, but the common mushroom (*A. campestris*) is the most important. It is occasionally found in open and grassy glades; never in the deep forest, but most frequently in old pastures and lawns, especially in autumn, but often when conditions are favorable during the summer. It grows about three inches tall, has a fleshy cap about three inches broad, generally white, sometimes reddish or brownish above and pink beneath. Its stem does not rise from a cup-like base as does that of *Amanita phalloides.* It is generally gathered in the «button» stage, that is, before the cap has expanded. Among its near relatives the best known is probably the horse mushroom (*A. arvensis*) which is much larger, whiter above, lighter below, the gills being white when young, but otherwise resembling the common species.

Success in mushroom growing seems to depend more upon the individual grower than upon the method, since two growers may each succeed equally with very different methods. The essentials seem to be decaying organic matter in abundance, uniform but not excessive moisture and equable rather low temperature. The most popular places for cultivating this plant are caves, abandoned mines and quarries, cellars, pits and similar places, where the temperature is naturally suitable or may be artificially controlled. The beds are usually made by spreading a layer of well-rotted manure and loam over a firmly packed deep layer of fresh horse-manure. After the violent heat of fermentation has passed and the temperature has fallen to or below 90° F., the mushroom «spawn» is planted. This spawn consists of the mycelium of the fungus in bricks (English) or flakes (French) made of equal parts of horse and cow manure and loam; it is a commercial article and its manufacture constitutes a business distinct from mushroom growing. After sowing, the bed is kept moist by mulching with straw or covering with mats which are replaced in about 10 days with a layer of loam about two inches deep. In America the mushroom is rarely cultivated out of doors; in Europe it often is, the temperature and moisture there being more favorable. It is frequently found growing wild in sufficient quantities to make commercial shipments profitable.

Besides the species already mentioned, several common American species are among the most desirable edible fungi. *Coprinus comatus,* the horse-tail or shaggy-mane mushroom, grows sometimes six inches tall, has a nearly cylindrical white shaggy cap with often black scales and white gills when young, but these turn black and liquefy with age. It is commonly found in lawns, waste places, rubbish heaps, etc., from midsummer until the coming of frost, especially after showers. *C. atramentarius,* the ink-cap, resembles the preceding in general appearance and places of growth. *C. micaceus,* the glistening coprinus, is a brownish species smaller than the preceding. It grows upon decaying wood. *Lepiota procera,* the parasol mushroom, and *L. naucina,* the smooth lepiota, grow in lawns, pastures and occasionally in gardens. They have white spores and a ring on the stems, to which the gills are usually not attached. *Cantharellus cibarius,* the chantrelle, grows about three inches tall, measures nearly as much across the cap, has an irregular top-shaped yellow or orange cap and has much-branched gills. It grows upon the ground in woods. *Maras-*

mius oreades, the fairy ring or champignon, is a small cream-colored or reddish species, which tends to grow in circles upon lawns and pastures. It is rather tough and solid, but is valued for its nutty flavor and its drying qualities. Its gills are alternately long and short. *Lactarius deliciosus* has an orange cap, an orange milky juice, and with age shows greenish tints where bruised. *Boletus edulis,* the edible pore-mushroom, has a yellowish or brownish cap, with convex tubes which change with age from white to greenish yellow. It is commonest in chestnut, pine, and oak woods during autumn. *Fistulina hepatica,* the liver-fungus, grows upon decaying wood, is stemless and of irregular form, red, succulent, and fibrous. It is often called beef-steak-fungus on account of its edible qualities. *Morchella esculenta* and several relatives, popularly known as morels, are of various colors, but usually grayish or yellowish. The top, somewhat resembling honeycomb, makes them easily recognized. They thrive in potash and are common where the land has been burned over or wood ashes have been thrown; also in orchards and woods. *Lycoperdon giganteum* and other species of puffballs, which are common in pastures, are considered among the best edible fungi if used while still white. They are more or less globular in form. The species mentioned sometimes attains a diameter of several feet.

Mushrooms are often said to be equal to meat in nutritive qualities, but these statements are not warranted by analyses, which show that fresh mushrooms contain about 88 per cent of water, 3.5 per cent of protein, 6.0 per cent of nitrogen-free extract, and generally less than 1 per cent each of fat, fiber, and ash. The protein content is therefore less than one fifth that of porterhouse steak, less than one third that of dressed codfish, and but little more than one fourth that of hens' eggs. Indeed, according to analysis, they seem to be inferior to most vegetables. Their chief value is therefore in their flavors, which vary with individual species as much as among higher plants. They are eaten by various animals (see FUNGUS-EATERS).

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MUSIC. When Hans von Bülow boldly decreed: "In the beginning was rhythm," he took advantage of the prerogative of so many sayings: to be pithy and unfounded. Music is certainly older than rhythm. Music in its broadest sense is even older than melody; older indeed than any single element of the sounding complex that we call music today. It has no single root, no single cause; and all the "plausible" theories of philosophers about the origin of music are vain speculations.

Primitive World.—Music has taken shape by merging and developing a number of different human utterances, which we see distinctly in the life of primitive tribes; for "primitive" means being arrested on the cultural level of the Stone Age. The Veddas of inner Ceylon, certain Patagonians, and other peoples recite their poems in what can hardly be called rudimentary melodies of only two tones a second or minor third apart and use them as little more than vehicles without much meaning of their own; Australians and American Indians burst into cascades of storming shouts and wails under the impact of strong emotion—cascades that slowly settle in musical intervals, leaps, and steps; and other peoples tend to organize their calls in regular fifths or fourths and their cries in shrieking trills. Even on the lowest level that the historian's eye beholds, the typical structure of modern songs evolves; indeed, the pygmies and their next of kin invent the strictest form of counterpoint, the canon, in which the leader and the chorus enter after one another with exactly the same short melody before the singer ahead has finished (as in *Frère Jacques* or in *Row, row, row your boat*).

Rhythm, the organizing power of human motion, does not join melodic expression at once. It reaches music essentially when bodily acts are made audible, when clapping, slapping hands or pounding feet unite the moving body with the singer's voice. Not alone does formal dancing create such a union; most early instruments—clappers, rattles, stamping tubes and, later, drums and xylophones—are extensions or projections of the moving limbs; they are rhythmical motion addressed to the ear. The ratio between the two elements—rhythm and melody—is different wherever we turn; rhythm, as the younger element, has an inferior role with many peoples, but in others is dominant enough to leave melodic expression far behind. The strongest example of such a dominance is probably the intricate, hardly decipherable polyrhythmical music of Central African drums, whose complicated patterns, syncopations, and offbeats tax the Western ear as other music seldom does.

In primitive civilizations, much more than in modern culture, music is connected with the daily life of the tribe. It has a leading part in all the manifold rites in pristine existence: birth, puberty, wedding, death, and the elaborate incantations for health, fertility, rain, resurrection, and victory. Every member of the tribe is expected to have a share in these musical activities, in singing, clapping, playing; and though some individuals may be more gifted and skillful than others and therefore sought as soloists, an actual specialization in a professional sense does not yet exist. But the collective and purposeful character of all this music around the fire or on the village square must not be mistaken for something merely utilitarian without aesthetic aims or standards. Whether most of it should be called art or not, is doubtful; the word has not been, and never will be, satisfactorily defined. There is no hard-drawn borderline between an art in the service of rituals and an art for the sake of self-expression or aesthetic delight. Despite the practical ends, the gusto with which the singers sing and drummers drum is very far from artless toiling. And the mere facts of a remarkable evolution even in the narrow limits of some tribal style and the often very careful polishing given to new inventions show the kind of individual contribution characteristic of any art in its own right.

Oriental World.—Oriental music or, better,

music in the high civilizations of Asia and the African North, differs from primitive music mainly in the emergence of professionals and of a well-ordered scientific fundament. The professional appears either as a bard—often blind—who sings the deeds of gods and kings at courtly banquets, or else as a well-trained member of one of the bodies of singers and players attached to the courts and the temples. The craft is often handed down to the sons and grandsons in Bach–like musical dynasties; or special conservatories take care of thorough, systematic education.

The Bible provides the classical illustration of the contrast between the primitive and the highly civilized world. In the books of Moses and the Judges, men and women of the people sing or play the lyre and the drum at celebrations; there is no mention of any professional. Indeed, when Saul, the king, was in need of soothing music to overcome his depression, he sent for David, then a shepherd, to play for him on the lyre. But the reign of David and Solomon marked the change: Levites were selected to dedicate their time and energy to performing the music in the temple, and when the House of the Lord was finished, it included a special school for 288 music students in 24 grades or classes "under the hands of their fathers."

Such planned education cannot be mere practice and routine. It presupposes a scientific basis, a musical grammar, a theory of rhythm, and a system of scales and steps and intervals. Music progresses to a conscious, methodical art and often attains some form of notation.

The music of the ancient Orient is practically lost. Only the cantillation of Orthodox Eastern synagogues, of Eastern Christian churches, and of Far Eastern and Hindu temples gives an idea of the religious music in antiquity; and much of the modern folk song in Asia and Northern Africa has obviously not changed in two or three thousand years. For the rest, we must rely on instruments dug from tombs, on reliefs and paintings of musical scenes, or on short allusions in contemporary texts. The situation is slightly better in the East—in India, China, and Japan, where the original nations and the original religions have survived—than in the West, where Islam and Islamic conquerors, and even Christian churches, have put an end to the ancient civilizations. No such break occurred in the East, and, much as some change in the current of three or more millenniums must be taken for granted, mutation has not been too significant in the otherwise unbroken tradition so characteristic of the East, as contrasted with that of the West.

Oriental music is probably at its best in India. Nowhere is it richer and more sophisticated. It has an unmatched number of different scales with five or six or seven steps per octave in finest gradation; an incomparable wealth of delicate grace notes without which, as the Hindus poetically say, a melody "is like a moonless night, a river without water, a creeper without flowers"; and above all, a subtly refined rhythm without actual stresses, which hardly ever assumes the all too straight and artless forms of our three-four and four-four rhythms. Melody is never entirely free; invention must accept the limitations of set patterns or *ragas,* in which a specific mood is expressed in some specific scale; and it also must accept the limitations of metrical patterns or *talas,* which are repeated throughout a piece as are the metrical feet of a poem. So important is rhythm that the heading of a piece indicates both *raga* and *tala,* in the place where our music would write the key, as in Sonata C Major.

In India, as well as in the rest of the Orient, all music in a curious way is connected with extramusical concepts. Single notes, as well as scales and melody patterns, stand, as a logical outgrowth of Eastern cosmology, for the cardinal points, the planets, substances, cardinal humors, diseases, and parts of the day. Even now, in a time when all this cosmology is vitally weakened, a serious musician would hardly play a morning *raga* at night.

Extramusical connotations are most outspoken in the sacred music of China, where, for instance, the *Hymn to Confucius* must be transposed every month by a semitone, because the semitones are closely related with the months of the year. Otherwise, East Asia's music, strongly Mongolized, is less subtle and less varied than India's. It has, on the whole, not more than two scales, both pentatonic with only five steps in the octave. One of them contains two undivided minor thirds, and the other, still used in Japan, holds two major thirds side by side with two semitones. Rhythm, very far from the delicate sophistication of India's metrical patterns, is almost uniformly a crude 2/4 beat. And whereas India is prevalently given to chamber music, the Far East has, or had, full orchestras: the emperors of the T'ang dynasty (618–906 A.D.) kept among the many court orchestras one with more than 500 pieces and an outdoor band of 1,346 men.

Orchestral art is to this day the characteristic form of Indonesian music, foremost in Java and Bali. An orchestra, or *gámelan,* in most cases composed of well-tuned gong chimes and bronze slabs, plays as a rule a single melodic theme, very slowly on the lower instruments, at the same time much faster on the middle ones, and dissolved in fastest passages in the higher instruments, while deep gongs mark the regular ends of periods.

The Near East, or the Mohammedan world between Morocco and Iran, has a musical language infinitely closer to that of India. Rather than orchestras, it delights in smaller chamber ensembles that play in a free, individually modified unison. It has a great variety of scales and rhythms and follows the principle of compulsory melody patterns in which the contribution of individual composers is, compared with Western concepts, rather limited. As a striking difference in devising scales and patterns, Arabian countries have a predilection for a kind of temperament in which the two semitones borrow a quarter tone each from its neighbor below, so that, for example, the notes D E F do not form a whole tone D E and a semitone E F, but two equal three-quarter tones, which the Western ear finds hard to accept.

Greek World.—While there is a strong stylistic connection with India, Arabian theory has depended greatly on the writings of ancient Greece, for the authors of Hellas—musicians, philosophers, scientists—had left the most complete grammar of music as well as the fundaments of acoustics, aesthetics, and music history. In these endeavors, as in musical practice, they threw a bridge connecting the East and the West, the Old and the Middle Ages.

The Greeks themselves used to acknowledge the Oriental origin of their music and were fully aware of the fact that not a single one of their instruments had a Hellenic name. Nevertheless, the ancient culture of Crete which they overran in their conquest around 1000 B.C. did give them the one most characteristic element: choral singing to praise the gods and accompany the solemn processions to holy shrines and oracles. Several hymns of this kind, to Helios, to Nemesis, to the Muse, are preserved among the dozen relics, notated on papyrus or engraved on stones in a letter script that we have learned to decipher without much difficulty. As a rule, rhythm was not marked; for the melodies followed the versification of the text so closely that, except for the end of a line, a long syllable carried a quarter note (in our terminology), and any short syllable, an eighth note. Thus, the music was just as dactylic, trochaic, or anapaestic as its texts. Even in the rarer and more complicated cases of five beats in one short and two long syllables, melody followed obediently and therewith achieved a peculiar airy charm. Only in one relic—a delightful drinking song—the letter symbols above the syllables of the text are supplemented by rhythmical dashes to indicate the length of each note, because the melody there is, in a way, independent of the text.

The Greeks, like the Orientals, had an impressive number of scales: a civilization without the shades of harmony must necessarily find the shades they need in the variety of melodic steps and their arrangement. The oldest, called enharmonic (against the modern meaning of the term), consisted of undivided major thirds and semitones, like the principal scale of Japan and probably related to it through inheritance from a common mother civilization somewhere in central Asia. Another one, chromatic, had minor thirds and whole tones. Most later scales were, like ours, diatonic, and yet so multiple in their structures that we hear of no less than 8 sizes of thirds, 7 whole tones, 13 different semitones, and 9 microtones smaller than semitones. Eventually, the confusing diversity was reduced by dropping most of the older scales and squeezing the rest into a simplified "Perfect System."

All these scales, or rather the melodies modeled after them, were, as everywhere in the Orient, interrelated with extramusical concepts. But different from the East, the connotations with planets, cardinal points, colors, or substances were ignored in favor of human moods and qualities, so that the ethos of a melody was mostly its way of affecting the character of man. For this reason, music became paramount in Greek education, and Plato even suggested—as Confucius had done in China a hundred years before—that the ideal state should be erected on the fundament of music.

Greek music has been misrepresented as an entirely homophonic art, with the instruments merely doubling the melody of the song. This is not correct. There was, of course, no harmony or counterpoint in a modern sense; but repeatedly Greek writers insisted on the beauty of simultaneous consonances and tell us about the independence of instrumental voice parts. This is important to know since it sheds new light upon the beginnings of medieval polyphony.

Middle Ages.—Rome, the homestead of the musical liturgy of the church, was the heir of Hellenic music and passed its theory and certainly a part of its practice on to the Middle Ages. Anicius M. S. Boethius, who wrote in Rome the last work on music in antiquity, about 500 A.D.—long after St. Ambrose had created his Christian liturgy and probably after the earliest *schola cantorum* of the pope had been founded—was for a thousand years considered by the Western World the supreme authority in music.

The picture which early medieval music offers is incomplete and distorted, for only the monks were able to write; and ignoring the popular tunes outside the church and the abbey, the musicians among them wrote on nothing but sacred music. Thus we acquire too easily the mistaken impression that secular music was nonexistent in the early Middle Ages.

The music of the church was at first merely vocal, to be sung by the priest, a unison choir, and soloists; the church fathers had been opposed to instruments. It served mainly the functions of the Mass and of the daily offices from matins to vespers and complin. Its melodic idiom was originally that of the Jewish Temple, but it must have accreted a large vocabulary from all the Mediterranean countries in which Christianity took root. St. Ambrose, bishop of Milan in the 4th century, made the first attempt to fuse these often heterogeneous elements into a unified liturgy. But Pope Gregory I defeated him 200 years later with the somewhat different liturgy which became known as the Gregorian chant (q.v.), and which succeeded in becoming the nearly exclusive form of Catholic Church music. Its melodies are modal; the eight ecclesiastical modes which they follow differ in the position of the semitones within the octave and can be roughly reproduced by playing the white keys of a piano on A, on B, on C, and so on. The melodies have not changed to this day; but their original rhythm, never notated, was probably lost as early as the 11th century and is now replaced by an almost even length (of an eighth) given to every note.

We know scarcely anything about the secular music of the early Middle Ages, except indirectly, when at the end of the 11th century a novel, courtly style of poetry began to emerge and be set to music. The courtly poets must have availed themselves of a musical language long in existence—the language of folk song, of dances, and of professional minstrelsy. It is important to note that, unlike the musical language of the church, the many hundreds of melodies written down and preserved show a surprising prevalence of the modern major mode.

The time of this important courtly poetry lasted from about 1100 to about 1450. The movement was inaugurated by the troubadours in the south of France, resumed by the trouvères in northern France and England, and ended by the minnesinger of Germany between 1200 and 1450. Although by no means all of these composer-poets were noblemen, their attitude was aristocratic, dealing with fight and death on the battlefield, or with fervent religion and uplifted love. And their music—of which many hundreds of delightful melodies were written down in beautiful, illuminated collections—was simple and popular, but never vulgar. How much of this music was due to the poets themselves, and how much to minstrels in their service, is an open question.

While the knightly poets were riding from castle to castle to sing their *rondeaux* and *lais, ballades* and *virelais* (virelays), the church established the characteristically Western style of music, polyphony—the lawful progress of two or more simultaneous voice parts or melodies. Toward the end of the first millennium A.D., monastic treatises on music had begun to mention and to describe the *organum:* during the liturgy of feasts, the unison chorus alternated with a soloist, who sang his passage in long drawn-out notes to the accompaniment of another soloist, who followed note by note and usually at the distance of a fifth or a fourth below. This solemn if heavy and awkward form (today preserved in students' songs in Iceland) was decisively remodeled in the 11th century. Singers began to invert the two voice parts and to place the liturgical melody or *cantus firmus* below the accompaniment, which then became increasingly freer, opposed two and more notes against one of the *cantus firmus,* and attracted more and more the chief interest of the listener. Eventually, their roles, too, found themselves inverted: the former accompaniment had become the melody proper, and the *cantus firmus,* a mere accompanying voice or *tenor* (this word being taken in its older, literal sense of a held, sustained voice, from Latin *tenere,* not in the present meaning of a range between the alto and the bass). This free-melodic organum came to a first peak around 1150 in the musical bodies of two churches of France: St. Martial in Limoges and Notre Dame in Paris. In this connection, we face the earliest composer whose name has been preserved (except for a few nonprofessional clerics of the preceding century and some courtiers remembered for their poems rather than their melodies). Master Leoninus of Notre Dame in Paris left a stock of 90 two-part organa for the whole church year—florid free coloraturas soaring above the solemn, awesome, endlessly drawn-out pedal of the tenor. His successor, Perotinus, honored as Magnus (the Great) by his contemporaries, marked the climax and ultimate transformation of this form. In his gigantic three- and even four-part organa, the florid coloraturas were forced into the strait jacket of metrical patterns, such as iambs or trochees; but the tenor droned on in still more lengthened notes, with one of them often lasting for 40 or more bars. Only in certain episodes of the organum, the *clausulae,* did the tenor lose its inertia and moved along with the upper voices.

The clausulae became eventually the nuclei of the leading polyphonic form of the 13th century, the *motet,* which must not be confused with the very different motet of later times. It took its name from giving a special text (*motetus*) to the upper voice(s) different from that of the tenor (*mot*). Eventually, all voice parts had different if related texts, and even in different languages: the Gothic age was more concerned with spiritual than with sensuous unity.

A third polyphonic form was the *conduct,* with one text only and with its two, three, or four voice parts moving evenly on, note against note, in chordal columns that seem to have prepared the later harmonic conception of music.

In the theoretical field, musicians faced the gigantic task of devising a satisfactory notation and a system of accurate scales, together with laws of consonance and dissonance in counterpoint and rhythmical rules, without which polyphony would result in chaos. The monk Guido d'Arezzo, in the first half of the 11th century, has been credited with most of these achievements and many others; but only few of them can be traced to his genius. His mnemonic devices to facilitate correct rendition of the liturgical melodies, the "hand" and solmisation, were Oriental; but his improvement in the field of notation was genuine. Music had been written down in *neumes,* a script of dashes, dots, and hooks above the syllables of the text that showed the up and down of a melody but neither its accurate notes nor their individual lengths. The neumes were sufficient as long as tradition was strong enough both in the Gregorian plain song and in folk music. It became intolerable when the growing role of polyphony required a degree of precision, both unknown and unnecessary in simple, melodic music. As a remedy, the dashes, dots, and hooks were given one, two, and—probably by Guido—a staff of four reference lines (still used in the prayer books of the Catholic Church) to place and space the neumes so unmistakably that their pitches were no longer left to guesswork or memory. It took 200 more years to establish the fundamentals of a metrical notation, in which the shape of the note indicated its relative length. This new measuring, *mensural* notation, created in the 13th century and slowly evolved from just a stemless breve and a stemmed long to an ever greater complication, was the link between the old unmetrical plainsong notation (again still used in Catholic prayer books) and our modern five-line staff notation, which was completed late in the 17th century. But as long as this notation was still mensural, it by no means conveyed unambiguous values: the longs, breves, semibreves could be perfect (that is, dotted) or else imperfect (not dotted) without showing it in their forms, and only the context, carefully parsed, would indicate which one was meant.

In the field of consonance and dissonance, the foremost problem concerned the (major) third—like C-E—and its complement within the octave, the (minor) sixth—like E-C. The "official," ecclesiastical music of the earlier Middle Ages had ignored them completely; its only recognized consonances had been octaves, fifths, and fourths. But in the Gothic period the third and the sixth began to spread from England to the Continent, although as late as 1300 the French still found them "hard on the ear." Their final recognition and adoption as the fundament of harmony occurred only in the 15th century. Apparently, the price to pay for accepting this new consonance was the renunciation of the older "natural" third provided by the cycle of fifths and the preference given to the just as "natural" third provided by stopped strings. But since the latter one, a bit smaller, consisted of two different sizes of whole tones (intolerable in polyphonic music), musicians around 1300 devised the earliest *mean-tone* temperament by dividing this smaller third artificially into two equal, somewhat shorter, whole tones.

The 14th century which we call *Ars nova* (misusing a contemporary term) as opposed to the *Ars antiqua* of the preceding century, ended the Middle Ages and was, as all ending periods are, particularly favorable to the evolution of music. Its outstanding traits, the awakening

interest in nature, man, and life on this earth, were faithfully reflected in the mirror of music. A sophisticated secular music arose alongside and often above religious music; rhythm grew ever more complicated; realism and descriptiveness appeared, as they did in painting and poetry; and the personal, individual contribution of the then well-known and admired composers became an important factor. In a host of names revered and beloved, two geniuses stand out as powerful peers: the Frenchman, Guillaume de Machaut (Machault, 1305?–1377), and the Italian, Francesco Landino (Landini, c.1325–1397), whose complete works are now available in modern editions. Besides many small-sized works for educated singers, Machaut is famous for having written a gigantic, megalithic Mass—the earliest complete Mass ever composed outside the Gregorian plainsong masses. The gentle Landino excelled in euphonious vocal chamber music with a remarkable anticipation of the harmonic, chordal trends of the future.

The main forms of this music for vocal soloists derived from dance songs, as their names imply: *rondeau* and *ballade* are connected with "round" and "ball." They also had refrains as remnants of the regular choral answers to the verses of the leader. The *madrigal,* on the contrary, though very different from the madrigal of the 16th century, had no connection with the dance and therefore no refrain. The most fascinating form, however, was the *caccia* (chase), in which two singing voices in strictest canonic imitation depicted convincingly and with dash and humor some scene from everyday life, the sports of fishing and hunting (whence the name), or breathless market scenes and fire alarms, with all the trimmings of shouting, galloping hunters and barking dogs, of sellers, quacks, and bargaining customers, in a fresh, delightful naturalism despite the strictest musical form.

Later Ages: 1400–1900.—Early in the following century, the accent shifted from Italy to the north. One center was England with the vigorous personality of John Dunstable (1370?–1453), who traveled on the Continent and, in a fruitful give and take, accepted the latest achievements of France and Italy, but left in turn to his Continental fellow composers the heavier, compact style of England with its thirds and sixths.

The other center was the brilliant ducal court of Burgundy in eastern France with the great Guillaume Dufay, a master of highest skill and of a charming serenity reminiscent of the contemporary painter Jan van Eyck. Dufay (1400?–1474) was one of the first musicians from the north to wander to Italy and serve in one of the select chapels of Italian princes—the leading bodies of Renaissance music. For 150 years, the great composers from the north often spent decades of their lives in Rome or Venice, Florence or Mantua, while Italy, absorbed in giving to the world the glorious treasures of her visual arts, did not produce musicians of the highest rank. And yet, the general atmosphere of the Italian Renaissance which the masters from the north imbibed at the courts of the pope and the Medici, the Este and the Sforza, changed their traditional ways. The Gothic spirit of the north, complex and angular, yielded to the new taste from Italy, to rounded lines, to restful balance, and to limpid simplicity.

The Burgundian school came to an end around 1460. In the following 100 years, its place was taken by men from the Netherlands who founded the Flemish School. The two great names of the first generation were: the Fleming, Jean d' (Jan van) Okeghem (1430?–1495), and the Dutchman, Jacob Obrecht (1430?–1505). They inherited the typical plan of Burgundian writing: three voice parts with the principal melody above, a similarly melodic tenor below, and a so-called contratenor which, as a sign that harmonic conception was gaining, filled in the notes necessary to form triads with the cantus and the tenor. Okeghem and Obrecht took a further step in this direction; they increased the number of voice parts to four and five and also ended not a few of their pieces with full triads instead of the customary open, empty fifths. They also widened the span of melody as against the short-winded sectionalization of the Burgundians; they did away with the subordinate contratenor and assigned roles of equal importance to each of the voice parts. Indeed, they stressed their equivalence by making them enter after one another with the same theme and thus drew the listener's attention to each one.

This "imitative" style reached maturity at the beginning of the 16th century in the generation of Josquin des Prés (c.1445–1521) and Heinrich Isaak (1450?–1517), the two Flemings whose full and mellow-sounding works in soaring, balanced lines were the true counterpart of the visual High Renaissance in the age of Leonardo da Vinci, Bramante, and Raphael. In their emphasis on chords, the two great masters also marked the progress of harmonic feeling and therewith the critical turning point—unique in the history of music—from a *horizontal* to a *vertical* conception. While the older masters had written the voice parts horizontally, at first the tenor and then, after one another, the cantus and the contratenor, they now began to work vertically, considering all the notes perceived at the same moment as consonant or dissonant chords, which had to be connected and resolved according to the nascent laws of the novel art of harmony. One contemporary theoretician, Pietro Aaron (c.1485–1545), emphasized what a very difficult thing the new vertical composition was and how long a training and practice it required.

We should not leave this critical turn without a look at the strange "artifices" of the Netherlanders which had to disappear together with the fading prevalence of absolute counterpoint. As a matter of fact, these artifices had started in France during the 14th century. They consisted mainly in writing down a single line of notation and deriving from it a whole polyphonic web by reading it at its face value, or backward, or upside down, or in different rhythms and tempos. It would be a purely romantic misconception to call such principle soulless and without imagination. Rather, it represented the truly Gothic principle of building a whole cathedral out of a small, half structural, half ornamental nucleus in order to achieve a maximum of organic unity and, at once, to enjoy the craftsman's feat in so doing.

Late Gothic polyphony reigned in Germany also. Still, the German scene was decisively shaped by Luther's Reformation. With the Protestant aim to make the congregation lead in singing, the musical circles around the reformer strove for monumental simplicity and popular character and hence converted Gregorian hymns and an old stock of secular folk songs;

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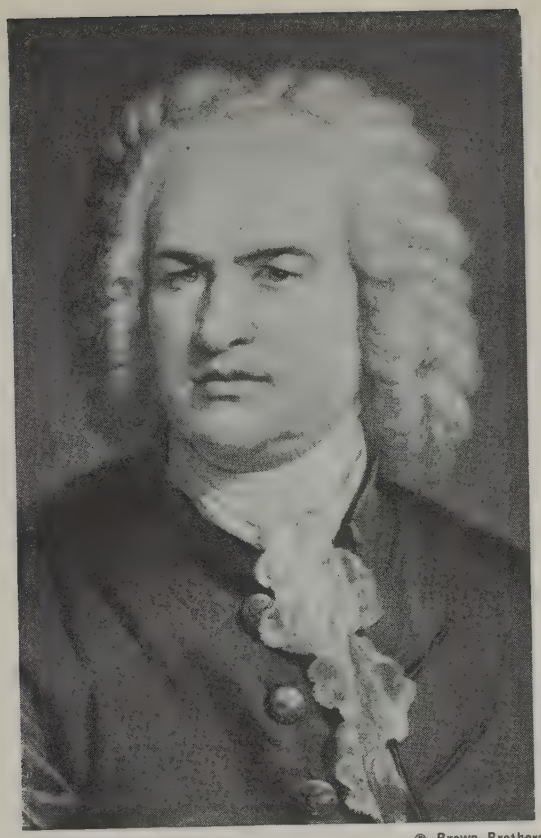

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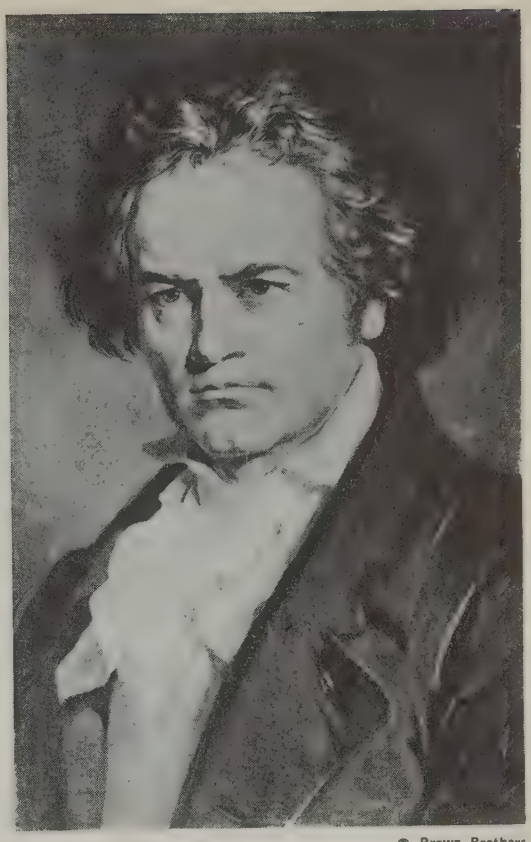
Bach.



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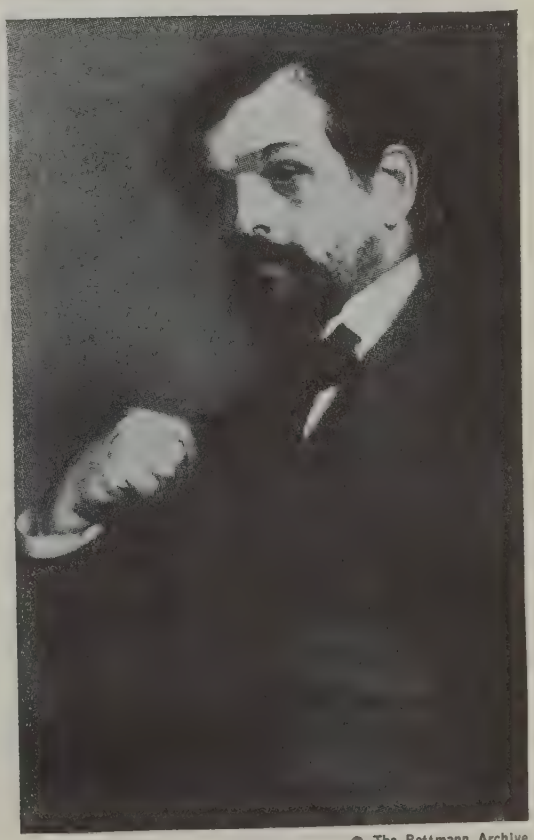

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Debussy.

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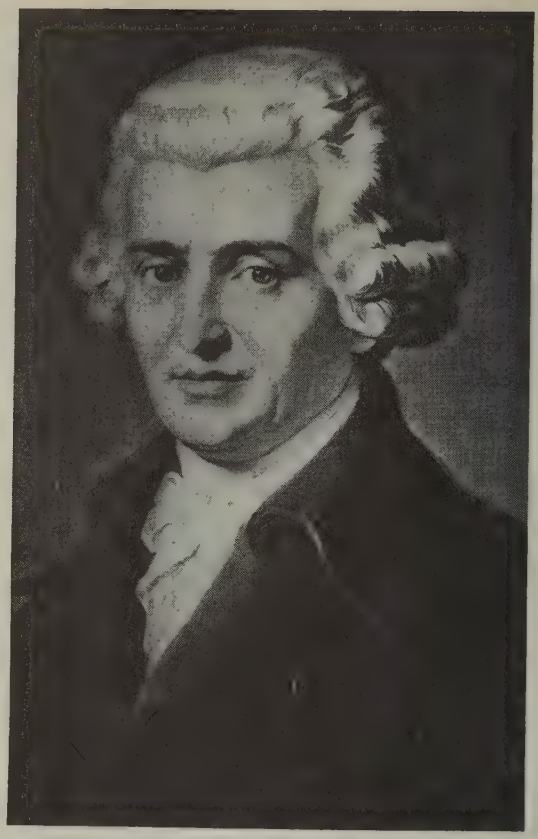
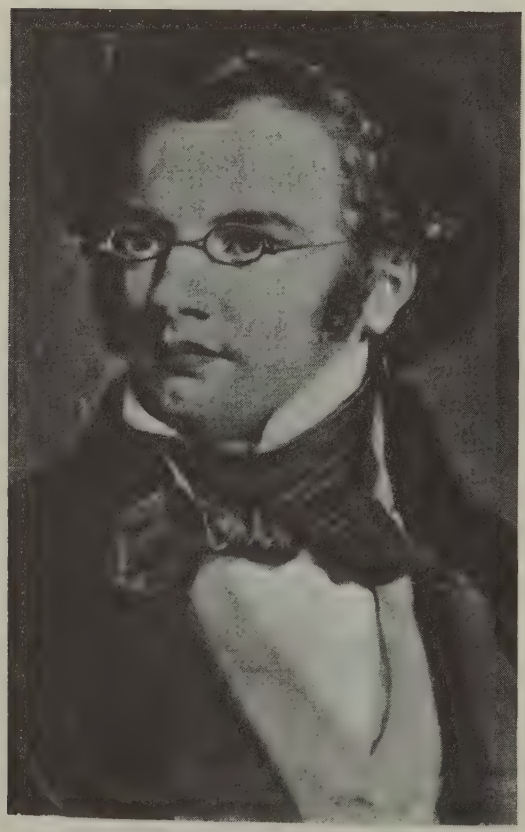
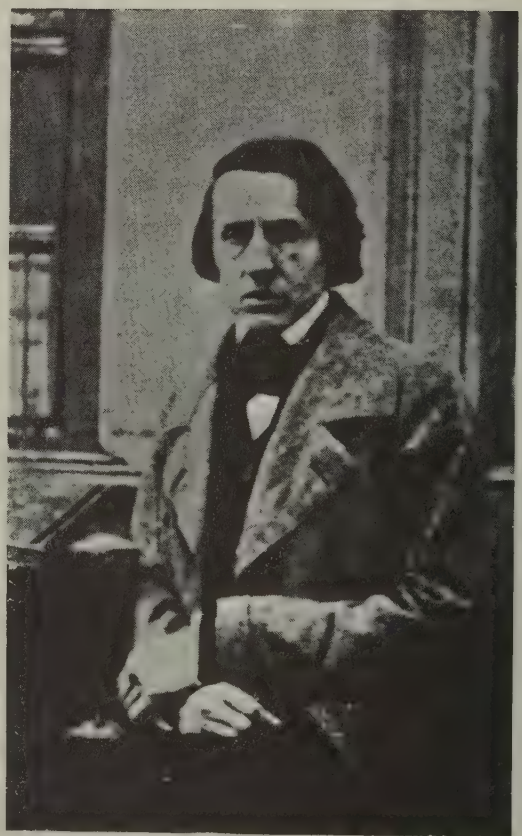
Henry Purcell (1659–1695).



Franz Joseph Haydn (1732–1809).



Franz Peter Schubert (1797–1828).



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Frédéric François Chopin (1810–1849).

often with risqué texts, into vigorous, solemn chorales.

In music, as well as in Bible lore and propaganda, the Protestant Reformation was highly indebted to the recent invention and improvements of printing and publishing, which had within a few decades enlarged its scope to include music. Owing to the activities of music printers, particularly in Nürnberg, Venice, and Paris, we know much more of popular and semipopular music around 1500 than of that in earlier times. (Publishers of course preferred these better-paying genres to the more esoteric forms of music.)

Outstanding among the half-courtly, half-popular forms was the Italian *frottola,* a lyrical solo song with an accompaniment either sung or played, and mostly set in harmonic chords rather than in contrapuntal voice parts. Out of this well-wrought but simple form in which the minor masters excelled, the major masters around 1530 —Italian and Flemish—derived the most important secular form of Italy in the 16th century, the *madrigal.* Idyllic or erotic, free in structure, and highbrow in text and musical diction, it was a basically vocal chamber music to be sung by cultivated amateurs around a table, with the voice parts laid out before them. The madrigal lasted in Italy until early in the 17th century in an evergrowing harmonic sophistication and—like our modern chamber music—passed more and more into the hands of professional singers.

The French did not import the Italian madrigal. Instead, they created their own brand of vocal chamber music by raising the age-old form of their erotic *chanson* to a climax of delightful, melodious, airy, and elegant writing. Paintings of the time show such chansons performed by a single voice with instruments taking over the other three voice parts.

In the 1560's, however, a number of French composers and poets turned their backs upon this charming, though frivolous genre and wrote the deeply passionate psalms for John Calvin's Protestant circles. These were intended to be sung at home after dinner—again around the table—since the Huguenot Church itself admitted no artful settings beyond the sober unison of the congregation. The two great leaders in this field were Claude Goudimel (c. 1505; assassinated during the Massacre of St. Bartholomew, 1572), and Claude Le Jeune (c. 1530–c.1600).

Le Jeune's characterization by contemporaries as "the last polyphonist" hints at a momentous turn in the history of music. The era of Flemish influence was drawing to a close with the most brilliant and versatile master from the north, Orlando di Lasso (Orlandus Lassus, 1532?–1594) from Hainaut, who lived in the Netherlands, Italy, England, France, and Germany. Honored as no musician had been before him, and even knighted by both the emperor and the pope, he left a truly cosmopolitan work, using texts in four languages—more than 2,000 pieces, among them more than 1,000 motets, 100 settings of the Magnificat, not to count his masses, psalms, chansons, and German lieder.

The end of Flemish supremacy implied the rise of Italy as the leading power in music. Almost at one blow, the Italians took possession of all the princely chapels, including the organs of important cathedrals. But long before the pioneers were able to replace the Flemish polyphony by a national idiom, an Italian marked the transition from a Flemish to an Italian character in the very field of Flemish influence, the polyphonic music of the church. This master of unforgotten world renown was Giovanni Pierluigi da Palestrina (1525?–1594), the counterpart of di Lasso and his exact contemporary. To the Fleming's versatile mind and cosmopolitan way of life he opposed a glorious one-track mind and the strictest localism. He spent his life in Roman churches as the pope's composer, conductor, or singer, and wrote almost exclusively for the masses and offices. In this capacity he succeeded in creating a style in which solemn grandeur, celestial sereneness, and mystic profundity became the paragon of Catholic music. As a son of his time, he often blended these qualities with the then recent custom of writing for two or three choruses which, now alternating, now mingling, reached the listener's ear from various sides or even floors of the church, and gave him the feeling of space that was so dear to the baroque.

England approached the musical ideals of Italy more closely than did any country in Europe. It is not without good reason that the greatest master of the time, William Byrd (Bird, 1540?–1623), has been called the British Palestrina. Three great T's, representing Tudor music, had preceded him: John Taverner (1495?–1545), Christopher Tye (1497?–1572), the creator of the English Church anthem, and Thomas Tallis (c.1510?–1585), who emulated the latest Italian style in a Latin motet for no less than 40 voice parts grouped in eight choruses. Byrd, however, did not confine himself to sacred music. He bowed to secular needs in "Songs of sundrie natures, some of gravitie, and others of myrth, fit for all companies." He tried his hand at British madrigals in Italian style (1588) and thus inaugurated an extraordinary if belated flourishing of the madrigal in England—the only soil on which this delicate form could thrive outside of Italy. But he also was the father of that brilliant school of keyboard music known as the Elizabethan Virginalists. Thus far, instrumental music had nowhere equaled vocal music in quality, importance, or number. The groups of court musicians who played at banquets and other festive occasions had preferred, way down to 1600, the instrumental rendition of vocal music, of motets and madrigals, now on strings, now on woodwinds or brasses. Still, the players were trying hard to find an idiomatic language of their own, at least for organs and virginals (harpsichords), for viols and lutes. Small instrumental forms had arisen from dance tunes and from improvised preludes in the accompaniment of songs, mostly as variations of some given theme. But the charming character pieces and variation sets of the Elizabethan Virginalists, of Thomas Morley (1557?–1603) and Giles Farnaby (c.1560–c.1600), of John Bull (1563?–1628) and Orlando Gibbons (1583–1625), were the first far-reaching successes and the seeds from which our piano music stems.

Tudor musicians also created the *consort,* which comprised instruments either of the same family (unbroken consort) or of various families (broken consort) and represented a basically polyphonic music midway between chamber and orchestral music. In a similar spirit, the Italians began to make instrumental ensembles independent of vocal music. Most daring among them was Giovanni Gabrieli in Venice (1557–1612). He even transformed the magnificent polychoral style of Venetian state motets (settings for sev-

eral simultaneous choruses) into what he called sonatas for several groups of instruments with—as something completely new—the exact orchestration carefully prescribed and, as another novelty, with painstaking indications showing which passages should be played forte, and which piano.

While this happened in Venice, Florence took a different step in revolutionizing music. The fight against the artificial, "barbarian" polyphony of the Netherlanders availed itself of erudite weapons from the knowledge (and misconception) of the truly classical music of ancient Greece. The result was a new ideal, different however from those of the Greeks: the generation born in the 1560's created a speechlike, naturalistic *monody* able to express man's moods and passions to the degree of illusion and completely free from regard for structure or counterpoint. This kind of monody rested solely on a *basso continuo,* or thorough bass, which, by a code of added figures, indicated what chords the lutes or keyboard instruments should improvise between the melody and its bass.

The new monodic style, mature around 1600, produced at once a number of unprecedented forms. It led almost inevitably to the *dramma per musica* or opera (q.v.), which arose in the 1590's and reached its earliest peak in 1607 with the immortal *Orfeo* of Claudio Monteverdi (1567–1643). This presented a number of episodic dances, instrumental pieces, and choruses, but rested essentially upon a naturalistic recitative full of dramatic tension. For about 40 years, such operas were rare events; they were written as courtly entertainments for some princely wedding or reception in Florence or Mantua and were scarcely repeated after a single performance. To a great extent, the opera preserved this aristocratic exclusiveness way down to the 18th century; but as early as 1637, Venice, the courtless city-republic, opened the first, and for decades the only, public opera theater (the Teatro San Cassiano) for subscribers and those who paid for admission.

At about the same time, clerical circles introduced a cousin of the opera, without stage settings, costumes, or action: the oratorio. Taking the name from its earliest place of performance, a Roman prayer chapel or oratorio, it based its text on some epic theme from the Old Testament and was sung by soloists and a narrator with choral and orchestral episodes, "in order," as a contemporary listener said, "to attract the faithful and to entertain them with spiritual profit in those hours of the night which in the fall and the winter are the most dangerous, above all for youngsters." Another cousin of the opera, the *cantata,* a set of contrasting lyrical arias alternating with recitatives, was still shorter in size. Both forms owed their first perfection to the Roman, Giacomo Carissimi (c.1604–1674).

Arias as integral parts of the cantata testify to a vital change in Italian taste after 30 years of speechlike melody. Toward the middle of the century the unavoidable "tedium of the recitative" to which the Italian masters of opera and kindred works openly confessed, and the innate need of attractive melody and balanced form, caused these composers to interrupt the "unending" flow of the recitative by lyrical episodes written in a truly melodic style and a symmetrical form (such as the universally known Largo by Handel). Most of them were so-called *da capo* arias, in which, after a second, contrasting section, the first was repeated *da capo* (from the beginning). More and more the aria dominated, indeed it domineered and therewith weakened the dramatic, driving force of the Italian opera to the benefit of vainglorious divas and *castrati.* This defection from the original ideal of the opera was enhanced by the increasing influence (and salary) of the stage engineer, who devised increasingly sensational tricks of transforming settings, wings, and props before the eyes of the audience, and of arranging surprising appearances of gods and demigods from the skies or the ground—the notorious *deus ex machina.*

Slowly, the Venetian opera yielded to the so-called Neapolitan opera, whose founders were Francesco Provenzale (d. 1704), and the patriarch, Domenico's father, Alessandro Scarlatti (1658 or 1659–1725), with 115 operas. A galaxy of brilliant names followed, among them Niccolo Porpora (1686–1766), Niccolo Jomelli (1714–1774), and Niccolo Piccini (1728–1800), way down, in the 19th century, to Giovanni Paisiello (1740–1816), and Domenico Cimarosa (1749–1801). In the Neapolitan opera, we look in vain for machines or showy settings. The singer reigned supreme and, with the singer, the form of the aria at the cost of recitative, choruses, and instrumental music. The prevalence of the aria reduced dramatic, driving action to a minimum; the interest shifted to melodic charm and coloratura technique.

As an antidote against the pomp and showiness of the various schools of opera, the Italians built up an impressive chamber music of intimate character—sonatas for one or two violins with bass and harpsichord, as an instrumental version of the vocal monody, and *concerti grossi,* where a trio of bowed solo instruments detached itself from the background of a string orchestra or *grosso.* The pioneer in the realm had been Salomone Rossi, sometimes called L'Ebreo (c.1565–c.1628); the fulfillment came with Arcangelo Corelli (1653–1713) and Giuseppe Torelli (1650?–1708), who probably wrote the first concertos for violin and orchestra.

Once more, England was Italy's next of kin. Her greatest master in the 17th century, Henry Purcell (c.1659–1695), most famous as the composer of brilliant anthems and hymns for Westminster Abbey, wrote beautiful violin sonatas in Corelli's style and even an actual opera, *Dido and Aeneas,* which differed from Italian models basically in the important role allotted to the chorus. Otherwise the English court preferred the time-honored ballet-like *masques,* and the public stage which featured the spoken dramas of poets and like Dryden and a corrupted Shakespeare with elaborate incidental music.

In France, the opera had similar difficulties; the court clung to the semidramatic form of the traditional court ballet, and an attempt to introduce a public opera ended in bankruptcy. Only in the 1670's, an Italian-born musician of the court, Jean Baptiste Lully (1632–1687), succeeded in adapting the opera to the taste of France and rooting it firmly in the soil of his new country. Lully's operas were once more musical dramas in the original sense. The master ignored the recent antidramatic development in which a dried-up recitative contrasted overdecorated lyrical arias. Instead, he reestablished an eloquent monody which, never dry and never florid, was carefully modeled in its accents and meters after the diction of leading actors in the Comédie-

Française. Complying with the national respect for correct and meaningful diction, he also complied with the national delight in dramatic or lyrical nature, as in thunderstorms, enchanted gardens, or moonlit nights. This was a rewarding task for the instruments. And indeed, as in all dramatic phases of operatic history (Monteverdi, Gluck, or Wagner), Lully's orchestra was given an eloquence and significance that the contemporary opera of Italy had completely lost.

Lully's counterpart in the field of intimate chamber music was François Couperin, surnamed the Great (1668–1733). His thoroughly aristocratic, delicate concertos for strings and pieces for harpsichord anticipated in a way the fragile elegance of the coming rococo.

Germany was just as late as England and France to adopt the opera. A place of honor belongs of right to the German lied, which kept an age-old tradition of intimate, tender, and often popular singing and grafted it on the novel Italian form of accompanied monody. Three names may stand for three generations: Heinrich Albert (1604–1651), Adam Krieger (1634–1666), the greatest among them, and Johann Wolfgang Franck (1641–c.1700), the master of the religious lied.

While these men had on the main a national significance only, the name and work of Johann Crüger (1598–1662) spread all over the Protestant world. His *Praxis pietatis melica,* with many well-known hymn melodies, was printed and reprinted for a hundred years in some forty editions from 1644 to c.1744.

But long before the opera, Germany had accepted the new monodic style for nontheatrical purposes. Under the vigorous leadership of Heinrich Schütz (1585–1672), the Protestant Church had taken advantage of the passionate intensity of free-flowing recitativic melodies to render the words of the Scriptures with all the might at music's command. It also had availed itself of the grandiose partnership of two or more choruses which Schütz had learned in Venice as one of the many students of Giovanni Gabrieli. But beside this strong Italian influence, the German Lutherans kept their faith in their own heritage, the chorale, and tried to exhaust its musical and spiritual wealth in polyphonic settings, cantatas, and organ phantasies. The latter had their greatest three masters in the organists, Samuel Scheidt (1587–1654), Johann Pachelbel (1653–1706), and Georg Böhm (1661–1733), while the church cantata for soli, chorus, organ, and orchestra reached its highest pre-Bachian peak in truly baroque compositions of Dietrich Buxtehude (1637–1707).

Here and there a few of the many royal, ducal, and princely courts in the country would import an all-Italian cast to provide a more or less brilliant imitation of the glamor of French and Italian courts. Very few availed themselves of native talents. Eventually, the Italian situation repeated itself in Germany: as the richest commercial center created a public, permanent, national opera; what had happened in Venice 1637, recurred in Hamburg 1678. Johann Theile, following the taste of patricians, preferred Biblical subjects from the Old Testament. But soon the management yielded to pressure from below and led the opera down to a level of vulgarity never reached before and hardly later. But in doing justice to this strange institution, we must underline that it attracted a number of high-ranking masters: Reinhard Keiser (1674–1739), Johann Mattheson (1681–1764), and young Handel (1685–1759) before his Italian years and his residence in England.

All these masters, Italian and German, English and French, all great in their own right, built the imposing edifice of baroque music which the memorable masters born in 1683 and 1685 completed and roofed. Their unforgettable names are Jean Philippe Rameau (1683–1764) in France, George Frederick Handel (1685–1759) and Johann Sebastian Bach (1685–1750) in Germany, and Domenico Scarlatti (1685–1757) in Italy.

The cosmopolitan Handel lived in Germany and Italy, and longest, in England, which became his adopted country. He wrote a German Passion and some German operas, much chamber music in the style of Corelli, and some 40 Italian operas in the so-called Neapolitan style with arias as the backbone of the scores. He also wrote *Te Deums,* anthems, and cantatas in the English style of Purcell. But his universal fame was based on the monumental London oratorios which, far from Carissimi's short devotional works, were gigantic in size and in means, and designed for gigantic audiences.

Bach, on the contrary, having spent his entire life in Saxony, now as an organist, now as a court violinist, conductor, cantor, or teacher, was deeply rooted in the polyphonic and chorale tradition of his country. His interest was by no means limited to this tradition. Again and again, he allowed himself to be fascinated by the charm of French orchestral music and of Antonio Vivaldi's (1675?–1743) brisk homophonic concertos. He studied them thoroughly, and adapted their style to his personal needs. And yet, the center of Bach's incomparably wide-reaching art was the fugue, all the way from the 48 preludes and fugues of the *Well-tempered Clavier,* through the almost superhuman choral fugues of the B-minor Mass, to the last apogee in the *Art of Fugue* which death did not allow him to finish. With the enormous span of his life work, from the esoteric violin sonatas to the gigantic *Passion According to St. Matthew,* from the good-humored miniatures of the *Klavierbüchlein* to the church cantatas, he avoided the two fields in which Handel was at his best: the opera and the oratorio (Bach's six Christmas cantatas, bundled together, form an oratorio only in name).

Domenico Scarlatti, who shared the year of his birth with Handel and Bach, wrote many hundreds of short sonatas in an unprecedented, antipolyphonic style. "Good-humored and spirited, limpid and light-footed, they were short and free in form, changing in tempo, and thoroughly and exclusively harpsichordistic, with glittering arpeggios, audacious leaps, crossed hands" (Sachs). Indeed, Scarlatti created the principles of modern piano music.

In Rameau, the eldest of the four, we revere the father of the modern system of harmony (*Traité de l'Harmonie,* 1722). Yet in his fifties, the one-time organist turned to the stage and became, after André Campra and André Cardinal Destouches, the most influential successor of Lully as the leader of French opera and the precursor of Gluck.

Again we find ourselves in the middle of a revolution, not after, but during, the lifetime of Handel and Bach. Sociologically, this revolution becomes manifest in the change of patronage. Up to 1700, the church, both Catholic and Protestant,

and the courts with the higher aristocracy had been predominant, although by no means exclusive, patrons of the arts. They were losing their interest (and taste) in the 18th century and left them more and more to the ever-rising middle class. The two main symptoms of this change were the beginnings of professional criticism and of public concert life.

The earliest critical columns can be found in the *Mercure de France* and in the two London papers *The Tatler* (1709) and *The Spectator* (1711–1712). Germany followed soon with actual music magazines, most of which were short-lived but showed a growing need for open discussion and clarification of aesthetical questions.

Public concerts were started in England. They began in 1672 under the leadership of John Banister in a comparatively small room with "a large raised box for the musicians, whose modesty required curtains," and were continued by Thomas Britton, "the musical small-coal man," in a loft over his coal-storing warehouse. In Germany, the composer Georg Philipp Telemann followed with concerts in Frankfurt and Hamburg, and in Paris, Anne Philidor founded the famous *Concerts spirituels* in 1725.

Musically, the revolution of the early 18th century becomes manifest in a thorough reaction against the trends of the late baroque. Again polyphony is scorned as stiff, pedantic, soulless. Again a limpid if often meager melody accompanied by a bass is the goal. The two general trends of the time centered on the aristocratic rococo, in music called *le style galant,* which reacted against the grave and heavy ideals of the baroque, and the leanings of the maturing middle class, which demanded simplicity and human warmth. Polyphony was not the only victim. Another was the traditional opera of the Italians, or one composed in their style and language, with their stilted and ever more ridiculous Alexanders, Caesars, and Neros, so pompous and remote from actual life when they sang their endless arias. From the 1720's on, lampoons attacked it; but the decisive victory came when John Gay and, as a musician, John Christopher Pepusch, performed the *Beggar's Opera* in London (1728), a play half spoken, half sung in catchy, popular tunes, full of wit and satire, and unafraid of vulgarity. Partly dependent upon, partly independent from, the *Beggar's Opera* and its followers, Italy responded with an *opera buffa,* of which Giovanni Battista Pergolesi's *La Serva Padrona* of 1733 is the immortal example. In France, the musician-philosopher, Jean Jacques Rousseau, imitated the *Serva* with his unbelievably successful and harmless *Devin du Village* (Village Seer, 1752); and in Germany, after many failing imitations of the *Beggar's Opera,* Johann Adam Hiller founded the Singspiel in 1766, which, like its foreign paragons, had its scene laid in the present, a simple if not naive text and a thoroughly popular music. Weber's *Freischütz* (1821) was fundamentally a Singspiel.

The heroic opera was, however, not dead. It reached another peak with Christoph Willibald Gluck (1714–1787). Gluck was no leftover from bygone times. He—with his librettist Raniero da Calzabigi—was a bold reformer who once more took up the dramatic ideas of Monteverdi and Lully. In the preface to his opera *Alceste* (1767), he wrote: " . . . I have striven to restrict music to its true office of serving poetry by means of expression and by following the situations of the story." The very subjects of his operas, like *Orfeo ed Euridice, Armide,* and *Iphigénie,* show the departure from the historical themes of the later Italians and the connection with Monteverdi and Lully.

The revolution toward a sincere, expressive, natural art, was accompanied by a thorough change in performance. While previous centuries had taken advantage of forte and piano in the best of cases only in the form of a contrast between sections loud and soft, the 18th century began, still timidly, to seek an unprecedented method of expression in a crescendo and decrescendo connecting the two extreme intensities. Instruments paved the way: the years around 1710 saw the invention of the modern piano with hammers, in Italy, France, and Germany, and of the earliest organ swell in England, all of them capable of such expression. At the same time, around 1711, orchestras in Rome began to diminish the "tone little by little, and then return suddenly to the full power." But it took more than a generation to bring this new achievement to France and to Germany. When Rameau wanted it in his ballet *Zaïs* in 1748, he had to describe rather than to indicate in the score what he wanted the instruments to do, and the German, Johann Joachim Quantz, did not even mention it in his treatise on performance in 1752. The crescendo triumphed only when the Italian, Niccolà Jommelli (Jomelli, 1714–1774), brought it to the court orchestra of Stuttgart, and the latter handed it over to the orchestra of Mannheim on the Rhine, which, under Johann Stamitz (1717–1757) and Christian Cannabich (1731–1798), well known from Mozart's letters, had become the world-famous center of symphonic music.

Stamitz and another Mannheimer, Franz Xaver Richter (1709–1789), had begun to shift the symphony to the center of concert life. But it was Joseph Haydn (1732–1809) who, more than anyone else, raised the symphony, together with its formally similar cousins—string quartets, trios, and piano sonatas—from a tasteful entertainment to an eloquent, moving expression of human fate and character. His sonata had, as a rule, four movements: a playful and joyous last one, a dance-like third, and an introspective, warm-hearted second. The first movement was dramatic, driving, exciting. To provide a dramatic contrast to the leading theme, Italians in Pergolesi's time had already introduced a second, lyrical theme; Haydn himself perfected the so-called development, "in which the themes, no longer treated as integers, were decomposed into characteristic fragments or motives which had enough motorpower to drive ahead. The theme no longer was; it acted" (Sachs). This Haydn first achieved in his string quartets (notable in his *Jungfernquartette* or *Maiden Quartets* of 1781), which, side by side with his 104 symphonies, form the bulk of his enormous life work. In its increasing depth and significance, Haydn's music is a symbol of the composer's changing position. He still enjoyed the patronage of an aristocratic house as a court composer, eager to write all the ever new music required by his service. But as a pensioner, he marked in his older age the momentous passage from an employed, though highly respected servant of the 18th century, to the free-lance writer of the 19th century, who dared express himself and his personal struggle.

Wolfgang Amadeus Mozart (1756–1791) had broken down under the impact of this social crisis. As a young man he had left the security of a court musicianship was never able to find other employment, and paid for his daring with a short, pitiful life in poverty and burial in potter's field. Still, smiling under tears, he created an almost unbelievable wealth of works in all the fields of music, from songs to operas, from piano pieces to symphonies. Even within the opera, he covered the whole expanse from the Italian *buffa* and *seria* to the German Singspiel. He not only mastered the styles of Germany, France, and Italy side by side; he integrated them into a higher, supranational whole. "Reconciling beauty and character, German and Italian spirit, the tragic and the comic, drama and music, voices and instruments, melos and counterpoint, he was graced in a blissful moment of history to hold the scales of style in perfect balance" (Sachs).

When Mozart passed away at the age of 35, with his *Magic Flute* completed and a Requiem left as a torso, Ludwig van Beethoven (1770–1827) was coming of age. Beethoven's works seldom smile and rarely cry; they sometimes laugh; but most often they show the superhuman tension of a hero fighting for peace, perfection, and truth. More than Haydn or Mozart, Beethoven expressed himself, his suffering, and his struggle; but unlike the romantics after him, he elaborated and remodeled his works in a long process of transformation until they had left the stage of personal confession and attained an all-human sublimation. Beethoven was the first composer who (his boyhood excepted) did not accept or even desire a fixed position in life. And he was the first who wrote comparatively little on commission for some demanding master or church. Thus he left one single opera (*Fidelio,* 1805–1814) against the 20 of Mozart's, 9 symphonies against the more than 100 by Haydn, one violin concerto against Mozart's 6. But each work stands in its own right, in a vein and a form of its own. And probably for the first time in history, his last works, among them the three last, esoteric quartets of 1825–1826, were couched in a language beyond the comprehension of the contemporaries and had to be rediscovered in later decades. The fatal divorce of "modern" composers from their contemporary audience had set in.

This is why the immediate influence of this giant was less than we should expect. It was nonexistent in the operatic composers of his time, of whom only the four most important may be mentioned. In Paris, Étienne Méhul (1763–1817) kept the noble tradition of French opera alive; also in Paris, and later in Berlin, the Italian, Gasparo Spontini (1774–1851), revived the heroic opera in the wake of Gluck but led it eventually down the path of soulless showmanship; all over the Old World and the Continent, the Italian, Gioacchino Rossini (1792–1868), began to enchant the opera fans with the sweetish melodies and neck-breaking coloraturas of his operas; and in Germany, Carl Maria von Weber (1786–1826) raised the German Singspiel in his *Freischütz* to heights that it had never achieved before. In the great works of the 1820's, *Der Freischütz* (1821), *Euryanthe* (1823), and *Oberon* (1826), Weber firmly established the romantic opera with, poetically, its predilection for mysterious extrahuman powers and, musically, its stress on descriptive harmony and orchestration as the essential elements of dramatic expression.

The only composer who had some affinity with Beethoven was Franz Schubert (1797–1828). Still, he was of a younger generation and therefore a full-fledged romantic, fond of streaming melody and the beauty of sheer sound, and always ready to change with a few significant chords from bliss to tragedy. And as a romantic, Schubert allowed the smaller forms an equal place with the large ones. To be sure, he wrote extensive chamber music and, like Beethoven, nine symphonies, including the "heavenly endless" one in C major, but he gave much of his best to the *Impromptus* and *Moments musicaux* for the piano. Even from the splendor of his trios and quartets, the music lover comes back again and again to the 603 lieder, which one would call divine if they were not so movingly human.

The first period of German romanticism ended with the two great masters born in 1809 and 1810. Felix Mendelssohn-Bartholdy (1809–1847) was a romanticist in his inspiration and choice of topics. But in his musical language he was a strictly classicistic master educated on the works of Bach (whose *Passion According to St. Matthew* he rediscovered exactly a hundred years after Bach had written it in 1729) and thoroughly averse to exhibiting personal feelings and conflicts. But even with his adherence to strictest form, he delighted in the miniatures of his *Songs Without Words* for the piano. His unhappy friend, Robert Schumann (1810–1856), was in orchestral, chamber, piano music, and lieder much closer to Schubert and probably even more romantic (the word taken in its German sense) in the sudden change from overflowing enthusiasm to longing and sadness. But, unlike Schubert, he found his principal medium in the piano. Exclusively pianistic was his nearest contemporary, the Franco-Pole, Frédéric Chopin (1810–1849), to whom the keyboard was the faithful beholder of his dreams and visions; and almost exclusive was his fondness of short character pieces, now sad, now chivalrous, now in the stricter forms of dances, now in the free improvisation of ballades.

No greater contrast to these delicate masters could be found than Hector Berlioz (1803–1869), the arch-romantic of France who, disdainful of smaller, intimate forms, of chamber music and the piano, expressed himself, and only himself, with all his nightmares, in fantastic symphonies and choral works of huge dimensions and unprecedented orchestral colors.

Romantic opera developed meanwhile along three principal roads. Paris produced in 1828 the novel *grand opéra,* of which Eugène Scribe (1791–1861) became the principal poet and Giacomo Meyerbeer (1791–1864) the chief composer. Brilliant and showy, with ballets and clattering marches, enormous ensembles and sensational deaths, it appealed to the eyes as much as to the ears. In Germany, an expressly so-called romantic opera under Heinrich Marschner (1795–1861), with supernatural powers, cursed heroes, and final redemption, led straightway from Weber to Wagner. In Italy, where romantic trends in the French and German sense were weakest, the opera, with Gaetano Donizetti (1797–1841) and Vincenzo Bellini (1801–1835) in the lead, maintained the old Italian concept of being mainly a vehicle for sensuous, beautiful singing.

Shortly before 1850, when the new generation of 1811 to 1813 had matured, romanticism was entering a second, naturalistic phase. This meant to music, not renunciation of magic potions, curses, gods, and redemption, but rather the illusion of actual life and feeling and the subordination of the "absolutely musical" to extramusical ideas. In this sense, Richard Wagner (1813–1883), in the footsteps of Monteverdi, Lully, and Gluck, changed his style almost completely. After *Lohengrin* (1847), he abandoned the title opera and adopted the more ambitious word musical drama to cover his *Gesamtkunstwerk,* or work embracing all the arts, which after a gap of seven years emerged with the creation of *Das Rheingold* in 1854. The new music drama was based on the concept of a poetically logical book without arias and other "closed" episodes arresting the breathless flow of action, and, instead, with "unending," almost speechlike melody, supported by an eloquent orchestra to underline the words and to supplement their unspoken thoughts in ever recurring symbols or leitmotivs. Wagner's greatest competitor, Giuseppe Verdi (1813–1901), agreed with him only on dramatic action as the life blood of the musical stage. But as an Italian, Verdi did not sacrifice the sensuous beauty of singing and self-sufficient musical forms, nor could he accept the intellectual approach of the German master. When he was almost 80 years old, however, he converged with Wagner in his last opera *Falstaff* (1893) by abandoning the aria and adopting "endless" melody.

Somewhere between these three poles—grand opera, Wagner, and Verdi—we find a number of French operas that all share the same fate, to be incredibly successful and yet to leave no after effects: Charles Gounod's *Faust* in 1859, the year of *Tristan und Isolde;* Ambroise Thomas' *Mignon* in 1866, the time of Wagner's *Meistersinger von Nürnberg;* George Bizet's *Carmen* in 1875; Camille Saint-Saëns' *Samson et Dalila* in 1877; and Jules Massenet's *Manon* in 1884.

Outside the stage, naturalism faced a stronger opposition. The two main opponents were Franz Liszt (1811–1886) and Johannes Brahms (1833–1897). Around 1850, while Wagner was conceiving his four-night drama, *Der Ring des Nibelungen,* Liszt replaced the stricter symphony by free symphonic poems which, in a single movement, represented some extramusical idea, inspired by poetry or painting. Even his two symphonies, *Faust* and *Dante,* are rather symphonic poems, although in several movements. In a similar vein, his B Minor Sonata for piano is a poem rather than a sonata in the older sense. Brahms, on the contrary, fought for absolute music without extraneous connotations and for the inalienable rights of classical form. Nothing could be more significant (though slightly oversimplified) than Hans von Bülow's enthusiastic welcome to the first of Brahms' four symphonies as the Tenth (after Beethoven's nine); it gave Brahms the status of Beethoven's heir in direct line. Averse to showiness and license, Brahms insisted on classic restraint and strictness in all the fields of orchestral and chamber music as well as in his numerous lieder. No wonder that he never wrote for the stage.

Two men, both organists, stood in age and style somewhere between the Liszt-Wagner group and Brahms: the Belgian, César Franck (1822–1890), and the Austrian, Anton Bruckner (1824–1896). Bruckner, once more with nine long, majestic symphonies, was nearest to Wagner and farthest from Brahms; Franck, composer of one mystic oratorio (*Les Béatitudes,* 1869–1879), organ pieces, and one symphony (1886–1888), stood much closer to the Brahmsian ideology.

The interest in folk song, with its particular flavor of health and vigor, is absent in most of the men whose names we have quoted. Still, such interest was a strong ingredient in the romantic naturalism of the second half of the century. It appeared in the Mighty Five of Russia, who included Modest Musorgski (1839–1881) with his opera *Boris Godunov* and Nikolai Rimski-Korsakov (1844–1908), but excluded Peter Ilich Tchaikovsky (1840–1893) for being too "Western" in his symphonies and operas. It appeared in the Czechs, Bedřich Smetana (1824–1884), creator of the comic opera, *The Bartered Bride,* and the symphonic poems, *My Fatherland,* and Anton Dvořák (1841–1904), whose symphony *From the New World* (1893) has been particularly well known in the United States. A similar urge to write in regional idioms was at the bottom of the Norwegian Edvard Grieg's (1843–1907) piano pieces and songs and, somewhat belatedly, of the works of the American, Edward MacDowell (1861–1908) and the Finlander, Jean Sibelius (1865–). With some justification one might add to this list the German Engelbert Humperdinck (1854–1921), with his Wagnerian Children's fairy-tale opera *Hänsel und Gretel* (1893).

The Modern Age.—The leaders of the generation active in 1900 fought a bitter battle around romanticism, either to lead it onward beyond its natural end and fulfillment, or else to stop its inevitable decay. There were still a few undiluted romanticists, like Hugo Wolf (1860–1903), the "Wagner of the Lied," Gustav Mahler (1860–1911), the ever-longing master of nine symphonies and many lieder, and Hans Pfitzner (1869–1949), composer of the opera *Palestrina.* And there were also a few undiluted naturalists. Nothing could be more significant than the name of "verists" or truth-followers given to, and accepted by, the Italian opera school from the *Cavalleria Rusticana* (1890) of Pietro Mascagni (1863–1945), to Giacomo Puccini's (1858–1924) *Girl of the Golden West* (1910) and its followers in Germany (Eugene D'Albert, 1864–1932) and France (Gustave Charpentier, 1860– ; *Louise*).

In a curious last climax, Italians topped naturalism with *futurismo* or, as the French say, *bruitisme,* in an attempt to catch the spirit of the machine age with percussion and other noise makers and more or less without any melody instrument. Its father was Luigi Russolo (1885–) in 1914. Futurism has not died out, although the name has disappeared. Even Edgar Varèse's *Ionisation* of 1931 for 13 players in two groups of percussion has been followed to this day by quite a number of noise pieces, including a broken glass pane to depict an automobile accident.

Against romanticism and naturalism, and against the still dominating influence of Wagner, a new school, termed impressionism, arose in France in the 1890's under the leadership of Claude Debussy (1862–1918). Fascinated by fleeting impressions, by the momentary, transitory images of our senses, by everything passing, vague, and subtle, this school moved away from

musical architecture function, and logic. The laws of melody, harmony, counterpoint, and form, often challenged in the 50 years before Debussy, were dispensed with and replaced by "the iridescent play of dreamy, unrelated chords and of shady, broken colors. If such play was not robust, it was dainty and delicate; if it lacked the backbone of vertebrates, it had at least the fragile beauty of butterflies" (Sachs). Most of Debussy's works were written in the 20 years from 1892 (the symphonic poem *Prélude à l'Après-Midi d'un Faune*) to 1911 (the mystery play, *Le Martyre de Saint-Sébastien*), with a high peak in the middle (his only opera, *Pelléas et Mélisande*, 1902). Thus, his work coincides approximately with the life span of the veristic opera.

Debussy's influence was deep and wide, but hardly any of his followers were quite orthodox. This is particularly true of the greatest of them, Maurice Ravel (1875–1937); his most significant works, however (*Pavane pour une Infante défunte* [1899] for piano; the one-act opera, *L'Heure Espagnole* [1907]; and the symphonic ballet-fragments, *Daphnis et Chloé* [1909–1911]), are contemporary with those of Debussy. The same is true of such non-French impressionists as the Englishman, Frederick Delius (1862–1934), the Italian, Ottorino Respighi (1879–1936), the Spaniard, Manuel de Falla (1876–), the American, Charles Martin Loeffler (1861–1935), and, in a way, the Russian, Alexander N. Scriabin (1872–1915). Most of these masters are indeed the closest contemporaries of Debussy, so that the expression "followers" should be revised: impressionism belonged to one single generation.

The reaction in France came with Erik Satie (1866–1925) and "Les Six" of whom he was the center: cold honesty against romantic false emotions, and cold lucidity against impressionistic haze.

Already Arnold Schönberg (1874–) was beginning to veer from the Wagnerian ideals of his early days (the Tristanic *Verklärte Nacht* or *Transfigured Night*, 1899, and the gigantic *Gurrelieder*, 1901) to expressionistic coasts where nature, reality, and impression on the outer senses disappear in favor of inner, often subconscious visions and experiences, which so often assume grotesque, distorted forms. Schönberg's expressionism was ready in 1908 with his *Klavierstücke* Opus 11 and had an early peak in his melodramatic cycle *Pierrot Lunaire* Opus 21 in 1912. Of those around the master, Alban Berg (1885–1935) was probably the greatest, and his opera *Wozzeck* (1921), obviously the most representative work.

Richard Strauss (1864–1949) was at that time well past his greatest bloom. He had started out in the footsteps of Mendelssohn and Brahms, had turned to Liszt's and Wagner's ideals, and found his personal language in the ten years in which he wrote his seven self-portraying symphonic poems (from *Don Juan*, 1889, to *A Hero's Life*, 1899) in an orchestral idiom of the last perfection and significance. After having taxed the eloquence of a nontheatrical orchestra to the utmost, he turned to opera and led the musical drama in 14 ever-different works to a similar exhaustion of all post-Wagnerian possibilities, not without having in *Elektra* (1909) moved into the realm of expressionism. In mentioning this fact, one should not leave unsaid that *Eine Alpensinfonie* (1915), Strauss' last symphonic attempt, comes greatly under the spell of impressionism.

What an amazing generation, those born in the early 1860's! In 1860: Hugo Wolf, the romanticist; Gustave Charpentier, the verist; Gustav Mahler, the arch-romanticist; Isaac Albéniz, the half-impressionist; 1861: the two Americans, Charles Martin Loeffler and Edward MacDowell; 1862: the two impressionists, Claude Debussy and Frederick Delius; 1863: the verist, Pietro Mascagni; 1864: the ubiquitous Richard Strauss; 1866: the anti-romantic and anti-impressionist Eric Satie.

While many a man mentioned in these last paragraphs may be classified under some ism, the masters, styles, and events after World War I cannot yet be properly filed away with suitable labels. Early in this latest period of music history, we face a stormy return to the elements, often cacophonous, often noisy, often primitivistic, and seemingly anarchic. Folk rhythms that enter this picture are no longer sentimental or nationalistic but a shock treatment apt to revive the natural gift and need for rhythmic invention that the Western concentration on harmony and counterpoint had all but strangled. Such a shock was the appearance of American jazz, which reached its climax in the *Rhapsody in Blue* (1924) and the folk opera, *Porgy and Bess* (1935), both by George Gershwin (1898–1937). Another shock came from Béla Bartók's Magyarism (1881–1945), another from Igor Stravinsky's early Russianism (1882–). No other time could have invented the title that Bartók gave one of his youthful piano pieces: *Allegro barbaro* (1910). No other time would have paid so much attention (at the cost of opera) to the ballet, where rhythmical movement reigns supreme and both the classicist and the romantic respect for dramatic action and convincing lifelikeness find themselves pushed back to a role of minor importance. There was an impressive number of unforgotten ballet scores created in the ten years 1910–1920: Stravinsky's *L'Oiseau de Feu* (*Fire Bird*, 1910), *Petrouchka* (1911), and *Le Sacre du Printemps* (*The Rite of Spring*, 1912–1913); Richard Strauss' *Josefslegende* (1914); Bartók's *Wooden Prince* (1914–1916); Eric Satie's *Parade* (1916); Darius Milhaud's *Le Boeuf sur le Toit* (*Cow on the Roof*, 1920); and Stravinsky's *Pulcinella* (1920).

Early in the 1920's, music joined the sister arts in a movement which—not without opposition—has been called neoclassicism. It strove for cool impersonality in strictest forms and put, as similar movements have done, an emphasis on solid craftsmanship at the cost of inspiration in a romantic sense. One facet of this turn was a sudden interest in the music of baroque and earlier periods. Such archaism was not entirely new. Mozart and Beethoven had in their last years rediscovered the wonders of Bach's fugues; Haydn had written his two oratorios in admiration of Handel's; Mendelssohn had opposed Bach to contemporary romanticism; Brahms and Gabriel Fauré (1845–1924) had fed on idioms of the past; and Max Reger (1873–1916) had tried to fight his romantic leanings with the inexorable polyphony of the ancestors. Early in the 1920's, the interest in older forms became more general. It affected organ building, the revival of harpsichords, clavichords, and gambas, historical concerts, the study of music history, and, in composition, a predilection for rigid patterns such as the passacaglia, the chaconna, and other so-called *ostinato* forms or ever-recurrent bass motives. The most amazing symbol of these trends is the fact that the greatest composer of Latin-Amer-

ica, Heitor Villa-Lobos (c.1884–), grafted the style of Bach upon his native idiom in the *Bachianas Brasileiras* (1932 ff.).

Diametrically opposite, though in the same direction, stands Arnold Schönberg's contribution to finding a way from chaos to order. Turning his back on atonalism as on something negative, he devised, as a positive solution, a twelve-tone row: the theme is always some typical arrangement of all the twelve notes of the octave, not to be changed during a piece, but suspectible to inversion, to reversion, and to transposition. The earliest document is his Serenade Opus 24 of 1921–1923.

From there on, the historian is in the depressing position of knowing outstanding masters and works, but of seeing them at too close a range to grasp their actual merits, connections, and ultimate roles, which a future generation will easily trace. Except the masters mentioned before there are the patriarchs of those who were living at the time this article was written (1950): the Englishman, Ralph Vaughn Williams (1872–), best known from two works of 1914—the *London Symphony* and the opera, *Hugh the Drover*—both "folksy," and the latter in the vein of the *Beggar's Opera;* and Ernest Block (1880–), with works of Jewish inspiration from the same time—*Trois Poèmes Juifs* for orchestra (1913), and a *Shelomo Rhapsody* for cello and orchestra (1915).

There are the men born in the 1890's: the Russian, Serge Prokofiev (1891–), with a Classical Symphony (1916–1917), and opera, *Love for Three Oranges* (1919), and a lovable fairy-tale for children, *Peter and the Wolf* (1936); the Swiss, Arthur Honegger (1892–), best known from a dramatic psalm, *Le Roi David* (1921), and the railroad apotheosis, *Pacific 231,* a "symphonic movement" (1923); the Frenchman, Darius Milhaud (1892–), composer of the ballets *Le Boeuf sur le Toit* (1919) and *Le Train Bleu* (1924), and of the opera *Christophe Colomb* (1928); the German-born Paul Hindemith (1895–), whose versatility appears in works as opposite in style as the song-cycle *Das Marienleben* (1924), the three operas *Sancta Susanna* (1921), *Cardillac* (1926), and *Mathis der Maler* (1934), and his children's play *Let's Build a Town* (1931); the American, Virgil Thomson (1896–), with the two operas on texts of Gertrude Stein, *Four Saints in Three Acts* (1934) and *The Mother of Us All* (1947).

Among the sons of this century are the American, Aaron Copland (1900–) with *A Dance Symphony* (1925), *El Salón Mexico* for orchestra (1936), and the high school opera, *The Second Hurricane* (1937); the Russian, Dmitri Shostakovich (1906–), who gained world renown with his First Symphony (1919), the operas, *The Nose* (1929) and *Lady Macbeth of the District of Mzensk* (1935), and the Leningrad Symphony (1942); the Frenchman, Olivier Messiaen (1908–), with a symphonic poem, *Les Offrandes Oubliées,* and other works in a spirit of Catholic mysticism.

The youngest of the outstanding masters in our time is the Englishmen, Benjamin Britten (1913–), creator of the opera *Peter Grimes* (1945). Not only their quality but also their diversity gives a hopeful ending to this brief survey. See also separate articles on Opera; Musical Elements and Terms; the music of the various countries.

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MUSIC APPRECIATION. This term has acquired a definite meaning in the United States, and to some extent abroad, particularly in schools and colleges where music is taught. In contrast to the study of musical performance or composition, or even to such subjects as theory, harmony, or musical history, it refers to the enjoyment and possibly the understanding of music by the average listener, who may be completely lacking in technical training or experience.

Music appreciation is, therefore, a subject open to the entire student body of any educational institution, or to the layman in general, adaptable to any curriculum, and within the pedagogic grasp of anyone possessing the necessary enthusiasm and equipment. But the term is still open to a variety of interpretations, and the title is likely to create suspicion in educational circles where the tradition persists that mental discipline of any kind cannot possibly be, and ethically should not be, enjoyable.

Consequently, one hesitates to substitute the word "enjoyment" for "appreciation," although it expresses far better the object of any such activity in the school or the home. "Understanding" is too ambitious a word, for even a highly educated musical scholar would hesitate to apply it to his own achievements. A vast knowledge of technique and history does not necessarily provide an answer to the eternal question of aesthetics: "What is beauty and how is it attained?" The indefinable quality known as inspiration or genius cannot be caught by a formula or reduced to a mathematical equation.

Music is practically unique in the fact that anyone can enjoy it, without the slightest knowledge or conception of its principles, and that increasing knowledge does not necessarily mean greater enjoyment, although it is fair to assume that it does. Music suffers from the snobbery of the self-sufficient souls to whom it is all an open book, and who resent the suggestion that anyone should be told what to like or why; and from that of the equally self-sufficient ignoramus who boasts that he knows nothing about art but knows what he likes. Strictly speaking, everybody can enjoy music, particularly in its simpler and more obvious forms, without being told how or why. But that instinctive enjoyment which has been called by the writer "the common sense of music" (literally the

sense of music common to all human beings) can be developed into an actual art by the simple process of creative listening, plus perhaps a certain amount of participation where the spirit is willing and the flesh not too weak.

At least it is agreed today that music appreciation in the best sense of the term has little or nothing to do with history, technical details—including a memory for opus numbers and key signatures—or the ability to pronounce foreign words or names correctly. Such information can be found easily in various books of reference, and even the critics and scholars of music (sometimes there is a distinction) would not dream of trying to carry it all in their heads when it is such a simple matter to look it up as needed.

The pursuit or study of music appreciation must be considered in the long run the acquisition of listening habits, just as the practice of athletics generally has as its ultimate object the permanent possession of physical habits. Music teachers may well take a lesson from athletic coaches in this respect, for they are still too often obsessed with the professional tradition, convinced that music is worth pursuing only for the sake of sensational and perhaps lucrative performance. The athletic coach knows perfectly well that only one in thousands of his pupils is likely to become a professional, and his entire effort is based on amateur standards, as that of most music teachers should be.

The errors made by teachers of music appreciation have been owing largely to their inability to put themselves in the place of their pupils. They fail to realize that to the novice all such technical details as notes, bars, staves, and acoustics mean absolutely nothing, and they seem unable either to approach the subject as a whole, from the standpoint of the inexperienced listener, or to cover one point at a time, disregarding the exceptions and explanations which to them are of vital importance but again mean nothing to the layman. Of all subjects, music has been most handicapped by the refusal of its practitioners and teachers to apply the fundamental rule of all pedagogy: work always from the known to the unknown, from the familiar to the unfamiliar.

The tragic joke of this situation, which lies at the bottom of a musical illiteracy that is still appalling, in spite of the best efforts of radio, phonograph, movies, schools, churches, and private teachers to eradicate it, is that music offers more familiar landmarks, more obvious points of departure, than any other art, and perhaps any other subject, in the educational curriculum. Everyone has an instinctive sense of rhythm, keeping time when the band goes by or the orchestra strikes up a good fox trot, regardless of training or past experience. Everyone can recognize a melody after a few hearings, and everyone responds favorably to certain combinations that represent harmony rather than discord and to certain qualities of tone that are universally accepted as pleasing. The only problem of music appreciation, therefore, is to guide these natural instincts in the direction of established standards of beauty, and perhaps to organize them to the extent of permitting an honest appraisal of unfamiliar material, in line with the best judgment of the past, present, and future.

Music may mean anything from the current popular tune to a Brahms symphony, depending largely on the individual concerned; and while certain matters of taste have been well established and generally accepted, no one living is actually qualified to say didactically «This is good and this is not.» If music lovers and critics are completely honest, they must admit that their enthusiasms, as well as their hostilities, represent primarily a personal preference or prejudice, and that they have no right to impose these on their fellowmen. Time alone can decide what is good music, and it may even be argued that no music can be considered completely bad if it has achieved some degree of permanence. Even though the sensitive pioneers of beauty may arrive intuitively at certain convictions which eventually prove correct, the test of time provides the only real and final answer. Folk music inexorably follows the law of the survival of the fittest; and the much abused word «classic» actually applies to any work of art that is recognized as permanent.

The layman wishing to develop an appreciation of music must, therefore, be content to discover and analyze those qualities and characteristics that appear in compositions of lasting quality, seeking to draw from them conclusions of wide and perhaps universal significance. To this extent it is possible to strengthen and justify an enthusiasm which is fundamentally direct and spontaneous. The unaffected conviction of beauty in any form is something not to be supplied by textbooks or teachers; and no matter how helpful such guidance may prove, those who enjoy or appreciate music must be permitted the feeling of having made this discovery for themselves. So the problem narrows down to the stimulation, encouragement, and analysis of what is actually a normal response to beauty in the universally appealing form of music.

The simplest and most comprehensive definition of music which the writer has been able to formulate constitutes the basis of his textbook, *The Art of Enjoying Music.* This definition, the result of much experience and many experiments with listeners of all sorts, is: «Music is the Organization of Sound toward Beauty.»

There are three important words in this definition. *organization, sound, beauty.* Sound without organization is mere noise. There is a rule of physics that regular vibration produces musical tone and irregular vibration produces noise. Therefore, the simplest form of organization of sound toward beauty is regular vibration.

But assuming various possible combinations of musical tones in time, there are many ways of organizing these raw materials in the direction of beauty. (It should be noted that the definition says «*toward* beauty,» not necessarily «*to* beauty.»

The most primitive organizing factor in music is *rhythm.* This one word covers all the phases of the time element—pulsation, measure, and the organized grouping of accented and unaccented tones. The Italian word *tempo* strictly refers only to the speed at which a composition is played or sung, and this term has become common in English, particularly in relation to the stage and the motion pictures.

Our word *time* has a broader significance. It refers first of all to the fundamental beat of music, which runs always in twos or threes. Roughly speaking, all music can be divided into march time and waltz time (duple and triple). The fundamental twos and threes may be doubled

or even tripled (in various forms of «compound time») but the basic beat remains constant. Even the supposedly irregular 5-4 time is merely the alternation of twos and threes.

Over this fundamental beat of time, represented familiarly by the action of the human heart, the regularity of breathing, the rhythm of sustained walking or running, the tides, the ticking of a clock, and the whole organization of the universe, music presents always a definite pattern of long and short notes, accented or unaccented. This free pattern of time may be called rhythm in the strictest sense of the word. A dancer or an orchestral conductor keeps time to the fundamental beat, in twos or threes, but follows or suggests also the broader rhythmic line, with its accents, its pauses or rests, its retarding or accelerating of tempo.

Rhythm, or time in its broadest sense is the first element in music discovered by mankind, whether it be the savage, the child or the inexperienced, civilized adult. It elicits primarily a physical response, perhaps almost a reflex action. It is no exaggeration to say that most people listen to music with their feet, and many of them never get beyond that stage.

Patterns of rhythm have the unique quality of repeating themselves endlessly, but with endlessly varying effects, depending on how they are filled out with melody and harmony. An amusing game can be played by tapping out the rhythmic pattern of a tune and asking someone to guess the melody. It is surprising how often the guesser will arrive at an entirely different piece of music, but fitting identically the same rhythmic pattern. (The word *pattern* will be found very convenient in its application to all the organizing factors of music.) Compare the rhythmic patterns of such tunes as *Frère Jacques, Yankee Doodle,* the old *ABC* (or «1, 2, 3, 4, 5, 6, 7, all good children go to Heaven») and the slow theme of Haydn's *Surprise* symphony. They all share the pattern of one note to a beat.

The rhythmic pattern of a long note followed by two short ones will suggest such different melodies as *Long, Long Ago,* two hymn tunes and Schubert's *Military March.* (See *The Art of Enjoying Music* for all these illustrations.) It is amusing to find that Chopin's *Funeral March* and Wagner's *Wedding March* start with identically the same rhythmic pattern.

Melody (q.v.) is the second and perhaps the most important organizing factor in music. It is the memory element, for people instinctively remember a piece of music by its tune. (Gen. U. S. Grant is quoted as saying that he knew only two tunes. One was *Yankee Doodle* and the other was not.)

Theodore Thomas used to say «Popular music is familiar music,» and he was right. The only problem of making good music popular is that of making it familiar. Therefore, it is fair to state that recognition is the first step toward appreciation. An audience recognizing the first few measures of a familiar encore often breaks into applause. The listeners are not applauding the music or the performer. They are applauding themselves because they recognized it. That is an encouraging sign of human interest in a concert program.

Patterns of melody may consist of only a few notes, and again the possible variations are endless. There are only 12 different notes in the chromatic scale between one tone and its octave, but mathematicians find nearly 500 million permutations and combinations of these 12 notes. Yet the materials of melody are sufficiently limited to cause the recurrence of recognizable patterns, just as bridge hands will often show a general arrangement of cards that has often appeared before. When a composer is consciously trying to stimulate the memory of his hearers, as is always the case with a popular tune, he almost inevitably falls into reminiscent patterns, and these parallels have often led to accusations of plagiarism and bitter arguments in the courts of law. The answer generally is that the similarities are entirely accidental, and that the supposed thief might as easily have taken his melodic line from a dozen different sources.

The common chord and scale are perhaps the most familiar patterns of melody, and most tunes can be analyzed as based on one or the other, or a combination of the two. (*The Star Spangled Banner* starts with the tones of the perfect major chord, as does the *Blue Danube Waltz. Dixie* is a perfect combination of chord and scale patterns. Handel's *Largo* is mostly a series of scale patterns.) But certain combinations are even less elaborate, suggesting such familiar models as the two notes of the cuckoo-call (used by Beethoven in his *Turkish March,* with the addition of scale passages), the three notes of the bugle, appearing in *Over There* and many other patriotic tunes, the four notes of the *Westminster Chime,* easily transposed into *How Dry I Am, Sweet Adeline,* the *Merry Widow Waltz* and other well known strains, and the five notes of the ancient pentatonic scale, which figures in much of the world's folk music.

Patterns of melody lead logically to patterns of *harmony* (q.v.), and this is the third step in the organization of sound toward beauty. Tones that sound pleasing in a melodic line, representing various levels of pitch, may also be played or sung simultaneously, with even more pleasing effect if they produce what is known as harmony. The traditions of harmony are very strict and limited, while the modern attitude is just as extreme in the other direction. Somewhere between the limits of dissonance and the platitudinous monotony of the commonest chords lies a happy medium that satisfies and stimulates the novice even though it will not necessarily bore the sophisticate.

The subject of harmony has been irreparably buried under a mass of technical detail, most of which has been enthusiastically discarded by contemporary composers. By common consent, the laws of harmony exist only to be broken. Therefore, it is absurd to saddle the layman with a load of outworn rules and formulas which have little or no significance today.

Anyone, however, can learn to recognize such conventional chords as those of the tonic (based on the key-note), dominant (on the fifth interval of the scale) and subdominant (on the fourth). These chords have become most familiar through their use in the various Amens at the close of hymn tunes. The average ear can also distinguish between major and minor harmonies, the technical difference of which lies in the mere lowering of the third interval by half a tone. Anyone who has ever sung in a barber shop quartet must have acquired a certain feeling for the fundamentals of harmony, no

matter how crudely expressed, and this unique diversion is actually a phase of American folk music.

Anyone can also discover with little effort the two main types of harmony, which have been burdened with the high-sounding names of «polyphonic» and «homophonic» or «monodic.» The first of these words means «many-voiced» and refers to the early style of harmonizing that reached a climax of popularity in the Elizabethan madrigals and a perfection of detail in the instrumental and vocal fugues of Bach and other masters. In polyphonic music, melodies are made to harmonize with other melodies, and sometimes with themselves. Simple examples are found in the familiar rounds, like *Three Blind Mice,* where a melody is allowed to overlap by starting at different points, thus producing a definite harmony which musical scholars call «strict canon.» The opposite of such polyphony is the common practice of putting chords under the important notes of a melody, enhancing its effect, but with little or no melodic significance within the accompaniment. This is sometimes called «vertical music,» in contrast to the «horizontal» effect produced on the eye by music written as a combination of harmonizing melodies. (Community singers have often enjoyed the simultaneous and fairly harmonious combination of such tunes as *The Long, Long Trail* with *Keep the Home Fires Burning, The Spanish Cavalier* with *Solomon Levi.*)

After the discovery of rhythm, melody, and harmony, the human ear becomes aware of *tone color,* or quality (known also by the French word *timbre*). This is an important factor in music, particularly of the modern type, where instrumental and vocal coloring have often been made to atone for a lack of melodic originality or inspiration. Every musical instrument, including the human voice, has an individual color or quality which can be recognized by any listener. A violin is as different from a cello as a soprano is from a baritone. There is no mistaking the difference between a flute tone and that of a trumpet or trombone, and this variety of color can eventually be detected even in closely related instruments like the oboe and English horn, or the clarinet and the saxophone.

When instruments or voices are heard in combination, the resulting tone color is all the more interesting and sometimes quite complicated. Those who enjoy music can find endless fascination in analyzing the compound tonal coloring of a symphony orchestra, a string quartet, a mixed chorus, or even a jazz band, whose muted brass and elaborate percussion have added much to the timbres of modern music.

The final organizing factor is *form,* and this is largely an intellectual process, but based also upon human instinct and universal laws. The organizing factors of rhythm, melody, harmony, and tone color must all be brought together under the general head of form, to create a complete composition. The basic pattern of form may be summed up as *statement, contrast, reminder,* often expressed by the letters ABA. A composer states his theme, which may be called his chief melodic idea. He then introduces something to provide contrast, suspense, even conflict, as is customary in all art, finally reminding the hearer of the material which had been presented at the outset.

This simple pattern of form applies to all music, from a primitive folk tune to an elaborate symphonic movement. It is the principle followed by a novelist or playwright, who similarly introduces his characters at the start, then creates the conflict and suspense of a good plot, and finally arrives at a happy or at least a logical ending.

In music the themes or tunes are the characters, and such words as *exposition, development* and *recapitulation* are used, very much as on the stage. In fact, these same words are applied to sonata form, perhaps the most elaborate in all music, appearing regularly in the first movement of a sonata, a symphony, a concerto or a string quartet. It is actually a development of the simple ABA formula which can be found in the chorus of any popular tune. The first section (A) is generally repeated for emphasis, with B serving as contrast and A finally returning as a reminder. (This basic form is found in such an excellent song as Jerome Kern's *Smoke Gets in Your Eyes,* as well as in a folk tune like the French *Au Clair de la Lune* and thousands of other famous pieces of music.)

In sonata form, the contrast is provided by a development of the melodic material, appearing in at least two themes or subjects, corresponding to the hero and the heroine of the play or novel. This development, sometimes known as a «free fantasia,» carries the tunes into various keys, breaks them up or turns them upside down, hands them over to various instrumental combinations, changes the harmony and perhaps the rhythm, and even plays them against each other in the polyphonic style called «counterpoint» (meaning «point against point» or «note against note»). This is the most difficult part of a symphony for the inexperienced listener, but if he is familiar with the tunes, it becomes increasingly interesting, just as the details of architecture grow upon the beholder after the fundamental outlines have been grasped.

Musical contrast may also be provided by «variations,» which are literally decorations or embellishments of a theme. (The form has become very popular in the improvisations of swing and «hot» jazz, whose devotees are generally unaware that their enthusiasm is responding to the lighter version of an established classical convention.) A theme with variations may provide the slow movement of a symphony or sonata. See also CONCERTO; SONATA AND SONATA FORM; SYMPHONY.

Beyond these elaborations of the song principle, most instrumental music is based on dance forms, such as the rondo, the minuet, the gavotte. The rondo is literally a round dance, with one tune returning again and again, in contrast with other interpolated themes. The minuet is the classic dance in triple time (slower than the waltz) and appears often as a symphonic movement, with the scherzo eventually taking its place. The classic suite, forerunner of the symphony, was actually a set of dances strung together without any necessary relationship.

The listener who acquires the habit of approaching music through its organizing factors of rhythm, melody, harmony, tone color, and form will find no difficulty in enjoying and perhaps appreciating almost any composition whose greatness is established by the test of

time. He can remain open-minded as to modernism and jazz (both of which represent the distortion of the conventions of music), and if they honestly appeal to him, he has no need to feel ashamed. It is well, however, to build up a fairly solid background of the recognized classics before venturing upon too many experiments.

The music that one is likely to hear nowadays, through radio, records, and actual performance on the concert or operatic stage, can be classified in a number of ways. The broadest division perhaps is that between *vocal* and *instrumental* music, and of the two the former is definitely the more popular, if only because the addition of words makes immediate understanding far easier. Grand opera (q.v.) has the further advantage of action, costumes, and scenery, and may therefore be considered the most obvious and at the same time the most elaborate of all types of music. Ballet achieves a similar effect through pantomime, and this also appeals automatically to a large public.

Another common distinction is that between *program* and *absolute* music. The first term applies to compositions that tell a story or paint a picture, perhaps indicated only by a descriptive title, like Liszt's *Dream of Love.* Technically the term «program music» is applied only to instrumental pieces, although in its broadest sense it necessarily covers all vocal music, whose program is made quite clear by the words. Absolute or «pure music» depends entirely upon mere tonal patterns for its effect, getting no help of any kind even from a title or a program note. It is fair to say that if a piece of absolute music inevitably produces a certain mood or emotion it must be conceded the highest possible merit. On the other hand, a piece of program music may well have an absolute value, worth hearing for itself alone, regardless of pictorial or narrative significance.

For the untutored explorer in the endless field of music the best and most satisfying start can be made in the direction of vocal music, and this has been clearly proved with children as well as adults. Simple songs appeal to everyone and require no elaborate machinery of appreciation for their enjoyment.

The quickest response to both vocal and instrumental music may be created by strong and obvious effects of rhythm, and this also appeals to young and old alike. Dance tunes of all kinds have no difficulty in winning a direct and favorable reaction, without requiring any study or analysis. After such simple discoveries, the development of music appreciation may go as far as the individual desires.

Program music will generally be found easier to grasp than absolute music, and this is again a natural process of selection. Eventually adventures in tonal design will be found just as fascinating as the interpretation of a definite meaning or the awareness of an abstract emotion. The enjoyment of music rests ultimately with the individual, and if this response is not sincere and spontaneous, no amount of study will make it so.

If music is «the organization of sound toward beauty,» the chief emphasis must be on the final word, and beauty has not yet been satisfactorily defined. To say that it is the same as truth is an evasion, for truth itself has remained indefinable. But the discovery of permanent beauty in any form, and particularly in the universal language of music, is an experience that anyone may enjoy, entirely personal, and contributing enormously to the enduring satisfactions of life.

See also Music.

Sigmund Spaeth,
Musician, Lecturer and Writer.

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MUSIC DRAMA. See DRAMA; MUSIC; OPERA.

MUSIC FESTIVALS. Music festivals may be traced as far back as the 11th century, when the French troubadours took part in the *puys,* or festivals of the literary and musical guilds. Competitions and prizes were part of the festivities, and the Puy d'Euvreux was held annually from 1570 to 1614. These festivals became models for the Sängerkriege of the German Minnesinger, and the Eisteddfod of the Welsh bards. In England the Festival of the Sons of the Clergy was founded in 1655, and in 1724 the Three Choirs Festival was started in England, combining the choral societies of Gloucester, Worcester, and Hereford. Both of the latter festivals have survived to modern times. There are also in England the Norwich Festival (1770) (now held triennially), the Leeds Festival (1858), and the Handel Festivals in London's Crystal Palace (1857). On the European Continent the Neiderrheinische Musikfeste was established in 1817, and has been held alternately in Cologne, Düsseldorf, and Aachen. The Tonkünstlerfeste of the Allgemeiner deutscher Musikverein were started by Liszt in 1861 and continued until 1932, annually in different German cities. Most important have been the periodic festivals honoring the great composers, generally held at their birthplaces: the Beethovenfeste at Bonn, the Bachfeste at Eisenach, and the Mozartfeste at Salzburg. Wagner himself started the Bayreuther Festspiele held annually long after his death.

In America, festivals on a large scale started in Boston with a festival of the Handel and Haydn Society of that city in 1857, and in Worcester the following year. These, however, were special, not annual affairs. Likewise the two festivals organized by Patrick Sarsfield Gilmore in Boston, historically important because of their mammoth proportions, were single occasions of five days' concerts each. The first, held in 1869, commemorated the end of the Civil War, and the second (1872), the close of the Franco-Prussian War. The oldest of the present day festivals are those held annually in October at Worcester, Mass. (founded in 1871), and the Cincinnati May Festivals (1873). The Ann Arbor (Mich.) May Festival dates from 1893. In 1900 the annual two-day Bach Festival was started at Bethlehem, Pa., and has continued.

In more modern years a number of festivals have come into being, some with special objectives. At the Eastman School of Music at Rochester, N. Y., the Eastman Festival of American Music has annually presented a week's programs of American music since 1931. The Berkshire Festivals at the Library of Congress in Washington, D.C. (1925), have presented annual series of chamber music concerts. The International Society for Contemporary Music has concerned itself with festivals of music by modern composers since 1923. These were first held in foreign cities, but since 1941 they have been given in the United States.

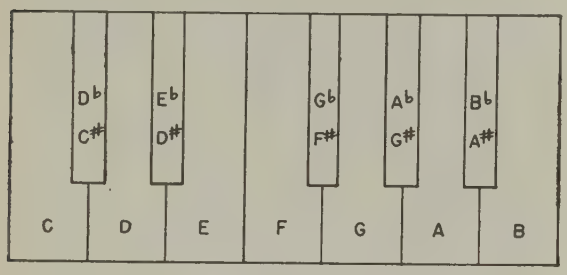
In 1936 Serge Koussevitzky established a summer festival of concerts by the Boston Symphony Orchestra which have continued annually at the Berkshire Music Centre in Tanglewood, Mass. In addition to a month of concerts by the orchestra and by chamber music groups, opera is presented, and a music school offers instruction in various subjects. For a number of years the Central City Play Festival in Colorado has offered operas and concerts as well as plays in its three-week July season.

MUSICAL ELEMENTS AND TERMS. Music is the meaningful connection of sounds. Any sound is produced by the vibration of air or of a solid body. When such vibrations are irregular, the sound is a *noise;* when they are regular, the sound is a musical *tone.* Music depends in the main on tones, but does not exclude noise (as in drums, cymbals, or clappers). Slow vibrations produce the tones and noises which we call low; fast vibrations produce the higher sounds. The practical range of music extends from about 40 to about 4,000 vibrations per second, but goes beyond these limits in accessory tones, such as partials and combination tones (see ACOUSTICS).

The exact number (frequency) of vibrations or cycles gives a tone its height or *pitch.* In a narrower sense, we call pitch the standard height of the tone a' (near the middle of the piano) from which all musical tones derive their pitches. It is given to all tuning forks and is played by an oboist when the orchestra tunes up before the beginning of a piece. The American standard a' is today 440 vibrations.

The reader who wishes to make himself familiar with the elements and basic terms of

music may look at a piano. On its keyboard he finds all the tones in a continuous sequence from the lowest (left side) to the highest (right side). The keys, white and black, alternate in a characteristic pattern seven times repeated. It consists of two easily visible groups of black keys—one of two, one of three—and of the neighboring white keys, seven in number. The white keys, in ascending order, are called by the letters C D E F G A B.



Looking at these white keys, we are under the impression that each two of them are musically equidistant. But the neat arrangement deceives: While the size of a normal step, like C-D and D-E is that of a whole tone or tone, E-F and B-C form only semitones half as wide as the whole tone. The reader is here, not for the last time, confronted with an ambiguous name: tone has the two distinct meanings of an individual sound and of a normal step between two of such tones. This ambiguity is probably the reason why the word *note,* originally confined to the visual symbol of an individual tone when written or printed, is often used for the tone itself.

Looking again at the keyboard, one realizes that there is no black key between those white keys which form only semitones; the black keys serve to split the whole tones into semitones. Owing to their intermediate position, they alter and replace both their upper and their lower white neighbor; a black between C and D sharps the lower neighbor by a semitone and also flats the upper neighbor by a semitone. Hence the black keys have two names each, according to their position and function within a piece: (1) C sharp or D flat; (2) D sharp or E flat; (3) F sharp or G flat; (4) G sharp or A flat; (5) A sharp or B flat. Abbreviating symbols are ♯ for the sharp and ♭ for the flat. Any sharp or flat is, when necessary, revoked by a natural, or ♮, which re-establishes the white key.

Any semitone, such as E-F, is also called a minor second, and any tone, such as C-D, a major second. The step one semitone wider, such as C-E♭ or as D-F, is a minor third; four semitones, like D-E, form a major third. There is a perfect fourth from C to F; an augmented fourth, from C to F sharp or from F to B; a perfect fifth, from C to G; a minor sixth, from E to C; a major sixth, from D to B; a minor seventh, from C to B flat; a major seventh, from C to B; an octave, from C to C.

The word *octave* is one more ambiguous term. It indicates (1) the distance of 12 semitones, which is characterized by a difference in altitude, one note being lower and one higher, but at the same time by a similarity of their essential quality, both of them being C's or D's or E's, which accounts for a repetition of the musical letter-names above and below the normal pattern indicated before. The word indicates also (2) the simultaneous occurrence of two such tones (as when a woman and a man sing the same melody); (3) the sequence of tones between any tone and its octave; and (4) the same sequence without the eighth tone. It is in accordance with meaning (4) that musicians speak of contra-, great-, small-, one-, two-, three-, four-, five-lined octaves, the names being extended to all individual tones between C and B:

contra octave: $C_1D_1E_1F_1G_1A_1B_1$
great octave: C D E F G A B
small octave: c d e f g a b
one-lined ('middle') octave: c′d′e′f′g′a′b′
two-lined octave: c″d″e″f″g″a″b″
three-lined: $c^3d^3e^3f^3g^3a^3b^3$
four-lined: $c^4d^4e^4f^4g^4a^4b^4$

Between any C and its octave, the white keys form semitones as the third and seventh steps. But this arrangement is by far not the only one that music uses. Under the somewhat bewildering name of a *major* scale (because it has a major third), it is opposed to the *minor* scale from A to A, in which a semitone, B-C, forms the second step and provides the interval of a minor third (A-C) where there had been a major third in major.

The other possible octave sections of the white-key row are obsolete, but survive in the ecclesiastical modes: D-D is the so-called first or Dorian mode; E-E, the third or Phrygian mode; F-F, the fifth or Lydian mode; G-G, the seventh or Mixolydian mode; A-A, the second or Hypodorian mode; B-B, the fourth or Hypophrygian mode; C-C, the sixth or Hypolydian mode; D-D, the eighth or Hypomixolydian mode (which differs from the first mode in its inner structure). In all these octaves, the relative position of the semitones is the distinguishing feature.

However, these octaves are by no means confined to the white keys. With the aid of black keys, the major or the minor or the Dorian scale can start on each of the 12 keys between C and B and yet preserve the characteristic position of its semitones. This is expressed by the well-known addition of tone-letters: if Beethoven's First Symphony is in C major, its basic scale is built on C, while the master's Second Symphony in D major has the same position of the semitones, but is transposed up by a whole tone. In this case the major character can only be achieved by introducing two black keys, F sharp and C sharp, lest it would be that of Dorian instead of major. In a similar way, Beethoven's Fifth Symphony in C minor needs the flatting of E, A, and B to make the C scale minor.

In order to simplify notation, the composer does not sharp or flat the notes in question wherever they occur, but marks them at the beginning of each staff as the so-called key-signature: one sharp for F denotes both G major and E minor; 2 sharps for F and C denote D major and B minor; 3 sharps for F, C, and G denote A major and F sharp minor; 4 sharps for F, C, G, and D denote E major and C sharp minor; 5 sharps for F, C, G, D, and A denote B major and G sharp minor; 6 sharps for F, C, G, D, A, and E denote F sharp major and D sharp minor; 7 sharps for F, C, G, D, A, E, and B denote C sharp major and A sharp minor. One flat for B, on the other hand, denotes F major and D minor; 2 flats for B and E denote B flat major and G minor; 3 flats for B, E, and A denote E flat major and C minor; 4 flats for B, E, A, and

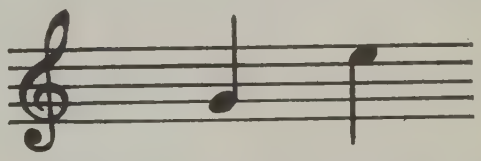
D denote A flat and F minor; 5 flats for B, E, A, D, and G denote D flat major and B flat minor; 6 flats for B, E, A, D, G, and C denote G flat major and E flat minor; 7 flats for B, E, A, D, G, C, F denote C flat major and A flat minor.

With key signatures, the reader has entered the maze of notation. The individual notes are expressed by oval *heads* placed higher up or lower down according to their position in musical space and on the keyboard. In order to make this position clear beyond doubt, the note heads are written on a *staff* (plural, staffs) of five horizontal lines, each line and each space between lines determining a definite note or tone of the scale: from below, the five lines stand for e g b d f, the four spaces for f a c e, and the two places directly below the lowest and above the highest line, for d and g. You can go beyond this narrow compass by placing additional notes, above or below the staff, on *ledger lines,* which are abbreviations of the regular lines not much wider than the note itself. But even with ledger lines (which are confusing when they exceed the number of three above each other), the one staff is not sufficient to cover the whole range of seven octaves that our music uses. Hence the lower instruments, such as bassoons and double basses, and also the left hand of the pianist, avail themselves of a second staff, whose lines and spaces have a different meaning: the lines denote G B d f a, and the spaces (F) A c e g (B), with corresponding ledger lines. Where too many ledger lines imperil easy reading, a dotted line, preceded by a figure 8 or 8va (*ottava*) indicates a transposition by an octave—upwards if the line is drawn above the staff, and downwards, if it is drawn below. To show the reader which of the two meanings a staff conveys, it carries one of two *clefs* right at the beginning—even before the key signature. That of the higher staff is a G, or violin clef, 𝄞, located on the second line from below and making it g′. That of the lower staff is an F, or bass clef, 𝄢, located on the fourth line from below and making it (small) f. Besides these current two clefs, the viola has still preserved one of the otherwise extinct clefs of older times: the alto clef, 𝄡, which makes the middle line a c′; and the violincello as well as the tenor trombone still cling to the obsolete tenor clef, which makes the fourth line from below a c′𝄡.

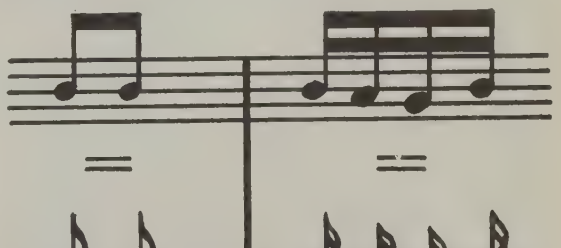
Speaking of high and low, of alto and tenor, it will be advisable to mention the principal types of musical altitude. Their terminology derives from the four or six registers of the human voice. Soprano or treble and alto belong to women and boys (although in earlier times the alto used to be a man's voice). The mezzosoprano stands in between. Tenor and bass or basso belong to men, with the baritone in between. The instruments have taken over the vocal names: we speak of soprano cornets, alto clarinets, tenor trombones, and bass tubas.

While the staff of five lines and its clef take care of the pitches—whether a note is to be great C, small d, or anything else—the various shapes given to the notes themselves are symbols of their duration; the notes themselves show how long they shall be heard. The *head* of the note, to be sure, is always oval; and yet there are decisive differences. A plain white oval without any addition is the longest note in use, extending over four time units, or *beats.* The half note, extending over two beats, is a white oval with a vertical *stem;* the quarter note, representing one beat, is a black oval with a stem. Beyond the quarter note, always dividing by two, we use a black oval with a stem and a *flag* at its end as the eighth note; with two flags, as the sixteenth; with three flags, as the thirty-second; with four flags, as the sixty-fourth; with five flags, as the one hundred and twenty-eighth. The stems, with

or without flags, grow upward from the right end of the head when the notes are located below the middle line of the staff. Upwards from this line, the stem grows downwards from the left end of the oval. In instrumental music, when two or more consecutive notes are flagged, the individual

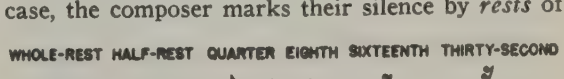


flags are replaced by as many connecting *beams* to join them in a group; but such joining rarely exceeds the value of a quarter note; that is, it connects no more than two eighths, or four sixteenths, or eight thirty-seconds.



A dot to the right of a note adds 50 per cent to its time value: a dotted whole note measures three halves instead of two, a dotted half note, three quarters, and a dotted quarter, three eighths. Two dots behind a note add 50 plus 25 per cent: a double-dotted whole note measures 2 + 1 + ½ half notes or 7 quarters, and a double-dotted half note, 3½ quarters or 7 eighths. A figure 3 above a group of three units indicates a triplet, which takes only the time of two such units. In a similar way, but by exception only, music uses duplets (to fill the time of three units), quadruplets (instead of three), and quintuplets (instead of four).

Often, a voice or an instrument stops for a little while in the progress of a piece. In such a case, the composer marks their silence by *rests* of



adequate length: Rests, too, may be dotted or even double-dotted.

A dotted half circle 𝄐, called *pause* or *fermata* (that is, stop), above an individual note lengthens it irrationally at the performer's discretion.

Music depends not only on the pitches and

lengths of tones, but also on their organization in rhythmic patterns. Such organization, made visible in the well-ordered movements of the conductor, consists in the regular alternation of stressed and unstressed or lesser stressed time units or beats. Its symbol, the *time signature,* is usually a fraction of two figures, marked on the staff right behind the key signature and not repeated on the following staffs. When the alternation of stresses is quite strict and simple—one beat stressed, one unstressed—we speak of two-four or 2/4 time, thus indicating that the pattern consists of two quarter notes. When, however, every stressed beat is followed by two unstressed beats, we speak of three-four or 3/4 time, thus indicating that the pattern requires the time of three quarter notes (as in the *Star-Spangled Banner* and *America,* as well as in all waltzes). When the stressed beat is followed by three unstressed beats, we speak of four-four time (as in *America the Beautiful*), with the signature 4/4 or 𝄴. When the time signature has 8 instead of 4 as the denominator, such as in 4/8, 5/8, 6/8, the unit of time is an eighth note. Inversely, the denominator 2, as in 3/2, indicates that the pattern comprises three half notes. A special case, remainder of an old, forgotten practice, is marked by 𝄵: it is called by the archaic name *alla breve* and makes a four-four time twice as fast as it would normally be. The conductor marks only two beats within the pattern, which, though written as halves, mean actually quarters.

To facilitate playing and singing, the pattern is set between vertical bar-lines running all the height of the staff. They always stand directly before a stressed note. The group inside the lines is called a *bar* or a *measure.* However, such a bar coincides with the rhythmical pattern only when the latter starts on the accented beat or *downbeat* (as we call it from the stressing gesture of the conductor). *God Bless America* and *My Country 'Tis of Thee* are examples. When, on the contrary, the pattern begins on the unaccented time or *upbeat* (as for example in the *Star-Spangled Banner* and *America the Beautiful*) it does not coincide with the measure.

Any deviation from the regular alternation of stressed and unstressed beats by introducing accents where normally there would be an unaccented beat—a well-known device in all forms of jazz and swing—is called syncopation.

Tempo.—Although the denominator of the time signature implies very roughly a difference in speed or tempo—since a three-eight is necessarily faster than a three-four, and a three-four faster than a three-two—musical practice has better means to indicate different tempos (or, more correctly, *tempi*). In the first place, all languages use a moderate stock of terms denoting tempo and general mood. But more frequent in scores of any nationality are the internationally recognized Italian words *molto adagio,* very slow; *adagio,* slow; *largo,* broad; *larghetto,* rather broad; *andante,* not too slow; *andantino,* still less so; *moderato,* moderate; *allegro,* brisk; *allegretto,* less so; *presto,* fast; *prestissimo,* as fast as possible. But these and other similar indications at the head of a piece are more or less vague, and their appropriate interpretation has often been open to discussion. A more precise direction, generally together with one of the Italian terms, is found in a short equation above the signature of the first staff of a piece and might read as, say, ♩ = MM 80. The double letter MM refers to the metronome that the mechanic Johann Nepomuk Maelzel (Mälzel) invented in 1816. It is a pyramidal box with a ticking pendulum whose speed can be regulated by shifting a little weight in front of a calibrated plate: 80 means that by shifting the weight, the pendulum should be made to tick 80 times per minute and that every tick should mark a quarter note. Changes within a piece are prescribed as *accelerando,* growing faster, and *rallentando,* growing slower. *A tempo* restores the original tempo.

Intensity.—The intensity, or volume of sound, of an individual tone or a whole section is marked by the abbreviations pp for *pianissimo,* very soft; p for *piano,* soft; mp for *mezzopiano,* half-soft; mf for *mezzoforte,* half-loud; f for *forte,* loud; ff for *fortissimo,* very loud. Exceptionally, the extreme intensities have been exaggerated up to ppppp and fffff. Increasing intensity is called *crescendo* (growing, abbreviated *cresc.*); decreasing intensity, *decrescendo* or *diminuendo* (*decr., dim.*). Oftener, these words are replaced by graphic symbols which allow marking exactly the extent of the increase or decrease: the former one by a prone, acute angle open to the right; the latter one by a similar angle open to the left. An extraordinary accent on an individual note appears in notation as sf, for *sforzando* (strengthening), or as a short, acute angle, either prone or pointing downward.

There are finally a few signs for the correct execution of individual notes and whole groups of notes. A dot or accent above a note means *staccato* (detached), and requires a light touch and prompt release of the note, irrespective of its original time value. The opposite of staccato is *legato* (joined), which appears in notation as a shallow arc reaching from the first to the last note of the joined group. While this kind of arc is called a *slur,* the name *tie* is reserved for a similar arc that connects two notes of the same pitch whenever it is not possible or wise to write them as a whole (for instance, when a note reaches beyond a bar-line, or when there is no proper symbol for the time value of a note, as, let us say, for a half note plus an eighth).

Musical Forms.—The concept *form* reaches from the smallest to the largest structural units. The smallest unit is a *phrase* of generally two or four or even eight measures which ends in an *open cadence,* that is, a formula that leaves the listener in suspense. Only a second phrase, similar in some respect, ends in a *closed cadence* that gives a satisfactory conclusion. The two phrases, called also *antecedent* and *consequent,* form together a *period.* Periods can be multiplied and grouped in quite a number of ways; indeed, they can be repeated without any change. When such is the case, the composer marks the repetition by a *repeat* sign: a double bar-line with, towards the section to be repeated, two dots above and below the middle line of the staff. This seriation of even periods is characteristic of simple songs and of dances. In certain dances, such as the minuet which has survived in our symphonies (either in its original form or, since Beethoven, as the scherzo), the structure is threefold, ternary, or *da capo,* the first part being repeated after the second part. The composer marks this repetition either by reprinting the first part in full or else by adding, after the second part, the cue *da capo* (from the beginning), to which might be added

dal fine (to the end). But if he does so, he must print the word *fine* at the end of the first part. The second, middle section of a minuet is called *trio,* because the masters of the 17th century gave it to three solo instruments, while the outer sections were left to the full orchestra.

In the *rondo,* which has often been used to conclude sonatas and symphonies, the periods are arranged in a peculiar way: the sections 1,3,5,7, and so on are similar or identical, while the sections 2,4,6,8, and so on differ, both from the first one and from each other.

The slow movement of a symphony or sonata often consists in a set of *variations.* In its basic form, such a set requires a *theme,* usually in the shape of one or several periods, and a number of individual variations which disguise the theme enough to give it in all their melodic and harmonic transformations an ever new interest without effacing its general outline and character.

Preceding these typical movements of the classical symphony and sonata—the slow variations, the minuet or scherzo with its minuet, and the rondo—we find a first and principal movement in *sonata form.* Before describing it, two bewildering points must be clarified. In the first place: the so-called sonata form belongs not only to sonatas for piano alone or for piano and some other instrument, but also to all typical chamber music, such as trios, quartets, and quintets for three, four, five instruments, to symphonies for full orchestra, and to concertos for some solo instrument with the accompaniment of the orchestra. In the second place: although these types of compositions have as a rule four movements (concertos have but three), only the first movement, and sometimes the last too, has the sonata form proper. It begins with the energetic first theme in the *tonic,* that is, the principal key of the movement, and contrasts it with a more lyrical second theme in some related key. This duplex *exposition* is repeated. Then comes the *development,* where characteristic fragments of the principal theme or of both themes are used "to fight it out," until the potentialities of the thematic material are exhausted. At this point, the exposition reappears victoriously as the *recapitulation* and ends in a decisive *coda,* or conclusion. In concertos, the coda is delayed by a *cadenza,* in which the soloist, without the orchestra, is allowed to show his bravura technique in another neck-breaking development. This section is a strange leftover from the virtuoso times of the 18th century and should as such be improvised. However, the cadenzas that we hear today are ready-made and carefully studied.

There is, beside the sonata proper, a *sonatina* in smaller proportions, both as to size and to weight.

The special form of the *fugue,* which can be independent or else serve as the climax of a last sonata movement, is explained in a separate article.

While all these forms are more or less strict (though all of them leave a good deal of freedom to the composer), other forms are free by definition: the *toccata* (play piece) in which chordal episodes alternate with rapid passages, the loosely written *rhapsody,* and the quite informal *fantasia.* See also separate articles on musical forms.

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MUSICAL TERMS

The following glossary includes the most commonly used terms and phrases of the vocabulary of music. Important terms treated separately in this Encyclopedia are designated by the reference: *See separate article.* English or Anglicized terms which are self-explanatory are generally omitted since they need no definition.

A Battuta (It.).—Indicating a return to strict time after deviations.

A Cappella (It.).—Unaccompanied choral music.

A Capriccio (It.).—At will, agreeable to fancy.

Accellerando (It.).—With gradually increasing velocity of movement.

Accent.—See separate article.

Acciaccatura (It.).—An ornament in harpsichord music, giving to chords the effect of an arpeggio.

Accidentals.—Occasional sharps, flats, and naturals placed before notes.

Accompaniment.—See separate article.

Acoustics.—See separate article.

Adagio (It.).—Slowly: slower than *andante* and faster than *largo.*

Adagio Assai or **Molto** (It.).—Very slow and expressive.

Adagio Cantabile e Sostenuto (It.).—Very slow, singing and sustained.

A Deux (Fr.); **A Due** (It.).—A direction in orchestral music to indiate that two instruments are to play the same notes. Opposite of *divisi.*

Ad Libitum (Lat.).—At will or discretion. This expression implies that the time of some particular passage is left to the pleasure of the performer; to include or omit an instrumental or vocal part or voice so marked; or that he is at liberty to introduce whatever embellishments his fancy may suggest.

Affettuoso, Affettuosamente, or **Con Affetto** (It.).—With tenderness and pathos.

Affrettando or **Affrettate** (It.).—Accelerating, hurrying the time.

Agitato or **Con Agitazione** (It.).—With agitation, anxiously.

Al (It.).—A prefix meaning "to the"; hence *al fine,* to the end.

Alla (It.).—A prefix meaning "in the style of."

Alla Breve (It.).—A tempo mark which indicates that in common time the half-note is to be regarded as the unit of time, rather than the quarter-note. In other words, 2/2 rather than 4/4. The tempo mark is usually

Allegremente (It.).—Brightly.

Allegro (It.).—See separate article.

Al Segno, Al Seg., or the character **'$.**—Signifies that the performer must return to a similar character in the course of the movement, and play from that place to the word *fine,* or the mark over a double bar.

Alt or **Alta** (It.).—Higher; as *Ottava Alta,* an octave higher.

Altissimo (It.).—Extremely high as to pitch.

Alto (It.).—Literally, high, but in modern usage a female or boy's voice of low range (also called *contralto*), or the second highest part of a four part mixed chorus. Also, in French and Italian, the viola.

Amabile (It.).—Amiably.

Amoroso, Amorevole, or **Con Amore** (It.).—Affectionately, tenderly.

Andante (It.).—This term often modified, both as to time and style, by the addition of other words, broadly implies a movement somewhat slow and sedate, but in a gentle and soothing style.

Andantino (It.).—Somewhat slower than *andante.*

Animato, Con Anima or **Animoso** (It.).—With animation; in a spirited manner.

Anthem.—A sacred choral composition, generally composed to Biblical text.

Antiphonal Singing.—Singing in alternating choruses, particularly in polyphonic music composed for a double chorus.

A Piacere or **A Piacimento** (It.).—At the pleasure of the performer; (see *Ad libitum*).

Appassionato or **Appassionamento** (It.).—With intensity of feeling.

Appoggiatura (It.).—A grace note or note of embellishment which as a passing tone precedes an essential tone on an accented part of a measure.

A Prima Vista (It.).—At first sight.

A Quatre Mains (Fr.); **A Quatro Mani** (It.).—For four hands; a pianoforte duet.

Ardito (It.).—Boldly, energetically.

Aria (It.).—An air, or song.

Arioso (It.).—In the style of an air; vocal, melodious.

Arpeggio (It.).—An imitation of the harp produced by playing the notes of a chord in rapid succession, instead of altogether.

Assai (It.).—Very, extremely.

A Tempo (It.).—Indicating a return to normal tempo following deviations.

Attacca or **Attacca Subito** (It.).—Attack suddenly or commence immediately.

A Vista (It.).—At sight.

Bar.—See separate article.

Barcarole or **Barcarolle.**—See separate article.

Bass.—See separate article.

Beat.—See separate article.

Beats.—An acoustical effect caused by the interference of two sound-waves of different frequencies. For Helmholtz theory of *beats* as related to dissonance see separate article on Acoustics.

Begleitung (Ger.).—An accompaniment.

Bel Canto (It.).—Literally "beautiful singing." Denotes a style of singing which emphasizes beauty of sound and brilliant execution.

Ben or **Béne** (It.).—Well; as *ben marcato,* in well-marked time.

Bis (Lat.).—Twice; indicating that a note or passage must be performed twice.

Bolero (Span.).—See separate article.

Bouffe.—See *Buffa.*

Bravura (It.).—See separate article.

Breve.—See separate article.

Brillante (It. and Fr.).—An expression indicating a showy and sparkling style of performance.

Brio, Con (It.).—With life and spirit.

Buffa, Buffo, Bouffe (It., Fr.).—Comic; as *opera buffa, opéra bouffe,* a comic opera.

Cadence (Fr.).—See separate article.

Cadenza.—See separate article.

Calando (It.).—Gradually diminishing in tone and quickness; becoming softer and slower by degrees.

Calcando (It.).—Pressing on, hurrying the time.

Calmato (It.).—With tranquility, repose.

Calore, Con (It.).—With much warmth and animation.

Canon.—See separate article.

Cantabile.—See separate article.

Cantata.—See separate article.

Canticle.—The name given to certain hymns with Biblical texts and used in church services, such as the Benedictus, Magnificat, Nunc Dimittis, etc.

Cantilena.—See separate article.

Cantor.—A solo singer, generally applied to the leading soloist in the Jewish service.

Cantus (Lat.).—In medieval and Renaissance music the upper (soprano) part of polyphonic compositions.

Cantus Firmus.—See separate article.

Canzone or **Canzona.**—See separate article.

Canzonet or **Canzonetta.**—See separate article.

Capo (It.).—The head or beginning. See separate article Da Capo.

Cappella, A (It.).—In church style.

Capriccio, Capriccioso or **Capriccietto** (It.).—See separate article Capriccio.

Carol.—See separate article.

Cavatina.—See separate article.

Chant.—See separate article.

Choir.—See separate article.

Choral or **Chorale.**—See separate article.

Chord.—See separate article.

Chromatic.—See separate article.

Clef.—See separate article.

Coda (It.).—A few bars added at the close of a composition, beyond its natural termination.

Col, Coll', or Colla (It.).—With; as *col arco,* with the bow.

Colla Voce (It.).—Implies that the accompanist must follow the solo voice when performing in free rhythm.

Commodo or **Commodamente** (It.).—Quietly, with composure.

Common Time or **Common Measure.**—See separate article.

Con.—With. See also separate article.

Concerto.—See separate article.

Concord.—See separate article Dissonance.

Consonance.—See separate article Dissonance.

Contralto.—See Alto.

Counterpoint.—See separate article.

Da Capo, abbr. **D.C.** (It.).—See separate article.

Dal (It.).—By; as *dal segno,* from the sign; a mark of repetition.

Deciso (It.).—With decision, boldly.

Decrescendo (It.).—Gradually growing softer.

Delicatemente or **Delicato.**—Delicately; *con delicatezza,* with delicacy of expression.

Descant.—In hymn singing, an added melody for treble voices, sung above the principal melody.

Dextra (Lat.).—Right; *manus dextra,* the right hand: *manu dextra* (*M.D.*), with the right hand.

Diapason.—See separate article.

Diatonic.—See separate article.

Dilettante.—See separate article.

Diminuendo, abbr. **Dim.** (It.).—Diminish gradually in loudness.

Discord.—See separate article Dissonance.

Dissonance.—See separate article.

Divertimento (It.).—A short light instrumental composition.

Divisi (It.).—Direction in orchestral music indicating that two or more instruments are to play different notes, opposite of *à deux.*

Dolce.—See separate article.

Dominant.—See separate article.

Elegamente or **Elegante** (It.).—With elegance.

Empfindung, Mit (Ger.).—With emotion, passion.

Energico, con Energia or **Energicamente** (It.).—With energy.

Enharmonic.—See separate article.

Espressivo or **Con Espressione** (It.).—With expression.

Extravaganza.—See separate article.

Falsetto.—See separate article.

Fandango.—See separate article.

Fantasia.—See separate article.

Fifth.—See separate article.

Figured Bass or Thorough Bass.—See separate articles, FIGURED BASS and BASS.

Forte (It.).—Loud; see also separate article.

Fortissimo.—Very loud.

Forzando, abbr. Forz or Fz (It.).—Same as *sforzando.*

Fretta, Con (It.).—With speed, hastily.

Fugue.—See separate article.

Fundamental Bass.—See separate article BASS.

Fuoco, con or Focoso (It.).—With fire, intense animation.

Galop.—A rapid dance of the mid-19th century.

Gamut.—See separate article.

Gavotte or Gavot.—See separate article.

Gebunden (Ger.).—Tied or connected in regard to the style of playing or writing.

Giocosamente, Giocoso or Giojoso (It.).—Humorously; joyously; with sportiveness.

Giusto (It.).—In just and exact time.

Glee.—See separate article.

Glissando or Glissicato (It.).—In a gliding manner.

Grandioso (It.).—In a grand and elevated style.

Grave (It.).—Slow, solemn; also low in pitch.

Graziosamente, Grazioso or Con Grazia (It.).—In a flowing and graceful style.

Gregorian Chant.—See separate article.

Gusto, Gustoso or Con Gusto (It.).—With taste.

Harmonics.—See separate article.

Harmony.—See separate article.

Hauptsatz (Ger.).—The principal subject or theme.

Hauptstimme (Ger.).—A principal part.

Hexachord (Gr.).—The six diatonic tones forming the Guido scale.

Homophonic.—Designating music in which a single melodic part is supported by a chordal accompaniment. Opposite of *polyphonic.*

Improvisation.—Performing extemporaneously, without preparation or the use of written music; a composition in free style, giving the effect of improvisation on the part of the performer.

Intermezzo (It.).—Originally a short, light opera, performed between the acts of a serious play or opera; an instrumental interlude; a short instrumental piece.

Interval.—See separate article.

Intoning.—See separate article.

Inversion.—See separate article.

Key.—See separate article.

Kyrie.—See separate article KYRIE ELEISON.

Larghetto.—Slower than largo.

Larghissimo.—Extremely slow.

Largo.—See separate article.

Leading Tone.—See separate article.

Lebhaft (Ger.).—Lively.

Legato (It.).—In a smooth and connected manner; *legatissimo,* exceedingly smooth and connected.

Leggiero or Con Leggierezza (It.).—With lightness and facility of execution.

Leitmotiv or Leitmotif.—See separate article.

Lentando.—With increased slowness.

Lento (It.).—In slow time.

L'istesso (It.).—The same, as *l'istesso tempo,* the same time.

Loco (Lat.).—Implies that a passage is to be played just as it is written in regard to pitch; it generally occurs after 8va alta or 8va bassa.

Lusingando (It.).—Soothingly, persuasively.

Lustig (Ger.).—Gay, sportive.

Ma (It.).—But, as *allegro ma non troppo,* quick but not too much so.

Madrigal.—See separate article.

Maestoso (It.).—With majestic and dignified expression.

Magnificat.—See separate article.

Main (Fr.).—Hand: as *main droite, main gauche,* or *M.D., M.G.,* the right or left hand in piano music.

Major.—See separate article.

Mano (It.).—Hand: *mano dritta,* the right hand; *mano sinistra,* the left hand.

Marcato (It.).—In a marked and emphatic manner; *marcatissimo,* very strongly marked.

Marziale (It.).—In a martial style.

Matins.—See separate article.

Mazurka.—See separate article.

Measure.—See separate article.

Melodrama.—See separate article.

Melody.—See separate article.

Meno, abbr. Men. (It.).—Less; as *meno presto,* less quick; *meno forte,* less loud; *meno piano,* less softly; *meno vivo,* with less spirit.

Messa di Voce (It.).—A swelling and diminishing of the voice on a long holding note.

Mesto (It.).—Mournfully, sadly, pathetically.

Metronome.—An instrument invented by Mälzel in 1816 for determining the exact tempo of a composition. See also separate article.

Mezzo, Mezza (It.).—Half; *mezzo forte,* half, or moderately loud; *mezzo legato,* moderately legato; *mezza voce,* with half voice, or moderate in tone.

Mezzo Soprano (It.).—A female voice of a lower pitch than the soprano or treble, but higher than the alto.

Minuet.—See separate article.

Mode.—See separate article.

Modulation.—See separate article.

Molto (It.).—Very, extremely; as, *molto allegro,* very quick; *molto adagio,* extremely slow.

Monophonic.—Music with a single melodic line without accompaniment.

Mordent or Mordente (It.).—A melodic ornament, in which the written note alternates with the note immediately below it.

Morendo (It.).—Gradually subsiding in regard to tone and time; dying away.

Mosso (It.).—Movement; as *piu mosso,* with more movement, quicker; *meno mosso,* slower.

Motive or Motif.—The melodic basis of a theme or melody. It may consist of as few as two notes. See also separate article LEITMOTIV.

Moto or Con Moto (It.).—With motion, agitation, energy, and animation.

Music.—See separate article.

Mute.—A device for muffling the tone of an instrument. See *Sordino.*

Nachdruck (Ger.).—Emphasis, accent.

Obbligato (It.).—Literally, and correctly, this term means "obligatory," designating instruments or parts which must not be omitted. It is often carelessly used for an accompanying part which may be omitted, for which the correct term is *ad libitum,* actually the opposite of *obbligato.*

Octave or Ottava.—See separate article OCTAVE IN MUSIC.

Offertory.—See separate article.

Opera.—See separate article.

Opera Buffa.—See *Buffa.*

Oratorio.—See separate article.

Orchestra.—See separate article.

Organ.—See separate article.

Overture.—See separate article.

Parlando or Parlante (It.).—In a speaking manner; accented, as if with words in a declamatory style.

Pastorale.—See separate article.

Pesante (It.).—With weight and importance, impressively.

Piacere (It.).—Will, pleasure; as *a piacere,* at the performer's pleasure in regard to time.

Pianissimo.—See separate article.

Piano.—See separate article.

Pianoforte.—See separate article PIANO.

Pietoso (It.).—With pity, compassionately.

Pitch.—See special article.

Più (It.).—More, an adverb of augmentation; as *più presto,* quicker.

Pizzicato or Pizz. (It.).—In violin or violoncello music, the plucking of strings with the finger, instead of playing with the bow.

Placido (It.).—Peaceful.

Poco (It.).—A little, rather, somewhat; *poco a poco,* by degrees, gradually; *pochetto, pochettino,* a little, as *ritard; un pochettino,* play somewhat slower.

Poggiato (It.).—Dwelt upon, impressive.

Poi (It.).—Then; as *piano poi forte,* soft, then loud.

Polonaise.—See separate article.

Polyphony.—See separate article.

Portamento (It.).—A smooth gliding from one tone to another.

Precentor.—Leader of a church choir or of singing by the congregation.

Prelude.—See separate article.

Presto (It.).—Very quick; *con prestezzo,* with rapidity; *prestissimo,* the most rapid degree of movement.

Prima Vista.—See *A Prima Vista.*

Primo (It.).—First; as *tempo primo,* in the first or original time.

Quasi (It.).—As if; almost.

Quieto (It.).—With calmness or repose; quietly.

R. or R.H.—Indicates the right hand in pianoforte music.

Rallentando (It.).—A gradual diminution in the speed of the movement.

Recitative or Recitatif.—See separate article.

Resolution.—The concord which necessarily follows a preceding discord.

Rhythm.—The succession of regular or irregular pulsations caused by the succession of strong and weak beats.

Ricercari (It. plur.).—Difficult exercises, usually fugal, for the voice or for some instrument.

Ricordanza (It.).—With recollection, remembrance.

Rinforzando or Rinforzato, abbr. **Rinf. or Rf.** (It.).—With additional tone and emphasis.

Ritardando, Ritardato, or Ritenente (It.).—A gradual retarding and decrease in the speed of the movement.

Ritenuto (It.).—An immediate reduction of speed.

Rondeau or Rondo.—See separate article.

Round.—See separate article.

Rubato or Robato (It.).—Robbed, borrowed. *Tempo rubato* is applied to a style of performance in which the interpreter, to express some emotional mood, holds some notes longer than their legitimate time, curtailing others of their proportionate durations in order that, on the whole, the aggregate value of the bar may not be disturbed.

Sanctus.—See separate article.

Saraband.—See separate article.

Scale.—See separate article.

Scherzando (It.).—In a light, playful and sportive manner.

Scherzo (It.).—An instrumental piece, in which gay, animated sections are alternated with those of more serious nature. A movement of a symphony, sonata, or quartet, introduced by Beethoven to replace the minuet.

Sdrucciolato (It.).—Sliding or gliding the finger along the keys, or strings of an instrument; same as *glissando.*

Segno or $ (It.).—A sign; as *al segno,* return to the sign; *dal segno,* repeat from the sign.

Segue or Seguito (It.).—Now follows, or as follows; *segue il coro,* the chorus follows; *segue la finale,* the finale now follows. It is also used in the sense of in similar or like manner, to show that a subsequent passage is to be played in the same manner as that which precedes it.

Sempre (It.).—Always; *sempre staccato,* always staccato or detached; *sempre forte,* always loud; *sempre più forte,* continually increasing in force.

Senza (It.).—Without; as *senza pedale,* without pedals.

Serenade.—See separate article.

Sforzando or Sforzato, abbr. **Sf.** (It.).—Implies that the note so marked is to be played with particular emphasis or force. Same as *forzando.*

Sinistra (It.).—Left; *mano sinistra* (*M.S.*), with the left hand.

Sino, abbr. **Sin'** (It.).—As far as.

Smorzando (It.).—Dying away.

Solfaing.—See separate article.

Solfeggio.—See separate article.

Solmization.—A term for systems of designating the degrees of the scale by syllables rather than letters. See separate article SOLFEGGIO.

Sonata.—See separate article.

Soprano.—The highest female voice. Also a boy's unchanged voice, or in former times, the voice of the male soprano, or *castrato.*

Sordino (It.).—Mute; *con sordino,* with the mute.

Sospirando (It.).—Sighingly, plaintively.

Sostenuto, abbr. **Sost.** (It.).—Sustained, continuous in regard to tone.

Sotto (It.).—Below, under; as *sotto voce,* in an undertone.

Stabat Mater.—See separate article.

Staccato (It.).—Implies that the notes so marked are to be played so that they are distinct, short, and detached from one another; *staccatissimo,* very detached.

Strepito or Strepitoso (It.).—In a noisy, boisterous manner, for some particular effect.

Stretto (It.).—That part of a fugue in which the subject and answer succeed one another during a very short interval of time. In modern music it is sometimes used to imply an acceleration of the tempo near the close of the piece.

Stringendo (It.).—Accelerating the tempo.

Symphony.—See separate article.

Syncopation.—See separate article.

Tanto (It.).—Much; *non tanto,* not too much.

Tarantella.—See separate article.

Temperament.—See separate article.

Tempo.—See separate article.

Teneramente, Tenero, or Con Tenerezza (It.).—Tenderly.

Tenuto or Tenue, abbr. **Ten.** (It.).—Implies that a note or notes must be held or sustained.

Theme.—See separate article.

Thorough Bass.—See separate article FIGURED BASS.

Timbre.—The quality or color of a tone.

Toccata (It.).—Literally, touched; a piece for a keyboard instrument, generally brilliant in style.

Tone.—See separate article.

Tonic.—See separate article HARMONY.

Transposition.—See separate article.

Traurig (Ger.).—Sad.

Treble.—The highest part of a choral composition; the upper parts in concerted instrumental music.

Treble Clef.—The G clef on the second line of the upper (treble) stave.

Tremolo (It.).—A vibrating or tremulous effect, produced by the human voice, and on certain instruments.

Triad.—See separate article CHORD.

Trill.—See separate article.

Trio.—See separate article.

Triplet.—See separate article.

Troppo (It.).—Too much; *allegro non troppo,* not too fast.

Turn.—An ornament in which the higher and lower adjacent tones alternate with the principal tone.

Tutti (It. plur.).—All; a term used to point out those passages where all the voices, or instruments, or both, are to be introduced.

Una Corda (It.).—A direction to use the left (soft) pedal in piano playing, thus causing the hammer to strike one, or sometimes two, strings.

Upbeat.—An unaccented part of a measure; one or several initial notes of a melody which occur before the first bar-line.

Veloce (It.).—In rapid time; *velocissimo,* with extreme rapidity.

Vibrato (It.).—On stringed instruments played with a bow, a slight alteration of pitch caused by a rapid oscillation of the finger pressing the string. In singing, a tremulous effect, caused by a series of rapid interruptions of tone.

Vista.—See *A Prima Vista; A Vista.*

Vivace or **Vivamente** (It.).—With briskness and animation.

Vivo (It.).—Lively, vivaciously.

Vocalize.—To sing an extended melody on a vowel, without text.

Volante (It.).—Light, swift.

Volta (It.).—Literally, time; *prima volta* and *seconda volta* indicate the first and second endings of a section that is to be repeated.

Volti Subito, abbr. **V.S.** (It.).—Turn over the page quickly.

Voluntary.—An organ piece, to be played in connection with a church service.

Bibliography.—Baker, T., *Dictionary of Musical Terms* (New York 1902); Thompson, O., ed., *The International Cyclopedia of Music and Musicians* (New York 1945); Apel, W., *Harvard Dictionary of Music* (Cambridge, Mass., 1947).

Revised by
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MUSICAL INSTRUMENTS were not "invented." They developed slowly and comparatively late—much later than singing. They developed from rhythmically moving limbs, from stamping feet and slapping hands; the hands and feet were replaced by more effectual devices—wooden clapper-sticks or pounding bamboos—or the ground to be stamped upon yielded to some covered pit in the earth or to a felled and dug out tree. Such simple contrivances and the rattles that shook from the dancers' ankles or in women's hands were the beginnings of the first large class of instruments, which scientific classification calls the idiophones, or instruments of materials sonorous by nature without needing any artificial tension such as do strings and drumskins. Most of them are struck; but a good many are pounded, shaken, scraped, plucked, or even rubbed.

As a second class, primitive tribes created the aerophones, from the air which constitutes their main vibrating agent. A minority of them are "free"; that is, some contraption like a propeller stirs the open air. Such is the widely spread "bull-roarer," a slab of wood whirled around the player's head on a thread. The majority, however, are wind instruments in the common sense, with the air vibrating inside a slender tube.

Most wind instruments belong to the families of flutes and of trumpets, though only in a general way. The flutes are often mere whistles of bone or reed without fingerholes, capable only of a single, screaming note; and the trumpets, roughly made of hollow stems or branches, are often used as megaphones, to be spoken, shouted, or wailed into, or to mask the player's natural voice. Such masking of the natural voice is one of the strongest indications that the instruments of the primitive peoples were not so much tools of music, in the sense that we give this word, but rather magical charms. Tied into a complicated network of cosmological ideas and symbols, of sun and moon, of male and female, of fire and water, they were supposed to help, with their characteristic sounds and shapes, in driving away malevolent demons and in creating life, growth, and bliss.

The densest network of such connotations surrounds the instruments of the third class, the membranophones or drums, where a bladder or skin, to be struck or to be rubbed, is tightly stretched across an opening. Many are kept as sacred idols and receive veneration and sacrifices. Their outer forms are numberless and betray, in all their variety, the derivation from two principal sources: the carved and hollowed tree and a lathed, earthen store pot. (Our modern military drums are ultimate offsprings of the tree, and our kettledrums of the earthenware pot.) Apart from them, the frame drums (popularly called tambourines) have no actual bodies, but only hoops to serve as frames for the skins.

The fourth class, chordophones or stringed instruments, reach, in the primitive world, only preparatory stages. Most of them share their forms with the hunter's bow, and a few, with swinging traps for big game (where a flexible rod in the ground stretches a rope descending from its loose end to a covered pit). Other forms of stringed instruments that we might find among the primitives seem to be degenerated types sunken down from higher civilizations rather than early developments.

In the high civilizations of the ancient Orient, the magic connotations grow weaker, but by no means disappear. Instead, a real instrumental music, quite rudimentary in primitive cultures, becomes independent and increasingly important. The two classes of idiophones and membranophones yield a good deal of their earlier preponderance to strings and wind instruments capable of playing melodies. The wind instruments form sets of tubes (panpipes), one for each note; or, the player produces these notes by stopping the fingerholes of one single tube. The stringed instruments, in a similar way, have as many strings as there are notes required. They are called open strings; or, the players produce these notes by stopping one single string at different places.

The earliest of the new, resourceful stringed instruments were the harp and the lyre. The harp, deriving from the musical bow had, as its

scientific definition reads, the plane of the strings vertical on the plane of the soundboard. The neck emerged from the end of the body, bent forward, and sent the strings down to the soundboard (instead of emerging straight from the body, as in the violin, and dismissing the strings almost parallel to the soundboard). The lyre, on the contrary, had a yoke with arms and crossbar instead of a neck to hold the strings. The harp spread from ancient Egypt to China and was evidently the only stringed instrument in India. The lyre, on the other hand, did not penetrate either to China or to India, but was confined to the Mediterranean and the neighboring corner of Asia. It became the principal instrument in ancient Israel (David's "harp" as a translation of Hebrew *kinnor* is a misnomer) and later in Greece, Etruria, and Rome. The *kithara* of the Greeks was the heavy, carefully joined instrument of professionals; their *lyra* was a lighter variety for the benefit of beginners and amateurs. East Asia never saw the lyre; nor did it assign any important role to the harp. Instead, it devised a zither (or neckless stringed instrument) in a lengthy rectangular form with silken strings to be tuned by triangular shiftable bridges. It is still alive and highly esteemed as the *ch'e* of China and the *koto* of Japan.

Around 2000 B.C., some country in or near Asia Minor produced the lute, consisting of a resonance body with a neck on which the various notes of the melody were "stopped" by pressing the fingers on the proper places of one string or two. This family, from which derive the lutes all over the central belt, from Japan to Spain, became particularly important because it led to the discovery of an exact mathematical fixation of musical intervals: the octave had to be stopped right in the middle of the string (ratio 2:1); the perfect fifth at two thirds (3:2); the perfect fourth at three quarters (4:3); the major third at four fifths (5:4); and the minor third at five sixths (6:5), and so forth. Hence, the name *kanon* or rule that the Greeks bestowed on it.

Almost all the stringed instruments were plucked, either with bare fingers or with an artificial plektron of some kind. Bowing, which probably started in central Asia, became known only thousands of years later; its earliest evidences date from the end of the first millennium A.D., and the "fiddler Nero" has no historical backing.

Wind instruments played a minor role in the ancient Orient. But while the various types of flutes were known all over the world, reed pipes became the almost exclusive property of the Mediterranean and the southwest of Asia, including India. They were either clarinets, with single reeds to interrupt the player's wind, or oboes, with double reeds as the mouthpiece. Both kinds were usually blown in pairs with the mouthpieces inside the mouth at the same time. Mostly, one pipe seems to have played the melody, and the other pipe a sustained "drone" or pedal note, as do our bagpipes. Those double pipes were indeed quite closely related to our bagpipes. For the player's mouth, like that of a glass blower, was kept independent from regular respiration and used as a wind chamber or bag, while the nose took care of breathing in and out and of feeding the mouth as much as necessary. Later, some types of reed instruments, for example, the Indian snake charmers' pipes, facilitated this method by inserting the tubes in a calabash to serve as an artificial wind chamber, and still later, some instruments replaced the rigid calabash by a flexible bladder or skin and became bagpipes. Incidentally, the translation of the word *sumponiah* in the Book of Daniel by "bagpipe" is erroneous: our earliest evidences of bagpipes date from the Christian era.

Horns and trumpets had two manufacturing centers: one was Mongolia, which fed all Asia and later, even Europe; the other was Etruria, which fed the Grecian world and Rome, especially the Roman Army.

The idiophonic class developed, in east Asia, an important family of chimes, or sets of well-tuned sonorous bodies, of bamboo tubes or wooden slabs (xylophones), of porcelain bowls, of metal slabs (metallophones—from which our modern celesta stems), or gongs (gong chimes), and of bells (bell chimes or carillons). Several of them have found their way to the West.

Even drums, at least in Burma, have been united to form chimes within a trellis round about the drummer, who performs complicated pieces with incredible dexterity. For the rest, the progress made in drums consists, in the Orient, in size rather than in quality.

In musical instruments more than in any field, Europe proved to be a peninsula of Asia. We do not know how the harps and lyres prevalent in the north were imported—through northern Asia or via the Atlantic sea route. All other instruments were imported, either through Byzantium, the gateway of the East, or through the Mohammedan conquest of Spain in 711. Among them were the ancestors of all our modern instruments: violins, lutes, and guitars; zithers, from which, much later, the stringed keyboard instruments derived; flutes, oboes, and clarinets; trumpets, horns, and kettledrums. Among them was also the organ. It had been invented in antiquity at a time unknown—the famous model of a hydraulic organ by the Alexandrian, Ktesibios, was, obviously, only the invention of a certain type of organ, not of the organ itself. The clergy opposed it in early Christian times, but accepted it long before 1000 A.D. By this time, it had so much increased in size that the organ of the monastery at Winchester, England, in 980 had no less than 26 bellows and 400 pipes, and required two players. But one should not fancy these organs to have had keyboards in a modern way or register stops to change intensity and color. They all were so-called mixture organs, in which every note was automatically accompanied by higher octaves and fifths—by 10 of them in Winchester, and in later organs, up to 20. Only in the 14th century did the organ change its principle: it was given several keyboards and even pedals, modern keys, and solo stops of different tone color. Rightfully, the greatest composer of the time, Guillaume de Machaut, could call it the king of all the instruments.

In the same century, we hear for the first time of stringed keyboard instruments, such as clavichords and virginals (qq.v.). Their invention was indicative of a growing trend to play chords. A little later, the short-necked lute, introduced many centuries before from Persia, came of age as a Western instrument: its technique, which had been strictly melodic in the Orient, changed to the playing of several strings at a time in chords as well as in counterpoint. With this new technique, the lute was able to

render, with more or less accuracy, all compositions written for voices or instrumental ensembles, and thus attained a dominant position in the home comparable to that of our piano.

The 15th century departed from the medieval habit of compressing high and low voices into a medium range that allowed all of them to participate wherever they wanted. The new style of combining high, medium, and low voices in their proper ranges and at proper distances from each other led to an extension of musical space upward and downward and, consequently, to the construction of musical instruments of high, medium, and low tessitura. From the 15th century on, the more important instruments were built in complete families of sopranos, altos, tenors, and basses, such as soprano recorders, alto cromornes, tenor flutes, and bass fiddles. Indeed, in 1493, some Spanish musicians wondered at viols as tall as men which they had seen in Rome; they were double basses.

The 16th century delighted in creating as many different and contrasting tone colors as possible—many more than we use or know today. This resulted in an astonishing number of instruments built in whole families, from sopranos down to bass and doublebass sizes, and, particularly, of flutes and double-reed instruments such as bassoons, cromornes, shawms, *rauschpfeifen,* rankets, and others. The most curious among them were the rankets: quite short and thick cylinders of wood or ivory, in which the wind canal was led through ten alternately ascending and descending bores. Most of these reed instruments had wooden caps to conceal the reeds and make them inaccessible to the lips. They served as wind chambers similar to the bags of bagpipes. As a consequence, they were not able to overblow into higher octaves or to change from forte to piano.

We are indebted to the 16th century, also, for having created, out of a confusing crowd of sizes, types, and shapes, the two most important families of bowed instruments: the *viole da braccio* or violins and the *viole da gamba.* (In English usage, viola—the singular of viole—means today the alto size of the violin family, while the members of the now extinct gamba family are referred to as the viols.) The characteristics of the violin family—violin, viola, violoncello or simply 'cello, and double bass—are too well known to need a redescription. It may just be stated that in the first decades of its existence the highest string was missing on all the members of the family, and that, down to the end of the 18th century, the neck was about half an inch, and the fingerboard several inches, shorter than they became in the 19th century. (All the older specimens still in use have been changed to the present lengths.) The viols, basically similar, had a deeper body, a flat back and six or seven strings essentially thinner than those of the violin family. The commonest size, close to that of the 'cello, was held between the legs, and the smaller sizes, upon the legs, not against the shoulder (whence the name viola da gamba or leg fiddle). Unlike the bowing of violins and their next of kin, the bowing was done with the palm of the hand upwards and with the accented beats towards the pointed end of the bow. The tone itself was cool, silvery, and reserved. These traits account for the long-lasting discrimination between the two families, the viols being considered aristocratic chamber instruments, and the violins vulgar dance instruments. Only Italy, homeland of the violin and its greatest makers, decided, as early as c. 1600, in favor of the new family and discarded the other bowed instruments almost entirely.

The 17th century also neglected the wind instruments, mainly because their windcaps hindered them from being flexible enough to follow the novel emotional style of the time. The violin family reigned supreme. Only at the end of the century did the wind instruments begin to be popular. Still, the violin family remained unchallenged as the kernel of the orchestra and of chamber music down to the 20th century, and it has preserved this central position essentially to the present.

The rehabilitation of wind instruments as the characterizing elements of the score, as opposed to the more neutral tints of the strings, came from France in Jean Baptiste Lully's time (c. 1660). The military fife, the military shawm, and the hunters horn were transformed into the flute, the oboe, and the French horn, and obtained seats in the orchestra. One generation later, a German master, Johann Christoph Denner, made the clarinet out of a rarely used folk pipe.

The trumpet was late in joining the orchestra, partly because the self-styled "knightly" guild in which the trumpetists were organized precluded, or at least discouraged, any cooperation with ordinary musicians. Whenever composers insisted on calling them in, the customary group of three trumpetists and one kettledrummer were kept apart, often above the orchestra, and entrusted with a special festive passage without merging with the orchestra proper. However, the guilds were doomed, and the orchestra needed, more and more, the collaboration of brass instruments. As far as was proper and possible, composers used trombones, which, owing to their gliding mechanism, could instantaneously change the length of the tube and, hence, produce a complete chromatic scale. But the trumpets and French horns were thrown upon the few skeletal notes that overblowing provided. Substitutions were tried; thus, we find in Johann Sebastian Bach's scores, for example, a slide trumpet, which, by pulling out the tube in trombone fashion, allowed for all the chromatic notes unobtainable on ordinary trumpets; and, also, the already obsolete *cornetto* or *zink,* which was a rather short and slightly curved wooden horn with fingerholes like those of an oboe. The hornists found a way to flatten at least the skeletal notes by "stopping" their fist into the widened end or bell of the instrument; but the notes thus obtained proved to be inferior in tone quality. Hornists and trumpetists also tried out a fingerhole and key system similar to that of the *zinken* (key horns, key trumpets). But the interruption of the otherwise homogeneous metal tube was not satisfactory either. The solution of the problem, definitive so far, came in the second decade of the 19th century with the invention of the valves (either pistons or rotary valves), that is, additional lengths of tube, to be connected or disconnected with the speed of a piano key and to thus transform the original length of the instrument into any length necessary for producing a full chromatic range. This new versatility allowed the trumpets and horns to merge in the rest of the orchestra and to give it color and an intensity unheard before; mod-

ern orchestration scores as many brass instruments as woodwinds, or even more.

The 19th century added a few more families of brass instruments beside the trumpets, horns, and trombones: the cornet, developed from the old postilion's horn; its relatives, the alto horn, the baritone, the euphonium, and the tuba; and, as a rare supplement for solemn passages, the Wagner tubas, hybrids between the French horn and the ordinary tuba.

The woodwinds, too, in the 19th century were built in whole families reminiscent of those of the 16th century: the flutes were given altos and basses; the oboes, English horns (altos) and baritones; the clarinets, altos, basses, and double basses; the bassoons, double bassoons. The new basses and double basses posed new problems; the fingerholes were spaced beyond the reach of the fingers and needed a complicated key mechanism with double levers. However, the whole conception of fingerholes and keys was entering a new stage, best known from Theobald Boehm's construction of the modern flute in 1832, where the fingerholes were not placed at the convenience of the hands, but according to acoustical laws, while easy fingering was safeguarded through an ingenious system of keys.

Not much later, a resourceful instrument maker in Brussels and, thereafter, in Paris, Adolphe Sax, in about 1840 added a new family under the name of saxophones (q.v.) : brass clarinets with wide parabolical tubes and bent-up bells in all sizes except the straight soprano.

Sax also improved an impressive number of other wind instruments, both wood and brass, and built a new family of brasses, known as the saxhorns, (see HORN), which are more or less the cornets and the tubas fused in one complete, homogeneous set.

Another Frenchman, the bandmaster, Sarrus, followed, around 1860, with the sarrusophones: a complete family of metal oboes, stronger and fuller than the orchestral oboes and bassoons. They are forgotten except for the double bass, which sometimes replaces the weaker double bassoon.

While Sax was working at his inventions, the organ builders developed a cheaper home and chapel surrogate, with reeds instead of pipes: the harmonium. The organ itself got rid of the fragile mechanical action that connected key and pipe by wooden trackers and stickers and adopted the British invention of a pneumatic action (Joseph Booth 1827 and Charles S. Barker 1832) which, among other advantages, made it possible to separate the keyboards from the pipework and to place them in churches or concert halls wherever the organist could be seated best. Later on, a part of this pneumatic action was even electrified (Barker 1868).

The harp, too, underwent its decisive and so far definitive improvement. Its seven pedals had been able to sharp its seven strings per octave by a semitone each and thus, theoretically, to make a complete chromatic scale available. Practically, they did not allow for playing in flat tonalities. Sébastien Érard in Paris, who gave the piano its modern action, transformed the single action into a double action in 1810: each of the seven pedals can be stopped midway to sharp the string by a semitone, and trodden all the way down to sharp the string by a whole-tone. In more recent times, so-called chromatic harps have been designed, for example, by Lyon and Healy in Chicago, all of them with a complete chromatic range of strings and without pedals at all, but none of these models has been successful.

The present state is about this: the violin family has not changed, and old instruments from the 18th century are preferred to new ones; the piano is essentially the same as it was a hundred years ago; and this is more or less true of harps and wind instruments.

Meanwhile, an entirely new fifth class of instruments had been created: electrophones. Here tone is produced by electrical circuits, which are switched on either by the action of the hands or the fingers or, indirectly, by a keyboard of conventional form. The Theremin belongs in the first of these categories (1920) ; the Hammond organ (1935) in the second. (The reader should not confuse this real electric organ with modern pipe organs operated by an electrical action.)

MUSK DEER, mŭsk dēr, *Moschus moschiferus*, a small deerlike animal which differs so greatly from other members of the deer family or Cervidae that it is placed in a special subfamily, the Moschinae. The distinguishing features include, among others, the presence of a gall bladder, a relatively unconvoluted brain and complete lack of antlers in both sexes. Other features, found in the males only, are a pair of long canine tusks in the upper jaw and a musk gland on the abdomen.

The musk deer is only 20 to 22 inches high at the shoulder, somewhat higher in the hind quarters. The legs are rather heavy and the feet are remarkable for the great development of the lateral toes, the hoofs of which touch the ground. The ears are long and the tail very short. The color is brown, more or less mottled with lighter patches, and the young are spotted. The pelage consists partly of coarse, bristly hairs with which are mingled shorter hairs of a woolly texture.

The musk deer is widely distributed throughout central and eastern Asia, and several local races or subspecies have been recognized. In the mountains, notably in the Himalayas, it is commonly found, in summer, at elevations of 8,000 to 12,000 feet. It extends westward into Kashmir, northward to Kansu, China, and also occurs in Mongolia, parts of Siberia, and even Sakhalin Island. A subspecies is found in Korea, and a southern one inhabits Assam and Upper Burma and extends into French Indochina. In habit the musk deer is solitary, extremely wary, agile, and fleet-footed. It frequents thickets of birch, juniper and rhododendron in the daytime, feeding chiefly at morning and evening twilight and at night on grass, moss and leaves. Mating occurs in January and the young are born in June. The males are said to fight fiercely during the mating season, using as weapons the canine tusks which sometimes exceed three inches in length.

The feature to which the animal owes its popular fame is a saccular cutaneous gland called the musk pod, found in the male only. Located on the abdomen with an opening in front of the preputial aperture, the gland attains about the size of a hen's egg in the adult. The secretion in the pouch forms a semisolid mass of dark brown color and strong odor which, when dried and processed, yields the highly valued musk of commerce, used as a base for many perfumes. The animals are so persistently and ruthlessly

hunted for musk that they are in danger of extinction in some regions. See also CERVIDAE; DEER; PERFUMES; RUMINANTS.

Consult Flower, W. H., and Lydekker, R., *Mammals, Living and Extinct* (London 1891); Harper, F., *Extinct and Vanishing Mammals of the Old World* (New York 1945); Tate, G. H. H., *Mammals of Eastern Asia* (New York 1947).

MUSK OX, *Ovibos moschatus,* a remarkable member of the Bovidae (q.v.), is found only in Arctic regions of North America, including a number of the Arctic islands, and the northern coastal region of Greenland; but fossil remains show that during the Pleistocene ice age it extended as far southward as Kansas and Kentucky, and inhabited northern Europe and parts of Siberia. Regarding its zoological affinities, some mammalogists consider it most closely related to the bison, while others regard it as more nearly allied to the antelopes, goats, and sheep. The name *Ovibos* signifies "sheep ox."

The animal resembles a small ox with extremely long, shaggy hair which on the sides may hang almost to the feet. Mingled with the long hair is a dense woolly undercoat which is shed in the spring. The color is dark brown in general, paler on the back, and the feet are white. The horns are extremely broad at the base, especially in adult males, in which they almost meet in the midline, forming a heavy frontlet. They curve downward at the sides of the head, then upward and forward at the tips. There is only one species; but three races or subspecies, differing in minor features, are recognized. The musky odor is commonly considered to be a general emanation, though it has been suggested that the suborbital gland may be its source.

The musk ox feeds on grass, moss, sedge, and shoots and leaves of the dwarf willow, scraping the snow away with its hoofs when necessary. It is commonly found in herds of 10 to 30 animals. Though it wanders locally in search of food it is in no sense migratory. When attacked the herd quickly forms a compact circle with the young ones in the center and the horned adults facing outward. This affords adequate defense against wolves, the chief natural enemy, but against men armed with rifles it merely renders easy the annihilation of the herd. Continual ruthless slaughter by Eskimos, explorers, and sportsmen has greatly diminished the number of musk oxen and even exterminated them in many regions, so that the species is doomed unless efficient protective measures are enforced. The Canadian government has forbidden the killing of musk oxen and has established a sanctuary of 15,000 square miles northeast of Great Slave Lake. In 1930 the United States introduced a number of the Greenland subspecies into Alaska where the musk ox, formerly present, has been extinct since the middle of the 19th century. In 1942 the introduced animals, transferred meanwhile to Nunivak Island off the Alaska coast, had almost tripled their original number.

Consult Flower, W. H., and Lydekker, R., *Mammals, Living and Extinct* (London 1891); Hone, E., *The Present Status of the Muskox in Arctic North America and Greenland,* Special Publication, American Committee for International Wild Life Protection, Vol. 1, No. 5 (Cambridge 1934); Allen, G. M., *Extinct and Vanishing Mammals of the Western Hemisphere* (New York 1942); Cahalane, V. H., *Mammals of North America* (New York 1947).

MUSK PLANT, a popular name for several unrelated plants. The one most common to the United States is *Mimulus moschatus,* of the family Scrophulariaceae, a native of the Western states. In Europe the name is most applied to *Erodium moschatum* of the family order Geraniaceae, a native of the Mediterranean region. The name is applied in the West Indies to *Guarea grandifolia,* a mahogany-like tree which is also known as muskwood; and to *Trichilia moschata,* also called musk tree. This name is also applied to a Tasmanian tree, *Olearia argophylla.* An East Indian plant, *Ferula sumbul,* is known as musk root. Its starchy roots are used as a substitute for musk in perfumery.

MUSK SHREW. See SHREW.

MUSK TURTLE, or **STINKPOT.** See TURTLES, TORTOISES AND TERRAPINS.

MUSK WOOD, a tree, *Guarea grandifolia,* of the family Meliaceae, so called in the West Indies because the bark smells so strongly of musk that it may be used as a perfume. Although the tree attains timber size the wood contains a bitter resinous substance which unfits it for many purposes.

MUSKEGON, mŭs-kē'gŭn, city, Michigan, Muskegon County seat, altitude 590 feet, is located on Lake Michigan, at the mouth of Muskegon River, 35 miles northwest of Grand Rapids, on the Pennsylvania; Chesapeake and Ohio; and Grand Trunk railroads. It is a port of entry, and has water transportation on the Great Lakes, car ferry service to Milwaukee, Wis., and airline service. Among its manufactured products are airplane and automobile engines, billiard and bowling equipment, piston rings, motor castings, filing devices, gasoline pumps, and knit goods. It is one of the great oil refining centers of Michigan. Many of its buildings and civic institutions have been provided through the benefactions of Charles H. Hackley, wealthy lumberman and philanthropist.

The name Muskegon is of Indian origin, meaning "river with marshes." It was first settled as a trading post in 1810, was incorporated as a village in 1861, and re-incorporated as a city in 1869. The city has commission-manager form of government. Pop. (1950) 48,429.

MUSKEGON HEIGHTS, city, Michigan, Muskegon County, is located just south of Muskegon, on the Chesapeake and Ohio; Grand Trunk; and Pennsylvania railroads. It is a residential suburb of Muskegon, but shares in the industrial activity of the larger city. Pop. (1950) 18,828.

MUSKELLUNGE, mŭs'kĕ-lŭnj, the great pike, *Esox masquinongy,* of the lakes of the interior of North America. See PIKE, PICKEREL.

MUSKET, a hand firearm with which infantry soldiers were formerly armed. When first introduced, early in the 16th century, it was discharged by means of a lighted match, and was so heavy that it had to be laid across a staff to be fired. To make use of it the soldier was required to carry a slow-burning match with him which was apt to be extinguished in wet weather. The wheel lock followed, the chief feature of which was a wheel made to revolve by means of a spring and to cause sparks by friction against a flint. The next improvement was

the flintlock proper (about 1625), in which sparks were produced by one impact of a piece of flint on the steel above the priming powder. Musketeers were soon introduced into all armies. In the beginning of the 17th century infantry consisted of pikemen and musketeers, and all changes in regard to the relative proportion of the two arms were always in favor of the latter. The flintlock musket was introduced into the British Army toward the end of the 17th century, and was the British musket of the days of the Peninsular War and Waterloo, known familiarly as "Brown Bess." It was superseded by the percussion musket in 1842, this musket being in turn superseded by the rifle. See ARMS AND ARMOR; SMALL ARMS.

MUSKETRY, the science and art of shooting small arms, particularly the musket or rifle.

MUSKINGUM, mŭs-kĭng'gŭm, river, Ohio, with a course of about 120 miles wholly within the state. It is formed by the junction of the Tuscarawas and the Walhonding, at Coshocton in the county of the same name, and it flows in a general southeast direction through a fertile valley to Marietta, where it joins the Ohio. The chief towns on its banks are Zanesville, McConnellsville and Marietta. It is navigable for 90 miles to Dresden, and has been extensively damned for flood control.

MUSKINGUM COLLEGE, a coeducational institution at New Concord, Ohio, founded in 1837 under the auspices of the United Presbyterian Church. It is a college of liberal arts giving the A.B. degree; with an attendance of about 800, and occupying some 102 acres.

MUSKMELON. See MELONS.

MUSKOGEE, mŭs-kō'gē, city, Oklahoma; seat of Muskogee County; altitude 559 feet. It is situated 47 miles southeast of Tulsa, and is served by the Kansas, Oklahoma and Gulf, the Midland Valley, the Missouri-Kansas-Texas, and the St. Louis-San Francisco railroads. It has an airport, Hat Box Field, with airline service.

Natural resources of the surrounding region include cotton and deposits of lime, together with oil and natural gas; and the zinc fields are near enough to support the manufacture of zinc and lead products. The city deals extensively in dairy products, such as butter and cheese. Its industrial establishments make road machinery, cottonseed products, oil-well equipment, batteries, castings, aircraft, automobile parts, tools, furniture, radios and phonographs, and paper and leather products.

Muskogee has public elementary and high schools for both white and Negro pupils, and parochial schools. It is the seat of a state school for the blind, and a veterans hospital. There is a public library, an art gallery, a city museum, a city hospital and the Eastern Oklahoma Hospital.

The city was settled about 1810 as a fur-trading center, formally founded in 1872, incorporated as a village in 1861, and chartered as a city in 1898. From the 1830's to the 1890's it was important as a lumbering center. Government is by mayor and council. Pop. (1940) 32,332; (1950) 48,429.

MUSKOGI INDIANS. See CREEKS.

MUSKOKA, mŭs-kō'kà, district, Canada; in Ontario, bordering Georgian Bay; the name also being borne by a beautiful lake and river, and comprehensively applied to the extensive region, 4,000 square miles in extent, lying between Georgian Bay on the west, Lake Nipissing on the north, Ottawa River on the east and Lake Simcoe on the south. The capital of the district is Bracebridge, on the Canadian National Railway. The region is a paradise for sportsmen, with between 800 and 1,000 lakes and smaller bodies of water, chief of which are Muskoka, Rosseau and Joseph lakes, all abounding in fish and studded with beautiful islands; several rivers and picturesque waterfalls, notably High Falls and South Falls on the Muskoka River and Bridal Veil Falls on the Shadow River; and extensive forests filled with game. It is one of the most popular summer resorts in Canada, and is visited annually by thousands of people. During the summer, steamboats ply on the principal lakes, connecting with the Canadian National Railway and the Canadian Pacific Railway. Area of Muskoka District: 1,585 square miles.

MUSKRAT, an aquatic rodent (*Ondatra zibethicus* or *Fiber zibethicus*) numerous throughout North America, and yielding a valuable fur. It is a member of the rat family (Muridae), and is, in effect, a gigantic vole or meadow-mouse, with a tail flattened sideways into a powerful swimming instrument, and fringed with stiff hairs. The hind feet are set obliquely to the leg; the ears are very small and buried in fur; the muzzle is blunt and furry; the palms and soles are naked and fringed with hairs. The average total length is about 21 inches, of which the tail is more than a third, measuring as long as the body without the head. The color varies above from almost black to pale brown; sides of head and body, chestnut-brown; under-fur, bluish gray; feet, dark brown; tail, black. Those of the Rocky Mountain region are smaller and paler than Eastern ones. The musky odor of these animals is due to a thick fluid secreted in two small glands near the generative organs, which imparts a taint to the flesh that makes it unpalatable to most persons.

These animals live along small streams, and in swampy places generally; being most abundant around Chesapeake Bay and in the marshy lakes of the upper Mississippi region and northward to Hudson Bay. Where the banks have some elevation they form extensive burrows, which have entrances below the surface of the water, and gradually ascend till they terminate in a chamber above the level of high water. These burrows are most frequently made under the roots of trees, or in other situations of difficult access. The excavations are of great injury to artificial embankments along canals and rivers, by permitting the water to undermine and to make large breaches in them, and in some parts of the country they do serious damage to canal embankments and river-dikes. When, however, these animals inhabit low and marshy situations, they construct conical houses usually surrounded by water, not unlike those of the beaver but smaller, composed of reeds, etc., mixed with clay. These houses have subterranean passages leading to them, and are inhabited by many individuals during the winter; but in the warm weather they desert them entirely, and dwell in pairs in

a bank burrow while they rear their young. The houses contain a large, smooth-walled chamber, above the water line, and when frozen are sufficiently solid to form a protection against all but the largest carnivora; but they are usually destroyed and swept away in the spring floods, so that a new house is erected every season.

The muskrat feeds mainly upon aquatic vegetation, especially the rootstocks and basal parts of stems, and is especially fond of pond lilies. These it brings to the shore to eat, almost always during the night, for it is essentially nocturnal, although often seen abroad in the daytime. It is very fond of mussels, and brings great quantities of these ashore, always, when possible, at the same place, so that piles of their shells accumulate to indicate favorite feeding spots. In summer the muskrats feed on shore herbage somewhat, and frequently go some distance to get a meal of growing corn, garden vegetables, or fallen fruit. They are accused also of occasional fish-catching, and are unwelcome in waters devoted to fish culture. Because of the commercial value of its fur and its destructiveness in some places, the muskrat is incessantly persecuted by man. It is also preyed upon by many natural enemies—minks, wolverines, foxes, wildcats, badgers, wolves, birds of prey, water moccasins, snapping turtles, pike, and others, which capture many young and some adults. Nevertheless muskrats are so secretive and so prolific, and have found so many advantages in civilized areas, that they are likely to maintain their numbers indefinitely. They produce from three to 12 young at a birth, and often breed three to five times a year.

Muskrats are taken by shooting, spearing in winter (through their houses or through the ice), or, most numerously, by trapping. In certain districts, as along Chesapeake Bay, men make a regular business of trapping muskrats in winter.

Consult Hodgson, Robert G., *Successful Muskrat Farming,* 6th ed. (Toronto 1930); Elliman, J. R., *Families and Genera of Living Rodents,* 2 vols. (London 1940–41).

MUSLIM or **MOSLEM.** See ISLAM; MOSLEM SECTS.

MUSLIN, mŭz′lĭn, a name used for various fabrics of cotton or silk, of different degrees of fineness. The word is derived from the city of Mosul on the Tigris River, now in Iraq, where the cloth is thought to have been originally made. Marco Polo describes muslins of silk and gold which he saw at Mosul in the late 13th century. The finest cottons so named, however, came in ancient times from India, especially Madras and Dacca, whose fabrics were spoken of as "woven air and running water" because of their fineness; they were not infrequently adorned with gold. Modern muslins range from fine crisp fabrics, often dotted or figured, used for women's clothes, to coarser materials used for bed linens. Silk muslins, often called by the French name *mousselines,* are also still produced.

MUSORGSKI or **MOUSSORGSKY,** mo͝o-sôrg′skŭ-ĭ, **Modest Petrovich,** Russian composer: b. Karevo, Pskov Government, Russia, March 21, 1839; d. St. Petersburg, March 28, 1881. The composer's father was a wealthy landowner, his paternal grandmother a peasant. Even as a small child he showed a tendency to compose spontaneously, inspired by the fairy tales he heard from his nurse. His mother began his musical education early, and he gave his first piano recital before an audience of family and friends at nine. Later he had formal instruction, but there always remained something amateurish and self-taught in his technique. At 13 he was sent to the Cadet School in St. Petersburg, where he took an interest in history while, on the musical side, the choirmaster urged him to study church music. As an officer in St. Petersburg (1856–1858), he became acquainted with Mili A. Balakirev, Aleksandr P. Borodin, César A. Cui, and Nikolai A. Rimski-Korsakov, who, together with Musorgski, later became known as the Mighty Five, founders of a new school of realistic national music in Russia. Musorgski quit the army in 1858, but financial losses resulting from the freeing of the serfs in 1861 forced him to become a civil servant. From 1858 he suffered from nervous ailments and alcoholism.

His songs, choral and piano music had already won him a reputation when, in 1868, he began to compose *Boris Godunov,* the libretto based on Aleksander Pushkin's historical play. The opera is suffused with Musorgski's feeling for the Russian past, his popular sympathies, and his ability to hit off character sharply with sparse and simple musical touches. Dramatic power saves *Boris* from being a sprawling panorama, which was a danger in view of its scope and relative plotlessness. Though the producers had twice rejected it, this masterwork was warmly received at its world premiere in the Maryinsky Theatre in St. Petersburg, Feb. 8, 1874. Musorgski was already working on his second major opera, *Khovanshchina,* basing it on the turbulent beginnings of Peter the Great's reign; but he never completed it, and after 1874, the year of his piano suite *Pictures from an Exhibition,* his powers declined as his health failed. After Musorgski's death, Rimski-Korsakov finished *Khovanshchina,* and also edited Musorgski's other works with such a free hand that for many years much music known as Musorgski's was in essentials Rimski's. Objections by critics and public finally forced restoration of the scores as originally composed, and in 1928 the Soviet government began to print a monumental edition of the original texts. See also BORIS GODUNOV, grand opera; RUSSIAN LANGUAGE AND CULTURAL LIFE—*4. Music.*

Consult Calvocoressi, Michel D., *Mussorgsky* (London 1946); Seroc, Victor I., *The Mighty Five* (New York 1948).

MUSSELBURGH, mŭs″l-bŭ-rŭ, burgh and seaport, Scotland, in Midlothian, on the Firth of Forth, six miles east of Edinburgh, of which it is gradually becoming a suburb. The river Esk divides it into Musselburgh proper and Fisherrow, the port. It has noted golf links, and a curious old jail built in 1590 of stones from the shrine and chapel of Loretto. Prince Charles Edward, the Young Pretender, slept in Pinkie House, a Jacobean mansion, the night after the Battle of Prestonpans (1745). Loretto School, one of Scotland's best public schools, is in Musselburgh. Industries include papermaking, brewing, and the manufacture of twine products. Coal is mined in the vicinity and there are a number of market gardens. There is a large fishing population located in Fisherrow. Pop. (1951) 17,012.

MUSSELS, mŭs″lz, a term generally applied to most of the fresh-water bivalves in the families

Unionidae, Margaritanidae, and Mutelidae, and to a limited number of marine bivalves, most of these latter being in the family Mytilidae.

Fresh-water Forms.—The family Unionidae is widespread in Central and North America, Europe, and Asia. The Margaritanidae, limited to North America, Europe, and Asia, comprises very few species. They are similar in their habits to the Unionidae, differing only in minor anatomical details. The Mutelidae are distributed mainly in South America, Africa, and Australia. Nearly all of the Unionidae are parasitic on fish during their early laval stages. After fertilization the young are held in the gills where additional growth takes place. Upon developing a small bivalve shell, usually with two tiny hooks on the ventral margin, they are ready to be extruded. At this stage they are known as glochidia. A violent contraction of the two valves of the female mussel ruptures the glochidial membrane, and the young glochidia are expelled through the exhalant siphon. The few that may directly contact a fish host fasten themselves to the gills or fins. Here they become encysted for shorter or longer periods of time, depending entirely upon the fluids of their host for sustenance. Upon the maturity of this second larval stage, the encystment sloughs away, and the still minute mussel leaves its host and begins its own existence on the stream or lake bottom. There is considerable variation in the duration of the parasitic stage and in the selection of the fish host among the many species of fresh-water clams. In general, the most widely distributed species of mussels have a wide selection of fish hosts.

In North America their greatest development has occurred in the Ohio River system and in the Alabama-Coosa river system. Shells of these mussels were in considerable demand for making pearl buttons, but the development of plastics has lessened this demand somewhat. Primitive man used these various mussels for food, as attested by the numerous shell heaps which are found along many river margins where these animals were abundant. Pearls of considerable value have been found in certain species of mussels but their occurrence is rare, at least as smooth, rounded pearls of commercial value.

Marine Mussels.—Most of the marine species that are called "mussels" belong to a single family, Mytilidae. They occur in nearly all temperate and tropical seas of the world. They frequent the intertidal zone, clinging to rocks, other shells, wharf structures, and even to each other. The valves are generally elongate, pointed at one end and smoothly rounded at the other. In Europe they are an important food item, but are much less so in New England where they are equally abundant. Their minor value as an item of food is offset by the damage they do as fouling organisms, clinging to the bottom of ships, buoys, intake tunnels, and many other marine structures. This necessitates frequent cleaning and scraping of such structures, and adds enormously to maintenance costs. See also Bivalves; Mollusca.

William J. Clench.

MUSSET, mü-sĕ′ **(Louis Charles) Alfred de,** French poet and playwright: b. Paris, France, Dec. 11, 1810; d. there, May 2, 1857. He was born into cultured, comfortable circumstances, and educated at the Collège Henri IV, where his first compositions won high praise. He hesitated at first among several professions, but by his 20th year, when he published the volume of verse entitled *Contes d'Espagne et d'Italie,* he had definitely chosen letters. For the next few years Musset's poems and plays showed the influence of Lord Byron, especially in their satirical quality and sense of doom. His start in the theater, with *La nuit vénitienne* (1830), was not happy.

The winter of 1833–1834 marked the crisis of Musset's life—his connection with George Sand (q.v.), and their Italian journey. With little real sympathy save a joint consciousness of genius, the two could not hope for enduring happiness; but the affair preluded two years (1834–1836) of intense literary creation by Musset. During these years he wrote the *Nuits* (see Nuit de Mai) and various other love poems, which have won him the title of the greatest French love poet. *Stances à la Malibran* was also composed at this time. For the theater he wrote, among other pieces, *On ne badine pas avec l'amour* (1834, q.v.), *Lorenzaccio* (1834), and *Il ne faut jurer de rien* (1836). It is a tribute to his dramatic power that although many of his plays were not intended for production, he is perhaps the only playwright among the romantics who holds the stage today. In prose he wrote *La confession d'un enfant du siècle* (1836, q.v.), an account of his life with Sand, which is also a political testament and the evocation of an era. Shortly thereafter he broke with romanticism in the *Lettres de Dupuis et de Cotonet* (1836–1837).

After 1840 Musset's creativity began to decline, a not illogical development in view of his precocious beginning, his pessimism, and dissipation; but he did publish the patriotic song *Le Rhin allemand,* an answer to Nikolaus Becker's *Rheinlied;* and the popular comedy, *Il faut qu'une porte soit ouverte ou fermée* (1845). Over conservative opposition he was elected to the French Academy in 1852. His collected works were published in France (1933–1938).

Consult Musset, Paul de, *Biographie d'Alfred de Musset* (Paris 1877); Sedgwick, Henry D., *Alfred de Musset* (Indianapolis 1931).

MUSSOLINI, mōōs-sô-lē′nē, **Benito,** Italian premier and dictator: b. Dovia di Predappio, Forlì Province, Italy, July 29, 1883; d. Dongo, Como Province, April 28, 1945. Mussolini's father Alessandro was a blacksmith with socialistic leanings, who named his son for the Mexican liberator Benito Juárez. At great sacrifice, the family procured Benito an education, first at parochial school and then at a normal school; at various times he was an elementary school teacher. The chief events of Mussolini's early life were his sojourn in Switzerland, where he went in 1902 and became associated with a group of revolutionaries, finally being expelled from the country for his activities; his stay in the Austrian Trentino in 1908–1909, which aroused his nationalistic feelings; and his reading of Friedrich Wilhelm Nietzsche and Georges Sorel, philosophers of force. By the outbreak of World War I in 1914, Mussolini was Forlì's leading Socialist and the trenchant editor of the party's official newspaper *Avanti!*

After hesitating for some weeks, Mussolini espoused the Allied cause in the war, perhaps motivated by French bribes. The Italian Socialists as a group remained pacifist, and Mussolini was forced from the party and his editorship (Oct. 20, 1914). On November 14 of that year, he founded his own *Il Popolo d'Italia* in Milan,

justifying Italian entry into the war by saying it would promote the proletarian cause throughout Europe. He himself was drafted as a private and severely wounded in a training accident (Feb. 23, 1917), eventually returning to his newspaper. By this time his break with socialism was complete.

Rise to Power.—Postwar conditions suited Mussolini's policy of cynical opportunism. To gain backing, he played on fears of the sizable Communist movement, and appealed to the growing patriotic discontent with Italy's share in the postwar settlement. On March 23, 1919 in Milan, he founded the first of the *Fasci di combattimento,* a political grouping whose program mixed syndicalist and nationalist catchwords. He backed Gabriele D'Annunzio's seizure of Fiume, which in its illegality and use of bluff was typical of his own future foreign policy. Mussolini used his bands of blackshirted *squadristi* against strikers, Communists, and Socialists in the turbulent years 1919–1922, as Fascist affiliates continued to spring up in northern Italy. His claim to be Italy's savior from communism was born in these years, but cannot be accepted; by 1920 the Communist threat had receded.

In the 1921 elections, 22 Fascists were returned to Parliament, and the party was organized nationally, Mussolini being known as *Il Duce,* the leader, a title later copied by Hitler and others. In 1922 a prolonged general strike was broken by the *squadristi,* clearing the way for the carefully planned march on Rome (Oct. 28, 1922). During this crisis Mussolini himself stayed in Milan, until the vacillating King Victor Emmanuel III, ignoring the advisers who would have arrested Mussolini, called upon him to form a cabinet (October 31).

Dictatorship.—Once in power, Mussolini moved step by step to establish a dictatorial regime. A new electoral law, adopted in 1923, guaranteed the Fascist Party a two-thirds majority in Parliament; five years later elections were reduced to the registration of a yes or no vote on a list of candidates prepared by the Fascist Grand Council, whose members were appointed by Mussolini. Finally, in 1938, the Chamber of Deputies was abolished in favor of a Chamber of Fasci and Corporations, with an entirely appointive membership. To insure his personal rule further, the dictator always reserved several cabinet portfolios for himself. Any attempt to oppose the regime was smashed by the secret police and the armed Fascist militia.

Encouraged by the apparent weakness of the democratic powers during the years of economic depression, Mussolini embarked on an aggressive foreign program, beginning with the invasion of Ethiopia (October 1935). When the League of Nations imposed sanctions, he defied the world organization, and finally in December 1937 withdrew Italy from membership. In the summer of 1936, in cooperation with the German dictator Adolf Hitler, he intervened openly in the Spanish Civil War on the side of Gen. Francisco Franco, sending tens of thousands of Italian troops and large numbers of planes to fight in Spain during the next three years. In October 1936 the Rome-Berlin Axis was formed by a secret agreement, which became an open military alliance in May 1939. In April of the latter year Italy annexed Albania.

Downfall.—Expecting to score an easy victory after Hitler's initial successes, Mussolini led Italy into World War II in June 1940. But repeated defeats in the field and the threatened invasion of Italy by the Allies led to his downfall only three years later. He was turned out by the Fascist Grand Council itself on July 25, 1943, and taken into custody, from which he was freed by German paratroopers on September 12. Carried off to northern Italy, which was under German occupation, he headed a puppet regime there until the final German collapse. He attempted to flee Italy in disguise, but was seized by partisans on his way to Switzerland, and shot with his mistress, Clara Petacci. His body, defiled by the Milanese populace, was later sequestered by the Italian government, which feared that his grave might become a shrine for the Fascist remnant.

By marriage to Rachele Guidi, Mussolini had five children, of whom his favorite was the eldest daughter, Edda, wife of Count Galeazzo Ciano (q.v.). Besides his extensive political writings and speeches, he was the author of a book on John Huss (1913; Eng. tr., 1929); a novel (Eng. tr., *The Cardinal's Mistress,* 1928); a play, with Giovacchino Forzano (Eng. tr., *Napoleon: the Hundred Days,* 1932); and two volumes of autobiography (Eng. tr., *My Autobiography,* 1928, 1939; *The Fall of Mussolini,* 1948). See also FASCISM; ITALY—*3. History* (Moderr Italy): The Rise and Fall of Fascism.

MUSTAFA KEMAL. See KEMAL ATATURK.

MUSTANG. See HORSE—*Modern Breeds.*

MUSTARD, mŭs'tērd, any of about 100 plants of the genus *Brassica* (family Brassicaceae, q.v.) with yellow flowers and linear or oblong pods. Several species are grown for their seeds, especially *B. alba* and *B. nigra.*

MUSTARD GAS. See CHEMICAL WARFARE.

MUSTARD OIL. See OIL OF MUSTARD.

MUSTELIDAE, mŭs-tĕl'ĭ-dē, a family of carnivorous mammals related to the dogs, bears, and raccoons and traceable to early Oligocene times. A special characteristic of the family is the presence of only one molar tooth on each side of the upper jaw. In general, the dentition resembles that of the cats. The family includes five subfamilies: weasels (Mustelinae), skunks (Mephitinae), badgers (Melinae), ratels (Mellivorinae), and otters (Lutrinae), thus including the ermine, stoat, mink, ferret, polecat, marten, sable, fisher, and wolverine. The habitat is worldwide outside Australasia and Madagascar, but it is in the subarctic and temperate regions of the Northern Hemisphere that the Mustelidae are numerous and produce the most valuable fur.

MUT, mo͝ot, in Egyptian religion, one of the chief goddesses, wife of Ammon (Amon, Amen), and mother of Khonsu; especially worshiped at Thebes. Her name signifies "mother."

MUTANABBI, al-, ăl-mo͝o-tă-năb'bĭ (real name ABU-AL-ṬAYYIB AḤMAD IBN-ḤUSAYN), Arabian poet: b. Al Kufa (now in Iraq), 915; d. near Baghdad, 965. The sobriquet al-Mutanabbi', meaning "prophecy claimant," was conferred upon him in his youth. His most important work, *Dīwān,* comprising 289 poems, shows

great talent and national spirit besides richness of language, but there are defects of exaggeration in poor taste and certain flattery that is lowering to the general dignity of the verses. Dieterice edited the work, together with the 'Commentary' of Wahidi, who died 1075, under the title 'Mutanabbii carmina' (Berlin 1861); and that of 'Ukbari, who died 1219, was published at Calcutta, Cairo and Bulak with other 'Commentaries.' Hammer-Purgstall translated (poorly) the 'Diwan' (Vienna 1824). Consult Bohlen, 'De Motenabbio' (Bonn 1824); Dieterici, 'Mutanabbi und Seifuddaula' (Leipzig 1847).

MUTATION THEORY, a hypothesis of organic evolution which accounts for development by sudden changes or «leaps» rather than by slow and successive degrees; sometimes styled saltatorial evolution. It is illustrated by «Sports» (q.v.),— sudden aberrations from the normal, more familiar in botany than in zoology, but often occurring there. This mode of evolution has always been regarded as effective to some degree, but its general application was urged by Prof. Hugo De Vries, of Amsterdam, in his work 'Die Mutationstheorie,' published in 1901. Professor De Vries showed that the objections urged against the Darwinian theory on the ground of the prodigious length of time needed for the development of species could be explained away by a due regard to the phenomena of mutation. He showed that new species are produced in this way not only on a single occasion, or with single individuals, but repeated continually and in large numbers. In the field of botany to which Professor De Vries' investigations were confined, he established the fact that mutations take place in the seed, independently of the vicissitudes of growth in the field, and in accordance with certain apparent laws. The new species which results from mutation remains constant but exhibits a tendency to throw off an ever increasing series of variations. Consult De Vries, H., 'Species and Varieties' (Chicago 1906); Lock, R. H., 'Recent Progress in the Study of Variation.'

MUTHER, mōō'tĕr, **Richard,** German art historian: b. Ohrdruf, Germany, 25 Feb. 1860; d. 1909. He was educated in the University of Heidelberg and the conservatory of Munich and devoted his attention to the history of art in which subject he was professor at the University of Breslau since 1895. He has published 'Anton Graff' (1881); 'Meisterholzschnitte aus den Jahrhunderten' (1887); «Geschichte der Malerei des 19ten Jahrhunderts» (1893; Eng. trans., 'History of Modern Painting,' 4 vols., 1907); 'Geschichte der Malerei' (5 vols., 1899–1902; Eng. trans. by George Kriehn, 2 vols., 1907).

MUTINY (Fr. *mutin,* refractory, stubborn *mutiner,* to rise in arms). Two hundred years ago the word mutiny was often used in describing insurrection or sedition in civil society; but it is now applied exclusively to certain offenses by sailors and soldiers. Properly it is the act of numbers in resistance of authority; but by statutes, certain acts of individuals are declared to be mutiny. The act of Congress of 3 March 1835 defines mutiny or revolt in the following language:

> If any one or more of the crew of any American ship or vessel on the high seas, or on any other waters within the maritime and admiralty jurisdiction of the United States, shall unlawfully, wilfully, and with force or by fraud, threats, or other intimidations, usurp the command of such ship or vessel from the master or other lawful commanding officer thereof; or deprive him of his authority and command on board thereof; or resist or prevent him in the free and lawful exercise thereof; or transfer such authority and command to any other person not legally entitled thereto; every such person so offending, his aiders and abettors, shall be deemed guilty of a revolt or mutiny and felony.

The same statute provides for endeavors and conspiracies to excite mutiny. In construction of the act it has been held that mere disobedience of orders by one or two of the seamen, without any attempt to excite a general resistance or disobedience, and insolent conduct or language toward the master or violence to his person, if unaccompanied by other acts showing an intention to subvert his authority as master, are not sufficient to constitute the offense of endeavoring to excite mutiny. An indictment for this crime, it is said, must set forth a confederacy of at least two of the men to refuse to do further duty, and to resist the lawful commands of the officers. The offense of making a revolt was by the act of April, 1790, punishable by death. By the act of 1835, it is punished by fine not exceeding $2,000, and by imprisonment and confinement at hard labor for not more than 10 years, according to the nature and aggravation of the offense; while attempts to excite a mutiny are punishable by fine not exceeding $1,000, or by imprisonment not exceeding five years, or by both. Mutinous conduct in the army and navy is provided for by the acts of 10 April 1806 and of 23 April 1800. By the former, «any officer or soldier who shall begin, excite, cause or join in any mutiny or sedition, in any troop or company in the service of the United States, or in any party, post, detachment, or guard, shall suffer death, or such other punishment as by a court martial shall be inflicted.» Under the latter, «if any person in the navy shall make, or attempt to make any mutinous assembly, he shall, on conviction thereof by a court martial, suffer death.» These laws are embodied in the present articles of war and articles for the government of the navy, except that death is not now mandatory in the navy. The law of mutiny in Great Britain is in general similar to the United States statute, except that the penalty of death is not imposed.

MUTOSCOPE, a mechanical apparatus for exhibiting instantaneous pictures of moving objects taken by the kinetograph or similar instrument. Photographic prints from the series of pictures thus obtained are mounted in consecutive order around a cylinder standing out like the leaves of a book. When this cylinder is slowly revolved, the picture cards being held back by a stop, and allowed to snap past the eye one by one, as one thumbs the leaves of a book, an apparently moving picture is the result. See Cinematograph; Moving Pictures.

MUTSU, mût'sû or mût's', **Munimitsu,** Count, Japanese statesman: b. Wakayama, 1842; d. Tokio, 24 Aug. 1897. After six years' foreign services and as governor of the province Kanagawa he was appointed (1874) secretary of the senate. He suffered a long imprisonment, from 1878, for participation in the Saigo Rebellion, but was pardoned in 1882 and

was again employed in foreign affairs by the state. From 1888–90 he was Ambassador to the United States, then becoming Minister of Agriculture in the Japanese Cabinet. During the Ministry of Marquis Ito (1892–96) he was Minister of Foreign Affairs, being a member of the peace plenipotentiary party that arranged the treaty with Li Hung Chang at Shimonaseki, for which he was rewarded (1895) with the title of count. In 1894 he negotiated a treaty with Great Britain in which the latter renounced extra-territorial jurisdiction from July 1899. Lung troubles enforced his retirement from political activity in 1896.

MUTSUHITO, moo-tsu-hee-to, the 121st in the line of mikados or emperors of Japan and, according to the impersonality ruling in all Japanese history, posthumously called after the year-period, the Meiji Tenno: b. Kyoto, 3 Nov. 1852, 2d son of the Emperor Komei; d. 1912; declared heir-apparent 10 July 1860; succeeded to the throne January 1867; inaugurated as sovereign, with the three imperial symbols, mirror, jewel and sword, 31 Oct. 1868; married 28 Dec. 1868 to Haruko, then 19, and the 3d daughter of the noble of the 1st rank Ichijo. No children were born of this union, but of the issue from imperial concubines, four sons and four daughters survive. From the first, brought up amid sounds of battle and in sight of the war fires of contending clansmen in Kyoto, as the old and new forces struggled for mastery, and, happily, early surrounded by men of vision and liberal minds, some of whom had been in Occidental countries, Mutsuhito was from the first in hearty and active sympathy with modern progress and civilization. One of his first public acts was to take the famous charter oath of five principles. In one of these he promised a national deliberative assembly, and in the other to seek for talent throughout the world for assistance in relaying the foundations of his empire. He became a shrewd judge of men and motives and a lover of peace. He signed in autograph the treaties, entered warmly into measures of reform and in erecting memorials to the martyrs and those who had advocated mikadoism and unity of government, traveled all over the empire to see his people, paid unique honors to his wife in public and private, and was a laborious servant of the nation. By personal tastes and habits thoroughly Japanese to the end of his days, he was a cosmopolitan in mind and sympathies, and his character as well as his office turned the scale in great crises, when grave debate was held by rival statesmen in his presence. Every word of the text of the constitution of 1889 was, during the two years of deliberation, discussed before him. Most notable and fiercely debated was the guarantee of religious liberty. His reign was marked by many wonderful events and a most extraordinary outburst of intellectual, industrial and military energy. On the 25th anniversary of his marriage, memorial postage stamps were issued and the empress was notably honored, marking a new era in the history of Japanese womanhood. The days of his last illness saw a prayer-meeting that was national and without regard to creed or class, all gods being petitioned, and the general sorrow was sincere and profound. His mauseoleum in Kyoto cost over $1,000,000. His consort, a true helpmeet and of finest character, followed him in death 8 April 1914. Both sovereigns were notable poets. From about 1870 the Japanese ceased to use the ancient poetical term mikado and adopted the native term tenshi, or tenno (son of heaven, or heavenly king), or emperor, as best according with the new status of Japan as a world-power. Consult Griffis, 'The Mikado's Empire' (1909), and 'The Mikado: Institution and Person' (1915); and Mrs. Fraser's 'Letters from Japan' (1899).

MUTTON-BIRD, a sailors' name for the shearwater (q.v.).

MUTTRA, is the northwestern district of the Agra Division, United Provinces, lying between lat 27° 14′ and 27° 58′ N., and long. 77° 17′ and 78° 13′ E., with an area of 1,445 square miles. It lies on both sides of the Jumna and in the centre of the western border; the Arvallis Mountains extend in the form of a low range of hills. There are no rivers besides the Jumna, but there are canals, wells and marshes. The climate is hot and dry, with extremes of temperature. There is very slight rainfall. Muttra contains 14 towns and 837 villages. The population has been frequently devastated by famine, but better road facilities and irrigation have lessened these difficulties. About 90 per cent of the people are Hindus and less than 10 per cent are Mussulmans. The principal crops are millets, pulse, cotton, wheat, barley and sugar cane. The administration is under a member of the Indian Civil Service and three deputy collectors. According to Ptolemy, Muttra was the capital of the ancient kingdom of Surasena and was an important religious centre, as the many antiquities discovered here testify. It was sacked by the Mahmud of Ghazni in 1019, but played only a slight political part. It was revived during the Buddhist period as a centre of faith. Its history was merged into that of the Jats of Bharatpur, and after changing hands several times came under British dominion in 1803. In 1857 it mutinied but was put down in the same year and has since remained friendly.

MUTUAL BANKS AND CO-OPERATIVE SOCIETIES. See BANKS AND BANKING—WORLD'S SYSTEMS.

MUTUAL BENEFIT ASSOCIATIONS. See HEALTH INSURANCE.

MUYSCAS, mŭ-ē′skä. See CHIBCHAS.

MUZAFFAR-ED-DIN, moo-zä-fėr′ĕd-dēn′, Shah of Persia: b. Teheran, 25 March 1853; d. there, 9 Jan. 1907. He was governor of Azerbaijan; succeeded his father, Nasr-ed-Din (q.v.), 1 May 1896. Influenced by European civilization, he showed great tolerance toward the Christians, and did much to reform the internal administration of Persia by lightening taxes and by establishing a parliamentary government. He visited Europe several times.

MUZAKOVA, mŭ-zhä-kō′vá, **Johana.** See SVETLA KAROLINA.

MUZIANO, moot-sē-ä′nō, **Girolamo,** commonly known as BRESSANO, Italian painter: b. Aquafredda, near Brescia, 1528; d. Rome, 27 April 1592. He was a pupil of Romanino (see ROMANINO GIROLAMO) and of Titian at Venice, and subsequently imitated Michelangelo. He was a skilled mannerist who could paint in

any style while possessing none of his own. The Academy of Saint Luke was founded at his instigation. Among his most successful pictures are 'The Taking Down from the Cross,' in the Borghese Gallery, Rome; 'The Gift of the Apostolic Keys,' in the Vatican. There are also some frescoes of his still to be seen in the Vatican.

MY PRISONS ('LE MIE PRIGIONI'), one of Italy's most noted books, was written by Silvio Pellico (1789–1854) and published in Turin in 1832. The work is autobiographical, relating the 10 years' experience of the author, charged with conspiracy and condemned by the Austrian government, first to death and subsequently to 15 years of imprisonment in the prisons of Venice and Spielberg, near Brünn in Austria. The work itself is of the simplest character, written, as he says in his preface, to comfort unfortunates like himself by showing that under the most unfavorable conditions humanity is not as black as it is painted. Had Pellico aimed directly to expose the inhumanity and cruelty of the Austrian government, as might have been expected he would have done, his effort would likely have fallen far short of what he actually accomplished in doing just that in this pathetic tale of his sufferings borne with the utmost Christian resignation. No hatred nor vindictiveness toward his arrogant persecutors escapes the unfortunate victim. In fact it is just here that the recital is most open to criticism. The patient sufferer is too submissive, too long-suffering. Inoffensive and saintly as he is, that virility, which, because founded on righteousness, must ever command respect, is conspicuously lacking in him. His sad story awakened throughout Italy the most profound sympathy. Its moral effect may be compared to Chateaubriand's 'Genie du christianisme,' which was worth an army to Napoleon. Pellico's 'Le mie prigioni' was, as Caesare Balbo, who counseled the author to write the story, has said, worse for Austria than losing a battle. It is not primarily as an author that Pellico's place is secure in the hearts of his countrymen, for his literary work as a whole is rather commonplace, but as a Christian martyr upon whom an odious enemy has placed a crown of thorns. From the time of the appearance of this story, the hateful domination of Austria was judged and condemned by the fairminded not only of Italy but of Europe. Nothing has ever been written better adapted to cause and to perpetuate feelings of hatred toward a despicable tyrant. And even to-day the influence of 'Le mie prigioni' on Italian sentiment toward Austria is abiding. Many translations of 'Le mie prigioni' have appeared in many languages and English versions are easily procurable in the large libraries.

JAMES GEDDES, JR.

MYCALE, mĭk'ą-lē, Asia Minor, the classical name of the modern Samsun, a mountain of south Ionia, with the promontory of Cape Santa Maria opposite the island of Samos as its seaward termination.

MYCENÆ, mī-sē'nē, Greece, an ancient city of Argolis in the Peloponnesus, six miles northeast of Argos, built on a steep hill dominating the passes to Corinth. Its ruins since Schliemann's excavations in 1876 have yielded an abundance of archæological treasure of the greatest value and interest, illustrating the distinctive Mycenæan period of civilization, which preceded the culminating era of Hellenic culture. Mycenæ is said to have been founded by Perseus, and before the commencement of the Trojan War was the residence of Agamemnon, in whose reign it was regarded as the leading city in Greece; it was also the scene of the domestic tragedies of the house of Atreus (q.v.). It declined in importance after the invasion of the Dorians, but its cyclopean walls, citadel and other features, chief of which are the Lion's Gate, and the vaulted building of megalithic architecture called the Treasury of Atreus (q.v.), stood through succeeding centuries, and still stand, as monuments of its ancient grandeur and importance. Consult Schuchhardt-Sellers, 'Schliemann's Excavations' (1891); Hall, 'The Oldest Civilization of Greece' (1901); Tsountas and Manatt, 'The Mycenæan Age' (1897).

MYCORRIZA is a general name for a group of subterranean fungi that spread their growing, feeding part (mycelium) through the loose damp soil (humus) of the floor of a forest or wood-lot. They are symbiotic with a great variety and number of green-leaved plants, including forest trees of several families. The first root of one of these affected plants, just born from the seed, remains free, but as fast as the lateral roots push out they are enveloped in the mycelium of the fungus, and their ramifications become entangled in it as they spread, and this connection continues throughout life. Wherever a root or rootlet extends underground the fungus accompanies it. The mycelial filaments may form a dark-brown, felt-like coating over the whole surface of the root, or, in other cases, depending on the species, may make a net-work of spider-web-like mesh. At various points the spore-producing hyphæ proceed outward through the soil from the mycelium; they look like rootlets and seem to perform a similar service. This mycelium (called «spawn» by mushroom growers) represents an unknown number and variety of species of fungus, and it abounds in the humus of forests and uncultivated heaths where the top-soil is the result of vegetable decay. The coating of roots by this mycelium is to be seen wherever plants grow, but it does not affect every kind of plant. It is restricted to the flowering plants, among them all the *Pyrolaceæ, Vaccineæ* (whortleberries), and *Arbutae,* and most if not all the heath family (*Ericaceæ*), rhododendrons, daphnoids, a great number of conifers and all the *Cupuliferæ* — a group that includes the oak, beech, alder, chestnut and many other forest trees; also many isolated trees, as willows and poplars, and the genista and several other familiar garden herbs.

This association of the mycorrhiza with the flowering plants is in each case a partnership of mutual benefit. Covering the root with a mantle it prevents, it is true, the absorbing pores from performing their function of withdrawing from the soil the dissolved elements that constitute the food of the plant, but in compensation the fungus takes on itself this function, absorbing the required nutriment and delivering it to the plant. It is enabled to do

this because the mycelium has the power of secreting "those special enzymes, or ferments which render soluble the organic ingredients they touch." In return for this service it receives from the plant-root nourishment for itself, which has been elaborated in the leaves and distributed to every part of the plant, including its uttermost rootlet. This, indeed, is only following the custom of all fungi, which, having no chlorophyl with which to derive nourishment from the air through chemical dissolution and recombination, must get it from vegetable sources. This association of the mycorrhiza with plant-roots is therefore really a parasitism, yet it seems not only harmless but decidedly beneficial — in fact, those plants participating in this association will not do well, and perhaps will fail to grow at all, in a soil wholly free from suitable mycorrhiza. Hence the special value of the addition of wood-mold to garden or window-pot soil is that it brings with it this advantageous, and sometimes indispensable, mycorrhiza mycelium.

ERNEST INGERSOLL.

MYDDELTON, or **MIDDLETON, Sir Hugh,** British contractor: b. Galch Hill, Denbigh, Wales, about 1560; d. 10 Dec. 1631. He was by trade a goldsmith, banker and clothmaker of London, but became (1597) an alderman of Denbigh, then was elected member of Parliament for that town in the years 1603, 1614, 1620, 1623, 1625 and 1628. The lack of water supply for the rapidly growing city of London induced the Parliament to pass a bill for the construction of the "New River" to tap the springs in Hertfordshire, and he contracted to carry out the undertaking. Powerful opposition from the landed proprietors forced him to call in the king's aid and James I paid half the cost in return for half the profits. The canal, begun 1609, was completed in 1613 and was then 38 miles long, 20 feet wide, with a depth of but four feet. Until after his death the project was unprofitable and he lost considerably though the New River Company later became, after his death, one of the most profitable undertakings of centuries, its shares (known as "King's" and "Adventurers") being broken up in 30-second parts, bring immense dividends to this day. In 1617 he made considerable profit in the exploitation of lead and silver mines in Cardiganshire. He was created a baronet in 1622.

MYELITIS (from Greek *μυελός*; marrow), an inflammation, attended with more or less softening, of the substance of the spinal cord. It may be acute or chronic and is a rare disease. Some of the maladies formerly ascribed to chronic myelitis are now known to be due to chronic induration and thickening (sclerosis). The most common causes of myelitis are: irritation of the cord by fractured, dislocated or diseased vertebræ, by the pressure of a tumor, or by hemorrhage into its substance. The disease is aggravated by intemperate habits. It begins usually with pain or other uncomfortable sensations in the spine or extremities, and fatigue, followed by an uncertain gait, paralysis and very frequently death. There are four different forms of the disease according to the position of the inflammation, which may be in the midthoracic region, the most common form, or in the lumbar or lumbosacral region, in the cervical region or it may, instead of affecting only a certain definite locality such as those already mentioned, involve a number of small areas in the whole length of the cord and brain. This form is called disseminated myelitis. If the inflammation involves the upper part of the cord above the origin of the respiratory nerves, respiration is interfered with and death results from asphyxia. This is, however, exceedingly rare. If the inflammation exists lower down, in addition to the loss of motor power in the extremities the bladder and rectum may be paralyzed, the evacuations are discharged involuntarily and death occurs from exhaustion. The tendency of the inflammation is to spread. Treatment consists of salvarsan and mercury for the cases of syphlitic origin. Absolute rest in bed must be required, an air or water bed being preferable as bed sores are very likely to occur.

MYERS, Abraham C., American Confederate soldier: b. in South Carolina, 1811; d. Washington, D. C., 20 June 1889. When a boy he removed to Louisiana, was appointed to West Point, and in 1833 was graduated and entered the army. He served several years on the frontiers, in the War with Mexico, and then entered the quartermaster's department as lieutenant colonel. He resigned after the outbreak of the Civil War; was soon appointed quartermaster general in the Confederate Army with the rank of colonel; organized the Confederacy's transport and supply service; resigned 10 Aug. 1863; and lived uneventful life thereafter.

MYERS, Jerome, American artist: b. Petersburg, Va., 20 Mar. 1867; d. New York, N. Y., 19 June 1940. Recipient of numerous awards and represented in various art galleries throughout the country, Mr. Myers was nationally famous for his street scenes of New York. He studied first at Cooper Union, New York, and later at the Art Students' League. He was awarded a bronze medal at the St. Louis Exposition, 1903; the Clarke prize of the National Academy of Design, 1919; its second Altman prize, 1931; Carnegie prize, 1936; the Altman prize, 1937, and the Isador gold medal, 1938. His 'The Night Mission' is owned by the Metropolitan Museum of Art; his 'The Old House' by the Brooklyn Museum of Art; and his 'The End of the Street' by the Chicago Art Institute. He is represented also in the Corcoran Gallery, Washington; the Rochester Art Museum, the Milwaukee Art Institute, Newark Museum; Los Angeles Museum; Del Gado Museum, New Orleans; Whitney American Museum of Art, New York; and in the John Gellatly Collection owned by the Smithsonian Institution. He was a National Academician, a member of the New Society of Artists, and other societies.

MYGALE, the technical and book-name of the Theraphosidæ a species of trap-door spider (*Mygale avicularia*) which has been known to catch small birds and kill them. It is a native of India, Australia, Africa and South America. It is the largest of all the spiders, being very stout, dark brown or black in color, and its thick legs covered with hairs mingled with longer bristles. It builds its nest in trees. Similar species are brought into our ports in bunches of bananas. These spiders are nocturnal in their habits and feed usually on in-

sects, but they do not hesitate to attack any living creature which seems unable to resist them. The fact that the bird-spider will actually kill birds and suck their blood was asserted by Madam Meriam in 1705. Her statements were received with doubt, but long after were verified by Bates. The specimen he observed on the Amazon River was nearly two inches in length, the legs expanding seven inches. He saw the monster on a tree-trunk beneath a deep crevice in the tree, across which was stretched a dense white web. "The lower part of the web was broken, and two small finches were entangled in the pieces; one was quite dead, the other was still living and was smeared with the filthy liquor or saliva exuded by the monster." The natives call them *aranhas carangueijeiras,* or "crab-spiders." The hairs on the body and legs come off when touched, and "cause a peculiar and almost maddening irritation." This, Bates thinks, is not due to any poisonous quality residing in the hairs, but to their being short and hard, and thus getting into the fine creases of the skin.

MYIASIS, a diseased condition in humans caused by the larvæ of flies. House-flies may affect the skin of man by depositing eggs in wounds and on ulcerations, or may invade the external cavities of the body. The eggs hatch, and the maggots cause much local irritation and symptomatic fever; or in the case of the bot-fly (q.v.), penetrate the skin deeply and produce large abscesses. The maggots, as a rule, do not penetrate other tissues. The principal flies that infect wounds, etc., are the flesh-fly (blue-bottle), blow-fly, screw-worm fly, which deposits its eggs in the noses of persons who sleep unprotected during the day, and house-fly (qq.v.). Internal myiasis may result from swallowing the eggs of flies in raw vegetables containing them, and sometimes eaten in salads, when the resulting larvæ are got rid of by vomiting or purgation. Consult Howard, 'The Insect Book' (1901).

MYLITTA, mi-lĭt'ta, an Assyrian goddess, identified by the Greeks with Aphrodite. She was, as goddess of the moon, the female principle of generation.

MYLODON, the "ground sloth," a genus of extinct edentate mammals, of sloth-like structure and large proportions, the remains of which occur along with those of the Megatherium and Megalonyx, in the recent or post-Tertiary deposits of South America and also scattered widely over the United States from Pennsylvania on the east to Oregon on the west. In size the *Mylodon robustus* — the most familiar species — attained a length, in some instances, of 11 feet. A large piece of the very thick hide of one of these mylodons, found in a cave in Patagonia, shows that they were covered with a dense coat of yellow-brown furry hair, similar to that of the brown bear of the Rocky Mountains. See GROUND-SLOTHS; MEGATHERIUM.

MYNA. See MINA-BIRD.

MYOPIA, mī-ō'pĭa, nearsightedness. See ASTIGMATISM; COLOR BLINDNESS; EYE; EYE STRAIN; VISION, DEFECTS OF.

MYOSIN, or **MYOSIN-FIBRIN,** a simple proteid substance, usually classed as a globulin (see GLOBULINS), which separates from muscle plasma after death, in the form of a clot, which is analogous to the clot of fibrin that is formed under similar circumstances in blood. Its average composition is carbon, 52.28 per cent; hydrogen, 7.11 per cent; nitrogen, 16.77 per cent; sulphur, 1.27 per cent, and oxygen, 22.03 per cent. It does not exist in the living muscle, being there represented by two other proteids called myosinogen and paramyosinogen, respectively. The stiffening of the muscles after death (technically known as the "rigor mortis") is due to the formation of the myosin-fibrin and myogen-fibrin clots in the cells of the muscles. Myosin is insoluble in water, but dissolves in dilute saline solutions. It is soluble also in dilute acids and alkalies, which convert it promptly into albuminates. Consult Hammarsten, O. (Mandel's translation), 'A Textbook of Physiological Chemistry' (New York 1908).

MYOSOTIS. See MOUSE-EAR.

MYRES, mīrz, **John Linton,** English classical scholar: b. Preston, Lancashire, 3 July 1869. He was educated at Winchester and studied at New College, Oxford. From 1895–1907 he was tutor at Christ Church and lecturer in classical archæology (1903) at Oxford University, junior proctor (1904–05), secretary to committee for anthropology (1905–07) and examiner in final classical school (1906–08). From 1907–10 he was Gladstone professor of Greek and lecturer in ancient geography at the University of Liverpool, then Wykeham professor of ancient history at Oxford. In 1914 and 1927 he was at the University of California. He traveled through Greece and Asia Minor, conducted excavations in Cypress (1894 and 1913), and reorganized the Government Museum (1894). He has written 'A Catalogue of the Cyprus Museum' (1899), in collaboration with Dr. Ohnefalsch-Richter; 'A History of Rome' (1902); 'The Dawn of History' (1911); 'Handbook of Cesnola Collection of Antiquities' (in Metropolitan Museum of Art, 1914); 'The Political Ideas of the Greeks' (Bennett Lectures, 1926); 'Who Were the Greeks?' (1930).

MYRIAPODA, a group formerly classified among the arthropodan animals, but now better known. It includes the groups of *Chilopoda,* or centipedes, and the *Diplopoda,* millepeds or galley-worms. The features common to all are the elongate worm-like body consisting of a head and behind this the trunk of numerous similar leg-bearing segments, not divided into thorax and abdomen. They are all habitants of dark and obscure places,— under logs and stones and the bark of trees. All but two species are terrestrial; those two are semi-aquatic, living between the high and low-water levels on the sea-coast. Closer analysis shows that the chilopods are related to the crustacea while the diplopods are allied to the worms. In the chilopods the head bears a pair of groups of simple eyes, a pair of antennæ and three pairs of jaws (mandibles, maxillæ, labium), while the first pair of trunk appendages becomes connected with the head and serve as poison-jaws. The trunk-segments are all similar, and each bears one pair of legs, the number of segments ranging from 15 to 170 or more. The body-segments are flattened and the reproductive openings are at the hinder end of the body. Most of the chilopoda are carnivore

ous and ferocious and are very quick in movement. The most noticeable members of the group are the centipedes (*Scolopendridæ*) of the tropics, some of which are nearly a foot in length and have considerable poison powers. See CENTIPEDES.

In the diplopoda the head bears but two pairs of jaws (mandibles and lower lip or gnathochilarium), while the trunk-segments are usually circular in section, and each, except a few near the head, bears *two* pairs of legs, an exception to the otherwise universal rule among arthropoda of a pair of legs to a somite. The range of segments is even greater than in the chilopods, there being nine in *Pauropoda* and 200 in some *Polyzoindæ*. The reproductive organs lie ventral to the intestine, and the external openings are a little behind the head. The *Diplopoda* live mostly upon decaying vegetation and are extremely slow in movement. For protection they rely upon the very thick and hard walls of the bodies, and in some species upon peculiar stink glands which open on the sides of the body. See MILLEPEDE.

Fossil Myriapods appear in the Devonian rocks and they are found in all parts of the world to-day. Most of the American species are described in Bollman's 'Myriapods of America' (United States National Museum, 1893).

MYRICIN, a substance formed by the combination of palmitic acid with an organic radical known as "myricyl." It has the chemical formula $C_{30}H_{61}.O.CO.C_{15}H_{31}$, and occurs in beeswax, forming the chief portion of that part of the wax which is insoluble in alcohol. Myricin melts at 162° F., is readily saponified by alcoholic potash, and may be obtained in the form of feathery crystals by deposition from its solution in ether.

MYRISTIC ACID, an organic acid occurring in the form of a glyceryl ether in nutmeg butter, from which it may be prepared by saponification and subsequent distillation at a pressure materially below that of the atmosphere. It is a component also of butter, wool fat, cocoanut oil and oil of quince seed. It has the chemical formula $C_{13}H_{27}.COOH$, and is insoluble in water. It is very soluble in hot alcohol, however, from which it separates, upon cooling, in the form of lustrous laminæ, melting at 129° F., and boiling at 250° F. It may be prepared by melting stearolic acid with potash. A number of compounds of myristic acid with the metals are known, as well as several ethers and other organic compounds. Myristic acid gives their characteristic name to the myristica fats of which it forms the predominating part as trimyristil glyceride.

MYRMECOPHILY, in its broadest sense, signifies a condition of friendship with ants, and includes the subject of the various insect and other guests kept or entertained in their nests by ants. The side of it to be considered now, however, is the relation of certain plants to ants, when this relation is, or is supposed to be, of mutual advantage. Such plants are termed myrmecophilous and are of great variety, especially in the tropics. That ants inhabit all sorts of cavities in trees and large vascular plants, such as cacti, is well known, and often they dig out the pithy interior or otherwise modify these cavities into homes fully adapted to their requirements. "The rigid vegetable tissues are an excellent protection against enemies," as Wheeler points out, "and the cavities are moist, dark and free from molds, so that they make perfect nurseries for the larvæ and pupæ." It is a matter of common knowledge also that in most cases the plants thus utilized furnish a good deal of food-material for the ants. The great mass of observations bearing on this matter have been interpreted by many naturalists to support the view that many plants have developed as an adaptation through natural selection elaborate structures to be used as ant-lodgings or even to furnish these insects with food-substances in order to attract certain pugnacious ants whose stings are formidable, because they will protect the plants from leaf-cutting ants or other leaf-destroying enemies. In this alleged symbiotic arrangement the insects profit by the supply of special food-material growing on the plant and return the service by warding off harm; and it is said that mutual adaptations have occurred between the chosen kind of plant and the species of ant that inhabits its appointed cavities. The great body of facts collected by Fritz Müller, Schimper, Belt, Semper, Beccari and others are accepted, and some of their interpretations are admitted, but recent students of the matter regard the theory as far overstrained and doubt that true symbiosis can be shown to exist in any case. The latest and fullest treatment of the matter will be found in William M. Wheeler's 'Ants' (New York 1910).

MYRMIDONS, mėr'mĭ-dŏnz, a former people on the southern borders of Thessaly, who accompanied Achilles to the Trojan War. They were said to have received their name from Myrmidon, a son of Zeus and Eurymedusa, the daughter of Cleitos, whom Zeus deceived in the disguise of an ant. He was married to Peisidice by whom he became the father of Antiphus and Actor. For Æacus, a descendant of this branch, Zeus changed the ants of the island of Ægina to men. This legend was the origin of the belief that the Myrmidons emigrated to Thessaly under the leadership of Peleus.

MYROBOLANS, the dried fruits of various species of East Indian trees, all having more or less astringent properties. They are used for dyeing and tanning, especially the latter. The trees are of the genus *Terminalia,* family *Combretaceæ,* the chief being the belleric myrobolan (*T. bellerica*), and the chebulic (*T. chebulica*).

MYRON, Greek sculptor: b. Eleutheræ, a seaport of Bœotia, about 450 B.C. He was, along with Phidias and Polycletus, a pupil of Agelades, the founder of the Peloponnesian school of sculpture, and made his renown at Athens as a versatile and masterly worker in bronze, silver and every other art material. He executed statues of gods, heroes and especially of athletes, many of which were set up in the temples at Delphi and Olympia. The most celebrated among them was that of swift-runner Ladas, and the Discobolus, or hurler of the discus, a work of art highly admired by the Romans, as is proved by the many Italian copies of it made in marble, the finest of which is that now in the Lancelotti Palace, Rome. On

medals, basins and reliefs there are still extant copies of his Athenian work, 'Athene Throwing Away the Flute,' etc. A marble copy of his 'Marsyas' is in the Lateran Museum at Rome, and one in bronze is to be seen in the British Museum. He was equally successful in the representation of animals. His 'Cow' in the market at Athens was the subject of many a laudatory epigram and was brought to Rome in the time of Cicero. Myron gave a somewhat exaggerated slenderness to the human form, which he modeled with exquisite beauty and anatomical accuracy, but was not a master of facial expression.

MYRRH, a popular name for a gum resin produced by *Commiphora myrrha* of the family *Burseraceæ;* also for a garden plant *Myrrhis odorata* of the family *Apiaceæ.* The resin is obtained from Arabia and adjacent Africa from a small, prickly, stunted, gray-barked tree which bears few small denticulate leaves and smooth, brown, egg-shaped drupes as large as currants. The drops, granules or tears which in commerce are brown, red or yellow are at first rather oily, yellowish and soft, becoming brittle with age. They have a pleasing balsamic odor and lasting, bitter, aromatic taste. From earliest times they have been used for making incense and other perfumes and have been reputed useful in medicine, especially for cleansing the mouth and sweetening the breath.

Myrrh, the garden plant, also known as sweet cicely, has been cultivated for ages as a sweet herb for flavoring salads and culinary preparations. It is little grown in the United States except by people of rather recent European ancestry.

MYRTACEÆ, a family of trees and shrubs, the myrtle family, comprising about 70 genera and more than 2,000 species widely distributed in warm climates, but sparingly in temperate. It is one of the most important families of economic plants. Some of the species, such as pomegranate (*Punica granatum*), guava (*Psidium spp.*), luma and ugni (*Myrtus*) yield important fruits; some such as cloves (*Eugenia sp.*), allspice (*Pimenta*), furnish highly valued spices; and still others, especially species of *Eucalyptus,* are leading timber trees of the world. The species are characterized by simple, entire leaves generally dotted with glands; perfect flowers in racemes or sometimes cymes, and various kinds of fruits. See Myrtle.

MYRTLE, a popular name for several unrelated plants of which the following are probably the best known: Crape myrtle (*Lagerstræmia indica*) of the family *Lythraceæ;* running myrtle (*Vinca spp.*) of the family *Apocynaceæ;* sand myrtle (*Leiophyllum spp.*) of the *Ericaceæ.* When unqualified the name generally refers to various species of *Myrtus* of the family *Myrtaceæ.* The common myrtle (*M. communis*) is an evergreen shrub native of the Mediterranean region and western Asia, whence it has been introduced into gardens throughout the warmer temperate climates of the world for its foliage and flowers. It was used in Greek festivals as sacred to Venus and as the symbol of beauty and youth. Its aromatic leaves and berries were formerly used in medicine and its bark in tanning, uses still made of them to some extent in southern Europe. The small leaved myrtle (*M. microphylla*), the luma (*M. luma*) and the Chilean guava (*M. ugni*) yield edible fruits, for which they are planted in South America and to some extent in California.

MYRTLE TREE. See Beech.

MYSIA, mĭsh'ĭ-a, Asia Minor, a name anciently applied to a district which varied greatly in extent at different periods. The name first occurs in the legend of Telephus, who became king of Mysia. Under the Persian Empire Mysia was the name of the section between Lydia on the south and the range of Ida on the north. It was united with the region on the north and with Lydia in forming a single satrapy. After the overthrow of the Persian Empire by Alexander the Great, Mysia fell to Lysimachus (311 B.C.). Subsequently it formed part of the Græco-Syrian kingdom, then of the kingdom of Pergamus, and finally, in 133 B.C., was bequeathed with the rest of the kingdom of Pergamus, by Attalus III to the Romans, by whom it was made a part of the province of Mysia. When the divisions of Asia Minor were settled under Augustus, the name of Mysia was given to the whole of the northwestern district, bounded on the north by the Propontis (Sea of Marmora), east by Bithynia and Phrygia, south by Lydia and west by the Ægean Sea. Under the later empire Mysia was erected into a separate proconsular province and received the name of Hellespontus. The inhabitants were thought by some ancient writers to be of Thracian or Lydian descent.

MYSORE, mī-sōr', or **MAISUR,** mī-soor', India, the dynastic capital of the native state of the same name, 250 miles west by south of Madras, in a valley 2,450 feet above sea-level, dominated on the southeast by Chamundi Hill 1,040 feet higher, with a temple on its summit. It is on the Mysore State Railway. Modern enterprise on European methods has greatly improved the town. The streets are broad and regular, the houses intermingled with trees and temples, and there are several fine modern public buildings, including the British residency. The fort built in European style, and separated from the town by a promenade, encloses the maharaja's palace, and the dwellings of his officials.

MYSORE STATE, or **MAISUR,** a native state in Southern India, lying between lat. 11° 36′ and 15° 2′ N. and 74° 38′ and 78° 36′ E. Its area is 29,433 square miles; the greatest length north and south being about 230 miles; east and west about 290 miles. It is bounded by Madras districts on all sides except on the northwest where it is bordered by two Bombay districts and toward the southwest where Coorg intervenes. It consists of an undulating table land, much broken up by chains of rocky hills and scored by deep ravines. Its form is that of a triangle with the apex to the south at the point where the western and eastern ghāt ranges converge in the group of the Nilgiris. The general elevation rises from about 2,000 feet along the north and south to about 3,000 feet at the watershed which separates the basin of the Kistna to the north from that of the Cauvery to the south. Isolated rocky peaks called «droogs» appear on all sides at an elevation of from 4,000 to 5,000 feet. The drainage

of the country finds its way east to the Bay of Bengal and there are three great river systems; the Kestna on the north, the Cauvery on the south and the Penner, Ponnaiyār and Pālār on the east. None of these is navigable, but they are sometimes used for floating lumber. They support an extensive system of irrigation by means of channels formed by immense dams, these channels tracing a course of more than 1,200 miles. There are no natural lakes in Mysore, but by embanking streams, tanks or reservoirs of all sizes are formed numbering some 30,000. Mysore is divided naturally into two regions: the hill country or Malnād on the west — a picturesque mountain land, with fine forests — and the open country on the east comprising the greater part of the state, known as Maidān or Bayalshīme, where the towns are located. The products of the country vary with the water supply and nature of the locality. The level plains of black soil in the north grow cotton or millets; the tracts in the south and west are covered with plantations of sugar-cane and rice; the lands irrigated from tanks yield coco-nut and areca palms; the red soil in the east produces rāgi and dry crops; the central parts covered with areas of coarse grass relieved by shady groves, are good for grazing. The principal mountain ranges besides the Ghāt ranges are the interior range, from 10 to 20 miles wide running between 77° and 77° 30′ E. to the frontier; and a corresponding range in the west. The highest point is Mulainagiri, at an elevation of 6,317 feet. Granites and granite gneisses of the Achæan occupy the greater portion of the state and traversing these are metamorphic schists of Pre-Palæozoic Age. There are other more recent deposits. Granite exists in large irruptive masses. Wild animals and reptiles are abundant in the forests and streams of the south. Large fish are found in the west.

There are three seasons, rainy, cold and hot. The country is visited by two monsoons, the southwest, from June to November, followed by the cold season. The temperature ranges from 64° to 84° in the rainy season; and from 51° to 80° during the cold season. In the hottest season it ranges from 66° to 91°, rarely reaching 96°. The rainfall varies from 19 inches in the north centre to 360 inches on the crest of the Western Ghāts.

Mysore yields 95 per cent of the gold of India. Iron is found in small quantities and asbestos is an undeveloped industry. The manufactures consist of fabrics, silk and carpets, gold ornaments, copper vessels. Sandal wood carving is extensively carried on. Coffee, cotton-ginning, bricks, tiles, etc., are also among the manufactures. A system of railways radiates from Bangalore; the length of the railway open to traffic in Mysore is about 500 miles. For postal services, Mysore is now part of the Madras circle. There are Mysore state savings banks and life insurance companies. Famine, due to lack of rainfall, has often carried off many of the people, but measures have been taken to alleviate this condition, such as the extension of railways, irrigation and plans for relief work.

The government is vested in His Highness the Mahārājā, a chief justice and a court of three judges. The capital is at Mysore City, but the administrative headquarters are at Bangalore. The administrative districts of the state are Bangalore, Kolār, Tumkūr, Mysore, Hassan, Spimoga and Chitaldroog. The officer in charge of a district is called the deputy commissioner who has a staff of assistants. The villages have local government under a pātel, a hereditary office. A representative assembly meets once a year, when the annual statement of finances is made. The government of India is represented by a resident. There are military systems, lesser courts, systems of land tenure and revenue, police departments, etc. Education was at first introduced by European missionaries and has been developed into a fine public system. There are now about 3,800 schools of all grades with some 125,000 male and 25,000 female students. Hospitals and asylums are also provided in the larger cities. The population of the entire state according to the most recent census is 5,978,892. Hindu castes predominate, the Lingayats forming the strongest sect. There are about 50,000 Christians, about 8,000 of whom are white. The principal cities are Bangalore, Mysore, Kolār, Tumkūr, Channapatna, Davangere and Tarikere.

The authentic history of Mysore as gathered from inscriptions, begins after the invasion of Alexander the Great in 327 B.C. After his retirement the north of Mysore came under the rule of the Andhra of Sātavāhana dynasty, extending down to the 2d century B.C. The various parts were under petty local princes who were frequently at war with each other, until in the 14th century the territory became a part of the Ballala Kingdom of Delhi, after the invasion of the Mohammedans. After their downfall a new Hindu sovereignty arose at Vijayanagar on the Tungabhadra. In 1565, this dynasty was defeated at the battle of Talikota and petty chieftains again divided up the state. The most important of these, the wodeyar of Mysore, seized the fort of Seringapatam in 1610 and founded the present state. Under Deva Raja it became a powerful kingdom. In the 18th century this dynasty was overthrown by the Mohammedan Hyder Ali, who, after a brief but brilliant reign, was defeated at Seringapatam in 1799, and the government was left to an infant descendant and an unscrupulous regent, Purnaiya. The British government took over the administration in 1831. In 1867, it was determined to permit the native rule, under British surveillance. In 1881, Maharaja Chamarajendra took the rule of the state, maintaining the standard of administration. In 1902 the ruler was vested with full powers. Consult 'Imperial Gazetteer of India' (Vol. XVIII, Oxford 1908).

MYSTERIES (Latin *mysterium,* from Greek *mystes,* initiate) — in ancient history, were among the Greeks, and afterward also among the Romans, secret religious assemblies, in which no uninitiated person was permitted to take part. They originated at a very early period. They seem to have had a double object — first, that of handing down the traditions relating to the divinities in whose honor they were celebrated; and secondly, that of teaching and practising religious rites. The true value of the mysteries did not lie in dogmatic teaching, but in the moral improvement apparent in

the votaries, in the comfort the rites gave in the present life, and the hopes they inspired for the world to come. The most important Greek mysteries were (1) the Eleusinian; (2) the Samothracian, which were celebrated in honor of the Cabeiri in all the places where these divinities were worshiped. (3) The Dionysia, at Rome called Bacchanalia, which were celebrated in honor of Dionysus or Bacchus. These latter mysteries were of so licentious a character that they were first forbidden in Thebes, and afterward in all Greece, as prejudicial to the public peace and morals. This was likewise done in Italy by a decree of the Roman senate in 186 B.C. (See BACCHUS). (4) The Orphic, consecrated to Dionysus Zagreus, the son of Zeus and Persephone. (See ORPHEUS). See also MIRACLE PLAYS.

Eleusinian Mysteries were generally held by the Greeks to be the most sacred of all the mysteries; and their great secrecy, intricate ritual and dramatic features were undoubtedly strongly influential in shaping the form of the ritual for many succeeding secret orders. They were connected with the worship of Demeter and Cora at Eleusis in Attica; and they appear to have had their origin in the ceremonies connected with the birth and death of the grain spirits. Demeter, in the ceremonies of initiation through which the candidate had to pass in order to become a member of the mysteries society, finally bestows agriculture upon man. The mysteries seem to have had degrees suggestive of the degrees in modern secret societies. All candidates had to become members of the society of the Lesser Mysteries at Agræ (near Athens), before they could enter that of the Greater Mysteries at Eleusis; and six months had to elapse between the two initiations. At both initiations the candidate made his own personal offerings or sacrifices to the gods, accompanied by fasting and other ceremonial practices in the nature of purifications; after which he wandered, or was led, through dark and intricate passages until finally he emerged into the presence of the deity upon whom streamed the light. As the Lesser Mysteries were celebrated in the early spring and the Greater Mysteries in the fall, the first probably represented the coming to life of dead nature and the latter the death of vegetation. A sacred peace declared some days previous to the opening of the ceremonies and continuing several days after their close permitted the pilgrims to the shrines and the candidates to come and go in peace, without any fear of molestation. The public ceremonies of the Greater Mysteries began with the bringing from Eleusis to Athens of certain sacred relics to be placed in the Eleusinia; the following day the celebrants put in an appearance and on the third day all the initiates (Mystæ) marched in procession to the Phalerum beach where they performed the necessary ceremonial bathing which was symbolical of purification. This was followed by two days devoted to offerings presented at various shrines throughout Athens. Early on the morning of the next day the relics were returned to Eleusis, escorted by a great religious procession, in the midst of which was the image of Iaccus. This occupied all day. The following four days and nights were given up to the secret ceremonies of the mysteries, under the direction of the Hierophant, the Dadouchos (torchbearer), the Hierokeryse (herald) and the officiating priest. Eleusinian mysteries were also celebrated in various other places in Greece proper and outside of it, among these being Megalopolis, Phlius and Andania (in Messenia). The mysteries undoubtedly dated back to considerable antiquity, far as the earliest notice we have of them, they are possessed of an organized priesthood and the custom of choosing the Hierophant from one family (the Eumolpidæ of Eleusis), and the Dadouchos from another (the Kerykes). It is probable that these families, in early times, derived their family names from their offices, as the Jewish priests did.

Samothracian Mysteries. These which were originally two, were known as those of the Cabeiri. In the course of time they became four, Axieros, Axiokersa, Axiokersos and Kasmilos, in popular phraseology; though the grammarians identified them, respectively, with Demeter, Persephone, Hades and Hermes. It seems probable that they were the survival of tribal deities belonging to the same great family religion.

Gradually as time went on these mysteries, which had much of the spectacular and the mysterious which always appeal to humanity, spread throughout Greece, in their own form and under their own name or in the shape of evident imitations or of other closely related tribal mysteries. The worship of the Egyptian moon and mother goddess, Iris, which had early been introduced into Greece, spread rapidly throughout all the land round the Mediterranean and later into the cultured sections of western Asia. With this worship came foreign mysteries, which seem to have originated in the same form of nature worship as the native Greek mysteries. Other foreign mysteries, apparently also of similar origin, were introduced into Greece and appear to have taken root there. The Greeks seem to have been very fond of these semi-religious, semi-social mysteries and most of the prominent citizens appear to have belonged to one or more of them, much as people to-day belong to secret societies. The mysteries, however, had a deep meaning for the Greek, which the modern secret society does not have for its members.

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MYSTERIES OF UDOLPHO, published in 1794, is the best known of the several novels of Mrs. Ann Radcliffe (1764–1822). The book was exceedingly popular at the time, the author receiving the unusual sum of £500 for it, and it was translated into French. Though the novel to-day is usually cited as an example of the florid, romantic style of the later 18th century, it is as a matter of fact an interesting and in many respects a powerful novel. It tells the romantic history of a young French lady, Emily d'Aubert, a heroine of much sensibility, but of considerable character, who has many trying and mysterious adventures in France and in Italy, and her marriage to the hero, Valancourt. The plot is an intricate and eventful one and the story deals with kind parents, unkind relatives, fine feelings, rude behavior, ruffians, and with mysteries, both of character and of circumstance, which are ultimately explained as natural. Perhaps the most distinguished parts of the book are the fine and often beautifully poetical descriptions of nature. The characters are less interesting in that nearly all seem to the modern reader to be unreal and melodramatic. The novel contains many good poems by Mrs. Radcliffe in the 18th century style. The tale is high in its class, but was, of course, overshadowed by the greater power and popularity of the Waverly novels, which owe something to it.

WILLIAM T. BREWSTER.

MYSTERY OF EDWIN DROOD, novel by Charles Dickens. It was the last work by this noted author and was never finished. Only eight numbers appeared, which were published in 1870, the year of the author's death. Numerous conjectures as to the outcome of the plot started or have been published from time to time, but his notes for the continuation of the work lead little toward unraveling his intent.

MYSTIC SHRINE, Ancient Arabic Order of Nobles of the, an order said to have been founded at Mecca in the year of the Hejira 25. The American order is composed only of Knights Templar and 32d degree of the Ancient and Accepted Scottish Rite, Masonic Order. The governing body is the imperial council with 101 subordinate branches called temples. The membership in America amounts to 300,000. See MASONIC FRATERNITY.

MYSTICISM, mĭs'tĭ-sĭz'm, a term derived from the Latin *mysticus,* Greek *μυστικός* mystical, secret, from *μυστης* a mystic, one initiated into mysteries, and from *μυξιν*, to close the lips or eyes. Mysticism has for many minds a repellent sense, owing, as a recent writer has acutely observed, to its association with the delusions of visionaries and the extravagance not only of gnostics and Neoplatonists, but of many so-called Christian mystics, who, misled by a resemblance in terminology and statement, as well as in practice and discipline between the false and the true, have failed to observe a difference of infinite movement in principle and substance, and have striven to mingle into one system utterly antagonistic elements. Against extravagances such as these common sense has justly rebelled, while philistinism has found in them a pretext for making a clean sweep of everything that would seem to raise religion above the plain man's apprehension and criticism.

For many, mysticism means simply an abandonment of all attempt to reconcile the «religious sentiment» with intelligent thought, a deliberate yielding of one's self to any unchecked and unverifiable fancy or speculation which seems to interpret the vague yearning of the soul after a transcendent being. Or it suggests a morbid quietism effected by a complete deadening of the affections and stupefaction of the mind, an Oriental contempt not only for everything material and natural, but even for all desire and existence; thus giving a Buddhist interpretation to the Christian discipline of self. Or at best the term stands for the exalted state of a few saint-like beings who have attained to a preternatural state of communion with the Deity, a state that has no practical interest to the ordinary mortal. But merely to tabulate the countlessly divergent senses associated with the term, not only in common usage but by authors of high repute, would exhaust the limits of the present article. The reader interested in the matter can consult some such work as that of Mr. Inge, mentioned below. One reason for the great discrepancy of usage has been already suggested. The confusion results mainly from the failure to view mysticism objectively in its ultimate meaning and relations, its origin and finality; an omission on which has followed a confusion of a primary and an essential property of human nature with one or other of its merely contingent modifications or partial tendencies; and thus abnormal and insane phenomena have come to be associated with a term which radically expresses the deepest movement and loftiest aspiration of man's being.

Like all other words of similar structure, the term mysticism connotes both a tendency or a realized experience, and a theory conversant therewith. For the sake of brevity the former acceptation may be here subsumed under the latter. The finality inherent in all creation — a tendency so imminent in nature that the effort to explain it away by reducing it to merely mechanical motion is impugned by the very ideas and terminology in which the attempt is conceived and expressed — reaches its highest expression in man's nature. Whether it be viewed as a process of natural selection, an adaptation to environment, a part of the struggle for existence, or under any other biological metaphor, this tendency to a purpose is as essentially — nay, surpassingly more so — a property of man as it is of any of the lower forms of life, vegetable or animal. If it be asked what is this purpose, this goal to which man ever presses, the answer may be given in terms of universal significance, that ultimately it is the realization of the plan of the universe. To this end, however, man strives unconsciously, and in a certain sense mechanically and involuntarily. Proximately, on the other hand, man is forever seeking self-realization, the development of his total self. This self, however, is perfected only in and by the exercise of its highest activity, and that activity can reach its complete perfection only when directed to and exercised on its highest object. Now man's

highest activity to which all other forms of energy within him are subordinate is mental, intellectual and volitional, and the highest object answering thereto is the True and the Good. The true as perfective of the intellectual side of human nature is identified with the Good as it satiates the appetitive or conative side, and both are concretely realized only in the Supreme Being, the Infinite, the Absolute, God. Now the mystic is one who, whether explicitly or implicitly, recognizes this essential relation of his nature to God and strives to adjust his life accordingly. It may of course be said that this is a conception of mysticism in the abstract, as seen from some transcendent viewpoint of man's personality, but not of mysticism in the concrete, as it occurs in actual life and history. In some measure this may be admitted. On the other hand it is the conception realized in those who have lived it out in the sanest form and the most perfect degree, and is inapplicable only in the case of those who directing their energies to some one or other partial object; to an object answering to only individual tendencies of their nature, to the neglect of the demands of their complete selves, have thrown their lives into disorder and confusion and have brought mysticism into obloquy and derision.

It is almost impossible to make any classification of mysticism that shall be adequately comprehensive. For the purposes of this article it will suffice to consider it as a rationalistico-natural or purely philosophical, and as a Christian-theological or primarily religious experience and theory; though these distinctive qualifications are far from being mutually exclusive; on the contrary they overlap at more than one point. Christian mysticism is substantially *philosophical* and of course rational; but it introduces a supra (not contra) rational element. On the other hand what is here called *rationalistico-philosophical* mysticism may and does with many of its disciples include Christian doctrine and practice, and in so far may claim the latter title. For the rest the distinction will become plainer from what follows.

I. Rationalistic Mysticism.— As a philosophical theory this attributes to the human mind the natural ability to rise to an immediate intuition of the Absolute, that is, God, and therein and thereby to an intuition of all truth. This immediate vision whilst reflective and contemplative is not attained so long as the mind remains on the lower level of ordinary discursive reasoning. Such thought being, it is claimed, confined to the sensible, to empirical phenomena, cannot attain to higher ideal truth. To contemplate the Absolute, man must withdraw his mind from the world of sensuous phenomena, inhibit all discursive activity, and concentrate his mental energy. As the mind escapes from the mists of earth the rising light of a higher vision is felt. In that vision the lower cognitive powers become inactive, the very consciousness of self is obliterated and the mind is absorbed in ecstasy. The ecstatic state is a condition pre-required for the contemplation of the Absolute. This state, however, is attained only through ascetic practices and he alone who reaches its heights is enabled to contemplate pure ideal truth and manifest it to others as he has perceived it. In ecstasy, moreover, the mind becomes interpenetrated, even identified with God. Nay more, ecstatic vision is one and the same with the act in which the Deity contemplates His own self: «the eye with which the ecstatic sees God is the eye with which God sees Himself.» Philosophical mysticism thus terminates in pantheism.

II. History.— The birthplace of this form of Mysticism is the Orient. Brahmanism (q.v.) is a finished mysticism. For it Brahma is the sole existent. What is is Brahma, and what is not Brahma is nothing. Things mundane are distinct neither from Brahma nor from one another. They are simply modifications of Brahma. So long as the mind conceives of them as distinct it is in a state of delusion. From this delusion it must free itself by penetrating into the vision of the unity of all things in Brahma. To this end man must perform works of penance and sacrifice, cut himself loose from the sensile and sensuous world, and by concentration of his entire physical energy absorb himself in the All; that is, lay aside all self-activity and allow the One alone to work within him. Then will the light of vision rise on his mind and in everything he shall see the Brahma, the eternal self-existent One, the All. Oriental mysticism was transplanted to the West by the Neoplatonists in the form of emanational pantheism. God is here the primal One and the primal Good; from Him emanates directly the *νοῦς* (*Nous*) wherein are contained the ideas of all things and from which proceeds the world-soul. The human mind is in turn an emanation from the world-soul and, remaining essentially included therein, it lives in essential connection with the *Nous* even as the latter remains in essential union with the primal One. Thus is the soul enabled to rise to an immediate vision of the primal unity. Sense cognition is simply a dream of the soul from which it should withdraw and sink itself in its centre, the *Nous;* and as the latter is essentially the universal *Nous* revealing itself in the human soul and absorbed in the contemplation of the primal One, therefore is the human soul likewise through the indwelling *Nous* able to reach this same contemplation of the original unity; and when it arrives at this state all images, thoughts and even self-consciousness disappear and the subject enters the state of ecstasy.

This mysticism more or less modified played its part in later times. Aside from the Persian Sufi, who in the Middle Ages cultivated mysticism within the pale of Islam, there appear among the Christian people of the West tenets that strongly suggest the Indian and Neoplatonic mysticism, for example, with Meister Eckart (q.v.) and the school of German Mystics emanating from him. Eckart is at present defended against the charge of panthesim; nevertheless it is undeniable that his mysticism touches very closely on the boundary line that separates the Christian from the pantheistic world-view. Eckart distinguishes two factors; the «basis» (Fünklein, spark) and the powers of the soul, analogously to his distinction in God between the basis or «ground» and the divine persons. The «ground» of the soul he places in essential union with the «ground» in God. There is something in the soul, he says, that is identified with God, that is one with

and not simply united to Him. It is uncreated. This something is the "spirit" the ground or basis of the soul. Here the "ground of God is my ground and my ground is God's ground." Now this divine spark in the soul he continues, is the organ of mystical contemplation. The "powers" of the soul do not reach God immediately. If man is to see God, the vision must be mediated by a light which is God Himself. And this light shines in the "ground" of the soul. Therefore does the soul see in the "spirit" God's pure essence as it is in itself. The "spirit" or "ground" of the soul penetrates into that "ground" in God, in which the latter is pure simple unity neither Father nor Son nor Holy Ghost. There, in this its "ground," the spirit seeks God, there to know and love Him without medium or veil. There is "my eye and God's one eye, one vision, one knowing, one love. The eye whereby I see God, is the same eye wherein God sees me. In order, however, to reach this vision of God in His "essence" (ground) man must first of all forsake all sin by genuine repentance. Next he must withdraw from all outward things, from himself and his "powers" and concentrate himself entirely within the essence of his soul; and having reached this state he must "leave" himself to God, hold himself passive and allow God alone to work within him. (Gottlassenheit.) Then will there arise in the essence of his soul (ground) a heavenly light. In this light God reveals to man the entire "ground" of the Deity; the whole essence of God becomes revealed to man. The soul likewise flows into God; its essence and life passes over into the essence and life of God; man is deified, is born a son of God; just as is the Eternal Word.

Subsequently the mystical Theosophists Valentine Weigel and Jacob Böhme built on the teaching of Luther who was in close sympathy with the "German Mystics," a form of mysticism which in many respects surpassed what most men will call the extravagance of Neoplatonism. A few expressions of Böhme will suffice in this connection. The soul he teaches has its source and origin in the essence of the Godhead; in its "ground" the light of God is enkindled. Now in and by this divine light the soul is enabled to enter into the very heart of the Deity and to see therein without any intermediate the primal generation of God in the three principles of being, and the process of becoming of all things. As I then, he says, earnestly uplifted myself to God, the spirit of God broke through me and my spirit broke through unto the inmost generation of the Deity and in this light did my spirit see all things. The influence of Böhme is seen later in the philosophy of Schilling (q.v.).

Neoplatonic mysticism modified by Protestant doctrine reappears in the 17th century in the mystical speculations and practices of the Cambridge Platonists Cudworth, Henry More and John Smith. Other noteworthy mystical writers in England during the same century were George Herbert, Francis Quarles, Henry Vaughan, and in the following century William Law.

III. Christian Mysticism.— A recent writer has greatly simplified this subject by defining mysticism as "the love of God," and he quotes in confirmation an author whose genius and amiable personality have endeared him hardly less to those who differ from him in religious belief than to those who venerate him as Saint Francis de Sales. Speculative theology, he says, tends to the knowledge of God. Mystical theology to the love of God,— mental prayer and mystical theology are one and the same thing. They are neither more nor less than the loving intercourse which the soul holds with God. In this sense every Christian whose practice accords with his profession is more or less of a mystic and differs from the highest mystic, the saint, not in his mysticism but in the degree of his mysticism. The term, however, is usually restricted to the higher degree of unitive insight. This simplification of the subject will doubtless be mistrusted, mostly by those who insist on associating all mysticism with mystery and in placing both if not against at least above reason. They should, however, remember that all even human love in a measure transcends reason. Feeling, instinct, sympathy, antipathy, telepathy, likewise, how quickly and far they elude psychological dissection! It may well be then that in the intimate communion of God with the soul which He permeates there are psychical acts and states of which reason and common sense can give no distinct account, "upraising strains that from the memory slip and fall away," as was the case in Dante's experience. But while mystical phenomena have in common with many ordinary psychical, especially emotional, experiences that they escape rigorous analysis, they lend themselves equally with their familiar analogues to a philosophy and even a certain though higher psychology. This statement will of course be a commonplace to those who are familiar with the great masters of mystical theory, such as Saints Dionysius, the so-called Areopagite, Augustine ('Confessions,' Engl. trans.), Bernard (Engl. trans.), John of the Cross (Engl. trans.), Thomas à Kempis, or the more modern authors mentioned below. For the benefit, however, of those who are not thus informed a very brief summary of the principles of Christian mysticism is here subjoined.

1. As in the macrocosm, the world of living organisms, the law is universal that all life emanates from life, *omne vivum ex vivo,* and as in the scale of their various kingdoms the higher raises up and assimilates the lower the latter receiving an essentially new and greater perfection from the former, so in the microcosm, the minor world of the human individual. Here, too, life is from life and life is from above; and the perfection of the lower consists in assimilation to the higher.

2. Beyond the natural life in man, the soul or mind, Christian Mysticism discerns a supernatural life consisting radically in a principle of activity higher than that of man's purely mental and volitional operations and consequently energizing in higher forms of thought, belief, hope, aspiration, love, etc.

3. The existence and supernatural character of this life and its activities are accepted in the first instance on faith, the data of this belief being found in the Bible, especially the New Testament. The foundations of this faith it is claimed are rational and the workings of the

higher life are confirmed by experience and attested by manifest effects.

4. Essentially and objectively this higher life consists in the vivifying operation of the Divine Spirit within the human soul; accidentally and subjectively it consists in the responsive co-operation of man's mental activities with the Divine influences.

5. The reception of this higher life is normally conditioned by certain spiritual dispositions and lines of conduct — notably of faith, love, prayer, repentance and self-discipline. The soul is thus prepared by alienation from carnal and inordinate propensities and rendered more sensitive to higher stimuli.

6. According to the degree of the soul's co-operation with the indwelling Spirit of God the former becomes proportionately assimilated to the latter. The soul thus passes from what is known as the purgative to the illuminative stage of mystical life.

7. This assimilation culminates in the act of contemplation which is distinguished from meditation in that it is not elicited with mental strain and does not apprehend its object, the divine presence or cognate truths, by inference; but in consequence of the immanent light simply gazes intuitively thereon; *contemplatio pertinet ad simplicem intuitum veritatis,* as all the mystics teach. The clarity of this act or state of vision begets sentiments of admiration, *contemplatio est perspicuæ veritatis jucunda admiratio,* as Saint Augustine says, and fills the consciousness with joy and rapture. The faculties are herein not merely *passive,* for contemplation is a *vital activity,* though the divine influence is the primary source of its elevation and application to the corresponding truths. The Church censured the teaching of the Spanish mystical writer Molinos on the question of the soul's passivity in contemplation,— a theory which was taken up by Madame Guion in France, and eliciting Fenelon's (q.v.) sympathy, entailed the well-known controversy with his great contemporary Bossuet (q.v.).

8. The unitive or contemplative state in so far as it is susceptible of psychologocal analysis is essentially intellectual, the mind being absorbed in intuition; it is, however, no less essentially volitional and in the sanest sense emotional, the whole adhesive power of the soul being drawn out in love of the object contemplated. Obviously, however, the two forms of energy — intellectual and emotional — act and react upon one another and in the intenser states of mental absorption entirely interfuse, all psychical differentiation being obliterated and the entire field of consciousness bathed so to say in light and love of the object contemplated. With the intellectual activity is generally though not always associated representations of the imagination wherein the object contemplated is symbolized. The object-matter of contemplation is primarily God or some of his attributes. Secondarily it may be any divine manifestation in the created, inanimate or animate order, above all in this respect the humanity of Christ. With many of the mystics the suggestion of the divine perfections reflected from almost any object in nature was enough to lift them at once to a condition of wrapt contemplation.

9. The strictly contemplative condition varies in duration from moments to several hours, dependently on preternatural and natural conditions. In the highest stage it may become practically habitual and yet leave a normal residue of attentional energy amply sufficient for all the demands of every-day life. Oftentimes it is associated with extraordinary psychical phenomena such as ecstasy, supernal revelations, visual or auditory — states wherein the mind sometimes though not always loses consciousness of self and of all else save the object contemplated. These are not, however, as many suppose, essential properties of mystical experience, but are rather effects resulting from the absorption of the psychical energy. An asserted similarity of these states to the well-known phenomena transpiring under the various forms of somnambulism, obsession, divided personality and the like, has led many psychologists to confound all mystic states with abnormal psychoses. The subject here opened out is a large one. The reader will find it fairly discussed in 'The Psychology of the Saints.' Suffice it to note with M. Joly that the true mystical state as realized in the saints' experience is not a «disintegration» of the powers of the mind; it is an aggregation of the closest possible kind, which derives its strength from a higher principle under the control of which it forms and sustains itself. It is not a «narrowing of the field of consciousness» but rather the opening out of a wider field, at the cost, if we may use the expression, of a narrowing of the field of passing sensations and empty illusions. Neither is it a «division of the personality» although it certainly evokes what may be called a «new personality,» and that at the cost of great sacrifice and much suffering. This «new personality» is not a medley of divided and disordered parts. It exhibits a cohesion, a strength and a unity above anything else which psychology can show us. This «new personality» also retains whatever was best of the original personality and these surviving elements combine peacefully with the new.

10. None the less the Saints, the typical mystics, were fully alive to the fictitious semblance of purely natural, both normal and abnormal, subjective states to genuine mystical experience and writers on the subject have laid down certain signs for discerning the true from the false. Usually they point to the «fruits of the Spirit» as enumerated by Saint Paul (Gal. 5, 22); «charity, joy, peace, patience, benignity, goodness, longanimity, mildness, faith, modesty, continency, chastity.» The essence of all these fruits of true mysticism is self-denial, love of self-sacrifice and humility; only where such dispositions are habits can the subject be said «to walk by the Spirit.» This mental attitude the mystics observe shows itself in subjection of the will to God and to lawful authority, a care to avoid self-obtrusiveness, a tenderness of conscience, zeal for self-control, deep interior peace even in the midst of misunderstandings and persecutions. On the contrary, they say, where the opposite signs prevail, self-conceit, obstinacy, an appetite for singularity, moroseness, refusal of humiliation, sentimentality in devotional observances, unrest and such like — all being indications of pride, vanity or some form of sensuality — there the subject, though seemingly wrapt up to the third heaven, will be

found to be the victim of an active or a passive delusion.

11. From the foregoing principles it should be inferred that *Christian* differs essentially from purely rational mysticism in the primacy it gives to *divine* influence in mystical experience. The uplifting and sustaining of the intellect and will in communion with God are due not in the first instance to purely innate endowments but to a transcendent light and energy. Christian mysticism as a theory ignores or pretermits none of the ascertained facts and legitimate inferences of psychology and philosophy, but it claims to supplement this knowledge with principles and deductions of a religious and theological character. The higher influences thus postulated though distinct from are nevertheless continuous with the normal psychical life of the mind, just as the higher mental powers are themselves distinct yet not severed from the sentient and organic activities. Thus genuine mysticism by its sharp distinction between the mental activities and the immanent Deity steers clear of pantheism. The terms «deification,» identification with God and the like in which mystical writers speak of the contemplative state are meant to express the close *union* of the soul with God but not a *unity* or substantial identity.

IV. History of Christian Mysticism.— Mysticism as an experience is as old as humanity. The patriarchs Abraham, Isaac, Jacob, Moses, are described in the Bible as men who while not exempt from human failings, lived more or less habitually in converse with God, while the prophets from Samuel to the Baptist passed much of their lives in the abiding realization of the divine presence. The unitive or highest form of mystical life culminates in Christ, who though of necessity perpetually conscious of His Divine Personality nevertheless frequently retired from human association to commune with His Father in the solitude of the mountain or desert. Christ became for all future time the pattern of the mystical life while His Personality, deeds and words have formed ever since the chief subject-matter whereon the genuine mystical mind has been nourished. As his example and teachings spread abroad and the realization of their power deepened in the Christian consciousness the tendency to devote more and more of life to mystical contemplation increased. Spontaneously and gradually at first and accelerated afterward by the pagan persecutions which drove numbers of the early Christians into the deserts the eremitical and subsequently the monastic state grew up and developed, at first in the East and in Egypt and later on throughout western Europe. Monasticism (q.v.) was and is essentially an institution established as a means to facilitate and conserve the contemplative life. Some of the religious orders were founded almost exclusively for this end. Others, and these the majority, aimed at combining the contemplative with the active life, a so-called mixed status wherein the cultivation of an abiding consciousness of the Divine Presence should fructify and energize in labor for human welfare. How successfully this aim was accomplished is told in the history of monasticism and the biographies of such men as the Gregories, Basil, Benedict, Bernard, the Francises, Dominic, Borromeo, Loyola; and of such women as Hildegarde, the Elizabeths, the Catharines, Teresa and other well-known heroes and heroines, of human as well as of divine charity; all of whom drew inspiration and energy for lives of continued self-sacrifice from an almost uninterrupted communion with the Unseen.

Though monastic retirement and discipline facilitate and foster the genesis of mystical habits, they are by no means essential thereto, as is patent from the case of numberless men and women who in every age have successfully united a high degree of contemplation with every variety of secular occupation. Here again the lives of the true mystics, the Saints, show that the cultivation of an abiding converse with God culminating frequently even in deep mystical union is compatible with all the duties and reasonable demands of social life.

V. Mystical Theology.— It is with mysticism as with every other human experience, theory follows on life. Speech precedes grammar, thought logic, conduct Ethics. *Primum est vivere deinde philosophari.* As mystical tendencies and habits spread and strengthened, there gradually grew up a mass of facts and inferences which constituted in time the body of a mystical theory, or what is known as mystical theology, and which took its place in the evolution of Christian doctrine as a sequent of moral theology. Mystical experiences were analyzed and systematized, principles induced therefrom and clarified in the light of Biblical and Patristic teaching, and practical rules for discernment and guidance in the mystical life were formulated; the whole developing by degrees into an organized science or discipline. The writers eminent in the formative stage of mystical theory were Saints Basil, Gregory of Nyssa, Gregory of Nazianza, Chryostom, John Climacus, Cassian, Gregory the Great, Ambrose and Augustine. The first systematic work on the subject was that of Dionysius, the so-called Areopagite. In the intense intellectual ferment that followed the triumph of Christianity the Neoplatonists endeavored to set up against Christianity a world-religion whose controlling tenet it was that the universe is simply a phenomenon of the divine life, the human individual a manifestation of the divine essence, God coming to consciousness in man. Dionysius opposed this teaching, vindicating the Christian doctrine that in the union of the human soul with the Deity it retains its distinct entity. During the Middle Ages the works of Dionysius became for the mystical writers what the 'Sentences' of Peter the Lombard was to the Scholastics, a text for the numerous commentaries of eminent writers such as Hugh and Richard of Saint Victor, William of Paris, Bonaventure, Dionysius the Carthusian, Gerson and others. The Scholastics, likewise especially Aquinas, based their treatment of mystical phenomena on the Areopagite. The influence of Neoplatonism (q.v.) lingered, however, in the writings of Erigena, even though he translated the works of Dionysius.

A tinge of Neoplatonism moreover clings to the 14th and 15th century writers, Tauler, Suso and Ruysbroek, who theorized more in the interests of an intellectual union with God, while the most eminent teacher of practical

mysticism — union of will — was at this time Thomas of Kempen. In the subsequent centuries practical mysticism is systematically represented by Saints Teresa, John of the Cross, Francis de Sales and Ignatius of Loyola. The works of these writers have for the most part been translated into English. Among the later mystical authorities may be mentioned Louis of Blois, John of Avila, Louis of Granada, Louis da Ponte, James Alvarez, Alphonsus Rodriguez, Nieremberg, Lancicius, Surin, Godinez, Scaramelli, Benedict XIV and Schram.

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MYSTROPETALON, a genus of leafless root-parasites constituting the tribe *Mystropetaleæ* of the order *Belanophoreæ*. It contains two South African species. It is known by the two or three free stamens, cubical pollen-grains, and the two-lipped staminate and bell-shaped pistillate flowers. The stem is sheathing covered by imbricated scales; the flowers in dense heads or spikes. They are monœcious, the male flower being on the upper and the female on the lower part of the spike. The fruit is a rounded achene.

MYTENS, mī'tĕnz, **Daniel,** Dutch painter: b. The Hague, about 1590; d. Holland, 1642. He went to London, England, and was welcomed at the court of James I; he was appointed painter royal by Charles I and was much favored by the king and aristocracy. Many of his portraits, which are bold and spirited in conception, broad in treatment and of admirable color, are in Hampton Court. When Van Dyck came to England he gradually eclipsed in royal favor the glory of his predecessor, who returned to Holland.

MYTH, a general name for certain kinds of folk-lore stories, historic tales setting forth the processes of nature, or beliefs about religion, custom, tradition, etc., and differing from fable (q.v.) and from legend (q.v.). See MYTHOLOGY.

MYTHICAL ISLANDS, imaginary islands described in popular fable, romance and song, supposed to have existed in all ages in the several oceans of the world. The Islands of the Blessed were creations of the Greeks, who there placed the homes of all who had been first mentioned by Plato, and situated in the realm of eternal bliss. The lost Atlantis was first mentioned by Plato, and situated in the same part of the world. The fairy isle of Avalon is a feature of Celtic mythology, presenting an exact counterpart to the Greek Island of the Blessed. The mythical land of Saint Brendan is also of Celtic origin and was thought to lie off the west coast of Africa, where, even as late as the 18th century, frequent expeditions searched for it. The Island of Seven Cities was also long sought for, and its settlement is ascribed in legends to the Christian refugees from the Iberian Peninsula, who had been driven out by the Mohammedans. Marco Polo's 'Cipango' was probably Japan. Probably the best known mythical lands or islands during the Age of Discovery were the island of Bimini, in the Bahamas, and the island of Brazil.

MYTHO, MITHO, or **MITO,** French Indo-China, a town of Cochin-China, on the northernmost branch of the Mekong delta, about 50 miles by rail southwest of Saigon. Mytho is an important trading centre for the produce of Cambodia and Annam, and the railway from Saigon was the first built in the country. It has a college and a hospital. Pop. 30,000.

MYTHOLOGY. (Latin *mythologia;* Greek *μυθος,* a myth, and *λογία,* an account), includes the whole body of myths of a nation; the explanation, comparative study and interpretation of these myths. In the popular acceptation of the term, mythology, however, is used to signify the religious conceptions of races expressed in the form of tales and other accounts of their deities. This is a very restricted part of the broad field of mythological activity; for mythology covers the whole sphere of activity of races before the knowledge of the laws of nature came to replace the exercise of the imagination in the explanation of natural phenomena. It includes physical, historical, philosophical and religious myths, generally so intermingled and interdependent that it is often difficult or impossible to separate the one from the others, since the imagination was the great source from which they all sprang either as a whole or in part. Owing to this constant play of the imagination, such history as primitive races possessed rapidly became myth, and the myths assumed the form, appearance and intent of history. During the pre-scientific ages, the greatest of all virtues was credulity in the scientific, philosophical and religious beliefs of the mass of one's fellows. Thus creed became a synonym for religion, or the true religion. To-day the Pueblo Indian speaks of one who holds to the faith of his ancestors, as "the true believer."

How Primitive Man Thought.— Man has apparently, since ever he began to reason, tried to explain the natural phenomena which most impressed him; and his success has always been in proportion to his scientific knowledge. At the beginning of his investigation of the phenomena of nature he was handicapped by an absolute ignorance of all natural law, and he was forced to reason from his experiences, much as the higher forms of animals do to-day. To him all life meant activity of some kind, generally translated into motion, and conversely, all activity meant life and volition. Thus when the sun, the moon and the other planets appeared and disappeared or changed form or position in the sky or appearance, they did so by their own volition. Behind the rushing of the wind, the fierce heat of the sun, the blighting cold of the north, the thunder of the clouds,

the destructive fury of the hail and the lightning, the insatiable greed of the fire, the reviving force of water and of the midnight mists and summer showers were so many powerful intelligences, human in every respect except in their magic power, working each his sovereign will. So primitive man peopled the physical world about him with a multitude of beings essentially like himself in their ambitions, desires, motives, loves and passions. These he classified unconsciously according to their apparent swiftness, strength, cunning and constancy, the primitive virtues by which he set great store, and the impenetrable mystery by which they were surrounded. These were the supernatural people in contradistinction to the human race, which belonged to the natural people. But it is necessary to understand in what sense the word supernatural is here used. It never implies beings in any sense different from man himself except in the power of their magic. Even the form in which a supernatural being appeared was not of great moment, since he generally had the power to exchange his shape for another at will. The Sun-father, the Moon-mother, the Thunder-man, Morning-star, the great hunter, the Spirit of the Northland, the Summer-queen, the four great Wind Spirits, the ghostly spirits that rode upon the tempests, the dark beings from the under-world, the bright beings who peopled the Cloud-land, the Sky-land and the Sun-land were essentially human; and each lived in strict conformity with his surroundings and attributes. The Sun-father and the Moon-mother inhabited a shining wigwam in the Sky-land, the Frost-spirit a yellow ice tepee in the far North, on the outer border of the world. The Great Spirit sat far up upon the mountain and smoked his pipe; the four winds blustered and quarreled and had ambitions and loves, hatreds and jealousies essentially human. The waters moved, rippled and roared; the trees swayed and whispered; the leaves rustled; the clouds raced across the sky or lazily disported themselves in the sun. All displayed animation which made them fellow-actors with man on the stage of human activity. Into this curious world so unlike our own scientific age, the study of mythology introduces us. Here all nature is not only alive but instinct with the motives that move humanity to action; and no explanation or interpretation of mythology which fails to keep constantly in mind primitive man's ignorance of the laws of natural phenomena, and its effects upon his religious, scientific and philosophical views can be effective.

The Spirit of the Myth.— To understand the spirit of the myth one must learn to live over again the age which produced it. Without this, the practice of minute analysis of myth forms and derivation of myth names, the division of mythical stories into historical, scientific, religious and folk-tales and the minute grubbing of the ordinary scientific methods are of little avail. The study of mythology, like that of history, requires the power of imagination coupled with the patience and the trained methods of the scientific mind. However well the division of myths into classes may serve the uses of scientific study, the farther investigation is carried into the past the more all classes of mythological stories come into contact, mingle or blend with one another and reveal to us man trying to solve the primitive problems presented to the race. He develops these problems as he sees them and he explains them in conformity with his mode of science. In the very infancy of experimentally acquired knowledge he began to record his racial or tribal experiences in the form of stories, songs, symbols, dances and fixed ceremonies coupled with mystical formulæ and incantations. However unreasoning these may seem to the scientifically trained mind of to-day, they were nevertheless perfectly reasonable to primitive man who propounded them. The primitive myth-maker, which is but another name for the primitive philosopher and scientist, noticed that the sun moves away from the equator in the winter and that then the days are shorter and the nights longer, and he invented a legend or tale to account for it. This tale conformed in every respect to the belief of himself and the people of his day. The sun was a great and powerful being. The night spirit grew jealous of him and came and persuaded the people that the sun was an impostor, that he was not at all powerful since he allowed himself to be driven daily across the sky in the self-same track. So the people mocked the sun and taunted him with his impotence, whereupon he became angry and vowed to leave them in darkness. As he moved farther and farther to the south and the days became shorter and colder and the frost spirits seized upon all the land and froze over the lakes and rivers, the people became terrified and made sacrifices and offered dances and music to the Great Spirit, who finally relented and came back to them. But to remind them of the fact that he is all powerful and to make sure they shall never forget the insult they offered him, the sun goes south for a part of each year and shortens the days and lengthens the nights. In this myth the sun is essentially human and he acts as an all-powerful kindly human being would do, specially in a primitive age, were he insulted. To the primitive mind the scientific fact around which the story is woven was satisfactorily explained by the story itself. The existence of summer and winter is accounted for by a similar nature myth and though the two myths explain what is practically the same phase of nature, yet to primitive man there was no inconsistency in the stories simply because to him the gradual retreat of the sun southward and the coming of winter were two distinct events in no way connected with each other. Nor for him was the coming of summer dependent on the going away of winter, though the events happened to be coincidental, for both summer and winter were powerful beings each of which acted of his own volition. An Algonquin myth brings them together through the Great Spirit who went northward, with the spirit of summer in his hunting-jacket, and routed the spirit of winter out of his ice tepee and brought the summer to the northland.

Man and Nature.— To primitive man all nature was a struggle, not of elements, but of wondrously powerful and intelligent beings who were so real to him that they may be said to have formed as active and concrete a part of his existence as his household, his friends and his enemies. About these beings of his

imagination he built up a mass of traditionary lore which was carefully handed down from father to son. In this lore he grouped and classified these supernatural beings; and to each he attached myths to explain their attributes, powers, functions and affections. Quite philosophical were these myths from the point of view of their creators. The earth received the seed and the sky sent the water that made it grow. The union of the two gave birth to the plant. Thus the earth and the sky became wife and husband. The sun was the greater light that ruled the day, the moon the lesser light that ruled the night, so in many theologies the former was the husband and the latter the wife, while the morning star, which appears with the sun, was their offspring. However, frequently in northern mythologies, where the light of the sun loses its great power for a part of the year, the latter frequently becomes the wife and the moon the husband. The moon governed the night, the season when the mists most frequently descend upon the land. So she becomes the goddess of fertility and as such is closely connected with all the water and vegetation deities. In Egypt Egyptian women prayed to Isis, the moon goddess, that she might look kindly upon them and bless them and make them fruitful. Roman women about to be married invoked Juno, the queen of heaven, that she might make them bear children; and Greek women made the same prayer to Hera, the mother of the stars, the queen of heaven, the moon goddess, the great deity of growth and fertility. Among the Aztecs and other cultured races of America, Indian women prayed the moon to make them fruitful; and offerings are still presented to the moon throughout Indian America with the same end in view. So strong is this belief that the Indian of Latin America frequently associates the name of the ancient moon goddess with that of the Virgin; and so powerful has the influence of the Indian become that not only Indian but also educated white women go to certain shrines of the Virgin to pray that they may be blessed with children. Indian women still hold up their new-born children to the moon-mother that she may bless them and make them, in their turn, fruitful. Being the patroness of growth, birth and fertility the moon became the deity of doctors and of medicine, and among Egyptians, Indo-Europeans, Aztecs, Mayas, Zapotecas and Mixtecas alike she took a kindly interest in people of feeble mind or those afflicted with skin or other scrofulous diseases. She was also the protectoress of young children and animals both in Europe and America. She was the goddess of hunters and is frequently represented as armed for the chase. A close examination of all these functions and attributes of the moon goddess will show that they are closely related, interdependent and that the one naturally grew out of the others. The moon, in most of the Indian mythologies of America, was also the mother or the grandmother of the winds or some of them, who are themselves the bringers of the fruitful rains and mists. Here again the mythology is consistent.

Growth of Myths.— Examples might be given ad infinitum, but the foregoing are sufficient to show that the mythologies of most ancient races represented systems of thought, of philosophy and religion which followed what were then rational lines of reasoning to those holding them and passing them on to succeeding generations. These ancient myths were at once religious, philosophical and scientific in that they contained within themselves the religious, philosophical and scientific knowledge of the race or what passed for such. Behind all mythologies are broad, general principles which lead, everywhere, to similar results. This accounts for the similarity of apparently unrelated myths in widely different parts of the earth, a similarity more marked in the nature myths. The comparative study of myths is of as much importance in the development of the science of mythology as is the comparative study of languages in the development of the science of philology; since the general laws that govern the making of myths seem to produce as closely related results as those that govern the formation of languages. Fairy tales, folk-tales, historical, philosophical, religious and scientific myths are continually running into one another. Often one short tale contains all these elements. Hence the field of study is not only very extensive, but the lines of thought are continually crossing and recrossing one another. Out of this confusing maze have come many theories, explanations and systems of mythology, most of them defective in that they have failed to survey the whole field and to take into account its broad general significance. Mythologies are like rolling stones, they take new forms as they move onward; and when they come to rest they gather extraneous mosses, which disfigure them often to such an extent as to hide their original forms. These changes are due to both external and internal influences, to action and reaction. Dissimilar myths are often found side by side apparently unaffected by one another; others are blended, while still others are so confused from long contact with one another that their original functions and attributes are not clearly discernible. Tribal influences, captives, slaves, foreign teachers and philosophers, servants, broken-down mythologies and the myths of subject people all have had their part in the shaping of the myths of nations. The constant rising and dying of religious, scientific and philosophical ideas, throughout the long unwritten history of man's progress toward civilization molded and shaped his myths; so that it is safe to say that however primitive myths may seem to us, there are probably no primitive myths in existence, since, man even in his lowest stage of development to-day, has passed far beyond the condition of his ancestors when they first began to formulate their philosophy of the world about them in the stories that we have named mythology. In the days when the Romans had conquered the civilized nations surrounding them, Rome had already become the meeting-place of creeds or mythologies as had Athens in the days of Paul. And often there, the same deity was worshiped in separate temples and under separate guise. There were temples to Juno and Luna, both moon deities, to Hera the Greek goddess of the moon and Isis the Egyptian moon divinity. Each was the sovereign lady of the sky. And when Christianity stepped in and drove out the heathen deities, her triumph was only partial, for the converted heathen could

not so easily forget his past. To his new Christian saints he attributed the powers and virtues of his ancient gods. Upon the Virgin, as the lady of heaven, he lavished all the adoration given to the moon divinities, and he long loved to depict her as standing upon the crescent (the symbol of the moon). Thus the mythologies of the past have followed us into the present. In art, achitecture, literature, philosophy, science, their names and influence greet us at every turn; for the dead past has not buried its dead. To-day the Christianized Indian throughout Latin America, in his Christian devotions, thinks as frequently in terms of his ancient gods as of his new faith. To the Virgin he attributes the power to send the rain, to fertilize the earth, man and beast; and he still puts food on the graves of the departed that they may have provision for their journey to the future world. Once a year, on the «dia de los muertos» (day of the dead), when the dead are popularly believed to revisit the earth, he decorates their resting-places in like manner. Thus the present teaches that the mythologies of the past were constantly being modified and changed while they were exerting their influence upon dying or supposedly defunct mythological systems. This is the same principle that was at work when Greece, Rome, Egypt, Assyria, Arabia, Persia, India and the broken-down mythologies of the races who preceded them, acted and reacted upon one another. To these must be added the modifying influences of the Celt and the Arab, the German and the Mongol, who each, in his own way, left his mark upon the mythologies of northern Africa and southern Europe and Asia.

Classes of Myths.— Myths fall into several more or less well-defined classes: myths of origin, myths of the stars and the sky-land, folk-tales, myths of the future world and of ancestors, and myths relating to or explaining the elements. Origin myths account for the creation of the universe, of man, the other animals and plants; for the customs and habits of animals, trees and plants and for their peculiar markings and characteristics; for the origin of tribes and races and for their racial names, tokens and customs. Under this head come the culture gods, the inventors and bestowers upon humanity of the arts, trades and sciences, of which they naturally became the patron divinities. The myths of the sky-land and the stars, as the name indicates, deal with the solar, stellar and lunar stories and their relationship to one another and to the other dwellers in the sky-land. They are, in many mythologies, closely related with the creation and the culture myths. The moon-mother as the fructifier and the goddess of medicine is in the category of the culture heroes, of whom she is generally the mother or grandmother or near ancestor. The sun, as the vivifier, the sender of life and death, has a close relationship with the deities of vegetation. The myths of the future world deal with the mystery of death and connect the earth with the sky, the sun-land and the under-world. They include tales of the life beyond the grave, of visits of mortals to the land of the dead and of their adventures in the future world. Very varied are these myths among different peoples; and yet they are frequently wonderfully similar in widely separated localities. They range from simple primitive tales to long heroic, circumstantially told stories in which the hero generally meets with many superhuman difficulties on his visit to the land of the dead. Closely connected with these tales are the ancestor myths, which form such an important part of the mythologies of many races. Myths relating to or explaining the elements are many and varied. The deified winds become the culture gods; the thunder, the great thunder-bird. The woods, clouds, mountains and streams are populated with spirits belonging to the elements who, for the most part, are kindly disposed toward man and spend their time in helping him, when so inclined. In the Indo-European mythologies the sky was populated with a great host of supernatural and powerful beings and the mythologies of the more cultured of the American races were almost as liberal in their colonization of the ærial regions.

To these classes of myths already enumerated must be added the vast body of folk-tales which may be related to none of them, some of them, or all of them. Many races have numerous folk-tales, part of which may have once belonged to a now displaced and broken-down mythology. Side by side with these are often found moral tales which appear never to have had mythological signification or connection. These tales are quite plentiful among many of the American races, and those possessed by the Pueblo Indians are especially numerous and rich in incident. Tales of adventure linked to magic and consisting of a series of superhuman acts find a place among the Algonquin, the Ojibway, the Plains Indians and numerous of the Pacific tribes. These tales approach more closely to the European story than probably any other class of American tales. The characters in these stories are generally mythological in origin, however much they may seem to have lost their primal signification. Thus in the Indian story of Chácopee the Giant Killer, the hero who lives all alone in the heart of a great forest with his grandfather, follows a white rabbit who shows him a village of cannibal giants and tells him he has been born into the world to destroy them. He gives Chácopee a magic white feather for plume, a bag, a magic cord and a magic pipe. When Chácopee smokes the pipe out of it come the souls of the dead slain by the giants, who are frightened by them. With the aid of the cord he trips up the giants one after another, kills them and wins a race he runs with each of them except the grandfather-giant whom he is enabled, with the aid of the rabbit's charms, to defeat, after numerous adventures, all of a miraculous character. In most civilized or semi-civilized races the folk-tales are likely to be the largest body of popular stories in the language because they have been fashioned not only from long ages of folk-tales, but from the broken down myths and creeds of their ancestors and the races who preceded them. Folk-tales are especially plentiful among the Mongolian and Indo-European races. To this class of story belong the imaginative Celtic fairy tales. Folk-tales of a more primitive class are very plentiful throughout Africa and Polynesia; and many of a higher and more interesting type exist among the American Indians, some of which bear a curious resemblance to the

folk-tales of nothern Europe and northwestern Asia.

Transformation.— The pre-scientific world firmly believed in transformations. This was the natural outcome of the personification of all nature. The wind was a person, yet he became invisible; the sun, also a person, hid himself, as did the moon and the morning star, behind a mask. The spirits of the forest whispered or roared or chatted, but they could not be seen by human eyes, either because they were hidden within the trees or because they had actually changed themselves into trees. The rivers, the mountains, the clouds were persons; but because of this power of self-transformation they could not be seen by earth-beings. If spirits could hide in trees and other moving things they could just as easily hide in sticks and stones. So inanimate objects, the residence of such spirits, became fetiches and wonder-working charms. Thus all nature, animate and inanimate, to the ancient myth was the abode of life, active, free and powerful as human life itself. All these different possessors of life might, on occasions, have the power of self-transformation. The simple fact of their appearing in some other than the natural human form was sufficient proof of their power of self-transformation. There were also, according to the belief of the mythological ages, other powerful beings who, in addition to possessing the ability to transform themselves, could bestow upon another the power of transforming himself. This was generally accomplished through the presentation of some wonder-working fetich which enabled the owners to effect self-transformation. Thus the hunter, in the Algonquin tale of the 'Wolf-Man,' takes from the breast of the wolf-man himself a powerful amulet, which enables him to transform himself into any form he desires. Though the wolf-man pursues him and overtakes him at sun-down each day for six days in succession, he outwits him each time by his transformations and succeeds finally in drowning him by the same means on the seventh. In the tales of 'The Witch and the Wind-Man' the Mole-man shoots his magic arrow into the cloud on which his brother, the wind-man, is riding and drives it backward with terrific force. This he does several times until finally he wins the race against him. In the same tale the Old Witch changes herself into a monster white rabbit and thus lures the nine brothers to her den; but the wind-man rides the wind into the cave of the supernatural people and rescues the brothers before the witch has had time to get them fattened enough to eat. Many similar Indian tales are built about the supernatural power of self-transformation. Nanabozho, the great culture hero of the Algonquian races, under his many tribal names, is an adept at transformation; and in nearly all his adventures in which he takes the leading part he makes use of it. The heroes of the Plains Indians are constantly subjecting themselves to self-transformation. Everywhere throughout Indian America the belief in transformation is strongly exemplified in the mythology and folk-tales. Witches, wizards and other evil-disposed beings had the power of self-transformation, and unnumbered are the myths, legends and folk-tales in which they figure. In the rivers and the lakes and pools were other evil-disposed spirits who delighted in luring people to death. These characters are well known in Latin and Greek mythology; but just as picturesque tales are told of them in the stories of other races. Under the name of the Malinche, the water siren shows herself as a beautiful woman on the tops of certain mountains in Latin America and lures men to her only to tear them in pieces. As the Llorona or «Crying one» she inhabits pools, lakes and rivers where she cries like a lost child in the night and draws her victim on to his death; for when he falls into the water she drags him down; so that there is no chance of escape for him. Or she may change herself into a «fool's-light» and lead some unfortunate into a bottomless swamp where death is equally certain. In all these stories self-transformation is the chief motive.

Ritual, supplying as it does the means whereby the correct relation to the various superhuman powers may be properly maintained, forms a very considerable part of mythology. Since the beings to be worshiped or propitiated are varied in attributes and powers the ritual and ceremonies dedicated to them must be varied also. In an age when the virtues of magic, charm, song, incantation, ceremonial dancing and instrumental music were firmly believed to be effective means of protection against adverse powers or of attracting the favorable attention of divine beings, extraordinary importance was placed upon the literal rendering of ritual and all other ceremonial forms. This belief helped to preserve ritual myths in a substantially unchanged form for generations; and many partially broken down myths repeated by primitive and other races are the survivals of the stories that once formed part of or went with rituals to explain them or to account for them.

See GREEK MYTHOLOGY; ROMAN RELIGION; AMERICAN MYTHOLOGY; MEXICO — MYTHOLOGY; PERSIAN MYTHOLOGY; SCANDINAVIAN MYTHOLOGY; NURSERY LORE; EGYPTIAN RELIGION AND SOCIOLOGY; FOLK-TALES AND MYTHS OF THE AMERICAN INDIANS; NATURE WORSHIP.

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MYTHS. See MYTHOLOGY; AMERICAN MYTHOLOGY; EGYPTIAN RELIGION; GODS, ROMAN AND GREEK; GREECE—*12. Greek Mythology;* PERSIAN MYTHOLOGY; ROMAN RELIGION; SCANDINAVIAN MYTHOLOGY.

MYTILENE. See LESBOS.

MYXEDEMA, or **MYXOEDEMA,** mĭk-sē-dē′mȧ, constitutional disease attacking adults, chiefly those between the ages of 30 and 60, and four to six times more prevalent among women than among men. Myxedema is caused by a decrease or cessation of the secretion of the thyroid—deficiency diseases such as the goiters and cretinism (qq.v.); its symptoms reverse those of hyperthyroidism. Myxedema was identified by Sir William Gull (q.v.) in 1873 and is occasionally known as Gull's disease. Symptoms include a general slowness of mind and body due to weakened heart, increased weight, accompanied by a lessening of appetite, and falling hair; the mental changes induced may be simply neurasthenic or ultimately demented. The most striking symptoms, however, are the swellings on the body and the face, which enlarges, coarsens and assumes a masklike expression; the victim may become unrecognizable. Myxedema runs its course in 12 to 15 years and unless checked is likely to bring death from tuberculosis or asthenia. It is sometimes hard to diagnose, being confused with nephritis or obesity; but yields readily to dosage with desiccated thyroid, *thyroideum siccum,* which may cure the disease within weeks. The thyroid is taken orally, intravenous injection not being recommended. Morphine is also dangerous to the myxedema victim. When the thyroid deficiency has been restored by graduated dosage up to three or four grains a day, the problem is simply one of maintaining proper thyroid balance in the body.

MYXOPHYCEAE, mĭk-sŏ-fĭs′ē-ē (Gr. "slime algae"), known also as CYANOPHYCEAE and SCHIZOPHYCEAE, is the botanical class that includes the "blue-green algae"; it is the sole class in the division Cyanophyta (see ALGAE). The typical blue-green color of many of the genera is the result of masking of the chlorophyll *a* and *Beta*-carotene with the phycobilin pigments c-phycocyanin (blue) and c-phycoerythrin (red). Because of variation in the abundance of the phycobilins, the plants may be decidedly reddish or almost black in macroscopic appearance. Their color may also be affected by the presence of pigmented, gelatinous surface coatings which surround the cells. The pigments of Myxophyceae, unlike those of all other algae, are not localized in sharply delimited plastids, but, instead, are dispersed as droplets in the more peripheral cytoplasm, the chromoplasm. The cells are bounded by cellulose walls and frequently, in addition, by the pectic sheaths already mentioned; the latter may be firm or diffluent and are often stratified. The cells of Myxophyceae differ further from those of other plants in their lack of prominent aqueous vacuoles, in the storage form of their photosynthate, namely, "cyanophycean starch," and in the organization of the nuclear material. The latter is not delimited clearly from the cytoplasm by a membrane and a nucleolus is absent. Division of the nuclear material simulates mitosis in a few genera but seems to be passive and effected by cell division in others. The possible relation of the Myxophyceae to bacteria has frequently been suggested, but the evidence hardly supports such a view.

The plant bodies of Myxophyceae may be unicellular, colonial or filamentous. Filamentous genera may be unbranched, branched or falsely-branched, the latter because of rupture of unbranched filaments through their sheaths. Reproduction of unicellular forms is by cell division. The colonial and filamentous genera multiply by fragmentation. Fragments of filamentous genera are known as *Hormogonia;* these may grow into new plants under favorable circumstances. Hormogonia may arise through the death of cells in the filament (*Oscillatoria*) or between *Heterocysts* (*Nostoc* and *Anabaena*). Heterocysts, which are transparent cells with nodular wall thickenings at their poles, are resistant and spore-like; they are capable of germination into vegetative filaments. *Akinetes,* also thick-walled dormant cells are granular and filled with reserve photosynthates; they also may germinate into vegetative phases. A few genera form spores (*Endospores*) endogenously. Sexuality has not been observed among Myxophyceae.

Scant information has been available until recently regarding the nutritional and photosynthetic activities of Myxophyceae. Study of a number of genera in bacteria-free culture has revealed that they are entirely autotrophic, although they may utilize organic supplements in culture media. Use of radio-active isotopes has firmly established the fact that certain Myxophyceae (*Nostoc* sp. and *Anabaena* sp.) have the capacity to fix gaseous nitrogen.

The Myxophyceae are found everywhere on and in moist soil, and tree bark, stones and timber and on the leaves of mosses and on and within liverworts and other plants (*Nostoc* in *Anthoceros, Anabaena* in *Cycas* and *Azolla*). They are abundant in both fresh and salt water and may be benthic or planktonic. *Polycystis* and *Anabaena,* among others, are genera which frequently appear in water blooms. A rather specialized group of Myxophyceae is present in hot springs in temperatures ranging up to 85°C. A number among these Myxophyceae precipitate rocklike deposits known as travertine (q.v.).

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MYXOSPORIDIA, mĭk′sŏ-spŏ-rĭd′ĭ-ȧ, an order of Sporozoa having its growing phase amoebic and reproducing constantly by spore formation during this period. They are chiefly parasitic on fish and amphibians but may occur in invertebrates; epidemics among fish and even silkworms are caused by members of this order. See also SPOROZOA.

MYXOSPORIUM, mĭk′sŏ-spō′rĭ-ŭm, genus of imperfect fungi of the order Melanconiales, resembling those of the genus *Gloeosporium.* They grow on bark and one species, *M. Corticolum* causes a mild canker on apples or pears.

The sequence *l, m, n* in the order of the letters of the alphabet is extremely ancient, and preserved with great regularity. Even in those scripts in which the old Semitic arrangement has been disturbed, these three tend to stay together, for example, Arabic (23, 24, 25). Ethiopic is an exception, having *n* 12th; *l* and *m* 2d and 4th respectively, with *h* interpolated. The view has even been advanced, and widely accepted, that the Latin *elementum* (*-a*) meaning alphabet (and hence elementary) is nothing but the names of these three letters (given as *el, em, en* by Latin grammarians)—supposedly the first three in a second row of letters, just as alphabet (that is, *a, b*) or *abecedarium* (first attested about the beginning of the 6th century) arose from the first two (or three) letters.

Be that as it may, and it must be admitted that the theory lacks proof, the form of the letter *n,* like that of *m* and *l,* has not varied greatly throughout the long history of the scripts derived from the North Semitic. It appears that the letter *m* is a differentiation of the labial from the dental nasal *n;* and in fact, in the final position, the alternation *m* and *n,* demanded in part by assimilation to the initial consonant of a following word (the Sanskrit *sandhi*), is frequent. Thus Greek, Celtic, Germanic, Balto-Slavonic all substituted *-n* for Indo-European *m;* Moabite, Aramaic, and Arabic have a plural in *-n,* where Hebrew shows *-m.* Assimilation also affects the place of articulation of a nasal medially. The participle of Latin *sumo* (classical *sumptus,* with *-p-* inserted as a glide) shows up in Italian as *sunto;* Gothic has *fimf* corresponding to Latin *quinque,* the former with a labial nasal (before *f*), the latter with a velar nasal (before *qu*).

But palatal and velar nassals are not commonly distinguished in the writing, though Sanskrit writes the cerebral, palatal, and velar nassals by symbols distinct from that of the dental *n,* and in Greek the practice arose of writing γ as a palatal nasal before κ, γ, χ. This came about from the fact that in the group *gn* the *g* passed into a palatal nasal, thus giving the symbol an additional value. A similar change took place in Latin (compare the pronunciation *signe, segno* in French and Italian), occasionally so written (*singnifer*), and English has to be content to use *ng* with this phonetic value (the technical symbol is ŋ), e.g. in *king* , as well as for *-ngg-* (as in *longer, finger*), and similarly *nk* for *-ngk-* (as in *lynx, monkey*). Fundamentally this variation is a matter of syllabic division (*ng,* when *g* belongs to the same syllable as *n; -ng-g-* when *g* belongs to the following syllable). However, some of the northern English dialects have *-ng-* not *-ng-g-* in the medial position, and conversely the Midlands often have *-ng-g-* instead of *-ng-* in words like *singing.* In present participles (ending in *-ng*) the dental nasal *n* superseded *-ng* in early modern English, as is clearly shown by the spelling *standyn* for *standing* (*fardin* for *farthing*), and this utterance is still widespread and found among educated speakers. Conversely *-ng* has been substituted analogically for *n* (*chicking, gudging* for *chicken, gudgeon*), but this practice is mostly confined to the less well educated. Final *-n* is not heard after *-m* (*autumn* beside *autumnal, damn* beside *damnation*); *handicap* stands for *hand-in-cap,* and the loss of *-n* in unaccented monosyllables is responsible for the pairs *a* and *an, i'* and *in, o'* and *on,* and (with syntactical differentiation) *my* and *mine, no* and *none.* Misdivision is responsible for *a newt* (for *an ewt,* Middle English *ewte*) and other words (*nick-name, adder, apron, auger*) that have taken on or lost *n-,* as the case may be. This proves that the difference of juncture heard in *an aim, a name* is not stable.

As for the form of the symbol (the 14th letter of the North Semitic original script), in Cretan we find 𐤍 and in Sinaitic 𐤍 . But already Phoenician and Moabite have 𐤍 or 𐤍 , and the Greek Ν and Latin N are readily traced back to this. The Slavonic Н (Cyrillic Н) is a slight and obvious modification of N. The Semitic name of the letter is *nūn* (whence Greek *nū*), and its apparent meaning is said to be "fish." Actually a fishlike symbol does appear, apparently with the *n*-value, in some Sinaitic inscriptions.

A syllabic *-n* (compare the article M) is heard in *mutton, heaven,* and a syllabic - n is occasionally substituted for it (in rapid speech after *-k-* as in *spoken, bacon*). Breathed *n* and *ng* (written *nh, ngh*) occur in Welsh as the result of mutation; in English, a partial assimilation to preceding *s* (in *snow*) has the effect of depriving *n* of some element of voice, but the combination is often unstable and in Latin it was the *s* that disappeared (*niuem* [acc.] is cognate, compare the treatment of *sm* described in the article M). Nasalization of vowels is often inadequately written by the symbol *n,* that is in French, where it is a strong nasal resonance (*vin, cent*). It usually affects a preceding vowel even when *n* remains a consonant (contrast the *a,* with a slight "nasal twang," in *man* with that of *bad*); and in many parts of North America nasalization may pervade the entire utterance.

Parallel to *mi* before *ū* is *ni* (written *n*), the standard pronunciation in words like *new*, though again in many parts of North America the consonantal *i* element is lacking. For bibliography see the article A; see also ALPHABET.

JOSHUA WHATMAUGH.

NABAL, nā'bäl, in Biblical history (1 Samuel 25:2-42), a wealthy sheep owner whose flock was protected by David and who afterward refused tribute to him. Abigail, his wife, mollified David with gifts and flattery, and Nabal dying soon thereafter, David married her.

NABATAEANS or **NABATEANS,** năb-ătē'ănz, an Arab people whose kingdom at one time extended as far north as Damascus. Around the end of the 4th century B.C. they were established in Petra, which they made their capital, and thereafter their sway was greatly extended. They forced the Edomites up into southern Judah. The location of Petra on the route of commerce from southern Arabia to Syria is credited with the prosperity of the kingdom in the 1st and 2d centuries B.C. and the 1st century A.D. The Nabataeans guarded their trade routes and grew wealthy by imposing customs' duties. At its height under Aretas IV (9 B.C.–40 A.D.) the kingdom reached to Damascus. The Nabataean kingdom was conquered by Trajan in 105 A.D., and became a Roman province. The Nebaioth, often identified with the Nabataeans, are said to be a completely different people. See also ARABIA—*Petty States in the North.*

NABLUS, năb'lŭs (ancient SHECHEM; later NEAPOLIS), town, Jordan, located in the northwestern region, between Mounts Ebal and Gerizim, 30 miles north of Jerusalem. It is a busy trading and industrial center, producing soap and olive oil, and is the seat of a Greek bishop. Shechem was important in patriarchal times, and has the traditional sites of the tombs of Joshua and Joseph and Jacob's Well. Abimelech ruled it, then destroyed it; Jeroboam I ruled as king of Israel from Shechem. The name of Neapolis, of which Nablus is the Arabic corruption, was bestowed by Vespasian. The town figured conspicuously during the Crusades. It was a religious center of the Samaritans, some of whose descendants still live here. The bulk of the population, however, is Moslem. Pop. (est. 1946) 24,660.

NABOB, nā'bŏb (from Hind. *navvāb,* colloquial *nabāb*), the title applied to a native ruler in India. It also designated a provincial governor of the Mogul Empire. Europeans returning wealthy from the East had the word applied to them, and, by semantic widening, *nabob* came to be used to designate any very wealthy man.

NABOB, The (Fr. *Le Nabab*), a novel by Alphonse Daudet, published in 1877. One of the most highly finished of the author's works, it is a romance of manners and observation.

NABONASSAR, năb'ō-năs'ēr, **Era of,** an historical era, reckoned from the accession of Nabonassar as king of Babylon in 747 B.C. In the time of Nabonassar the calendar was rearranged with the Ram as the vernal equinox, and as a result the Era of Nabonassar (or the Age of the Ram) came into use in the chronicles as a reckoning device. The new reckoning never obtained full recognition in Babylon itself, but gained its main support in Egypt. Later, it had some use among the Greeks.

NABONIDUS, năb'ō-nī'dŭs (Assyrian *Nabū-na'id*), Babylonian king: d. about 538 B.C. He was the last of the Chaldean dynasty to reign at Babylon (556–c.538 B.C.). Not a member of the family of Nebuchadnezzar II, he may have usurped the throne. He seems to have performed religious duties zealously, and to have restored various ancient shrines, but his neglect of the gods Marduk (Merodach) and Nebo (Nabu) brought him into conflict with the priestly class. His antiquarian interests, so strongly indicated by his inscriptions, are thought to have occupied him to such an extent that they were responsible for his disregarding the state's defense. He spent several years of his reign in the oasis Teima, in northern Arabia, during which period, it is believed, his son Belshazzar actually governed at Babylon. According to Eusebius, after Babylon had fallen Nabonidus fortified himself at Borsippa, only to be captured there by Cyrus the Great, who nevertheless treated him with kindness and permitted him exile in Carmania (now Kerman). A cuneiform record of Cyrus, however, indicates that Nabonidus was delivered over to Gobryas, Cyrus' general, and died in mysterious circumstances. See BELSHAZZAR.

NABOPOLASSAR, năb'ō-pō-lăs'ēr, king of Babylonia: r. 626–605 B.C. He was a Chaldean, not of the kingly line, and erected an independent kingdom in Chaldea in the second quarter of the 7th century B.C. Thence he extended his power to Babylon. During what appears to have been a struggle for power following the death of Ashurbanipal, king of Assyria, he declared his independence and, in alliance with Cyaxares, king of Media, began to take over Assyrian territory. His army was well trained in Assyrian methods of fighting, and eventually, in 612, he and his ally took Nineveh. The conquest meant that the Assyrian Empire was divided, with the southern part falling to Nabopolassar. In this new Babylonian Empire Chaldea was the dominant power. Nabopolassar met the threat of Necho II of Egypt by dispatching his son, Nebuchadnezzar II, against him; improved the irrigation around Babylon; and did much to beautify the city itself. Nebuchadnezzar II succeeded him.

NABOTH, an Israelite, owner of a vineyard in Jezreel, during the reign of Ahab, king of Israel (1 Kings 21). The palace of Ahab immediately adjoined this vineyard, which became an object of the king's desire and he offered to purchase it or give another in exchange for it. When Naboth refused to part with the "inheritance of his fathers," Ahab was bitterly disappointed, but his wife, Jezebel, sent letters in Ahab's name, sealed them with his signet and caused Naboth to be tried for blasphemy and treason on the testimony of two suborned witnesses and stoned to death. This crime brought down the curse of Elijah upon the guilty couple (2–26), which was fulfilled soon after in the fate of both. See AHAB.

NABU. See NEBO.

NABUA, nä'bwä, town and municipality, Philippines, located in Camarines Sur Province, in the southeastern part of Luzon, 19 miles southeast of Naga. The district is agricultural, producing among its chief crops rice and abacá. Gypsum is also produced. Pop. of town (1948) 4,595; pop. of municipality (1948) 42,946.

NACHTIGAL, näĸ'tê-gäl, **Gustav,** German explorer in Africa: b. Eichstedt, Germany, Feb. 23, 1834; d. at sea near Cape Palmas, April 19, 1885. After studying medicine, he became a military surgeon, then went to Africa in search of health. In 1869 the king of Prussia sent him with gifts to the sultan of Bornu, in recognition of kindness shown to German explorers. His journey through Fezzan and Tibesti was over country hitherto untraversed by a Europeon. He arrived at Kuka in 1870, thence explored Borku, Kanem, and the country south of Bornu, and on his way back to Cairo passed through Wadai. The years from 1875 to 1882 he spent in Germany arousing national interest in German colonization. He entered the consular service in 1882, becoming consul to Tunis, and in 1884 was German commissioner for the annexation of Togoland, Kamerun, and Lüderitzland. He died on his way back to Europe. Nachtigal's work marked a distinct era in the exploration of northern Africa and even more notably in German colonial policy. He wrote *Sahara und Sudan,* 3 vols. (1879–1889). His letters were collected in Berlin, *Erinnerungen an Gustav Nachtigal* (1887).

NACIMIENTO MOUNTAINS, nä-sê-myĕn'tō, a prominent ridge in Sandoval County, N. Mex., lying between the headwaters of the Puerco and Jemez rivers. The length is about 40 miles and the highest peaks range from 9,000 to 9,700 feet. To the north they merge into the San Pedro Mountains. The rocks are uplifted granite with limestones, sandstones, and volcanic tuffs on the flanks.

NACOGDOCHES, năk-ŭ-dō'chĕz, city, Texas, seat of Nacogdoches County; altitude 285 feet; on the Nacogdoches and Southeastern and Southern Pacific railroads; 130 miles northeast of Houston. The region produces beef cattle, milk, and poultry. The chief manufactures are lumber, feed, fertilizers, cottonseed oil, filter clays, and clothing. Stephen F. Austin State College is located here.

Nacogdoches was named for a chief of the Tejas Indians. It was visited by de Soto, then by La Salle, and was first settled by Spaniards in 1716, when they set up a mission for the Indians. It was on the old Spanish highway called El Camino Real. From 1819 on it was the center of Texan revolutionary efforts, and Sam Houston lived here. The Old Stone Fort, built in 1779 and torn down in 1901, was re-erected in 1923. The city has a commission government. Pop. (1940) 7,538; (1950) 12,327.

NADAL, Ehrman Syme, American author: b. Greenbrier County, Va. (now W. Va.), Feb. 13, 1843; d. Princeton, N. J., July 26, 1922. He was graduated from Yale College in 1864 and became a secretary of the American legation at London, 1870–1871; 1877–1883. He published *Impressions of London Social Life* (1875); *Essays at Home and Elsewhere* (1882); *Notes of a Professional Exile* (1895).

NADAR, nà-dâr', pseudonym of Felix Tournachon (q.v.).

NADEN, nā'd'n, **Constance Caroline Woodhill,** English poet: b Edgbaston, Birmingham, Jan 24, 1858; d. London, Dec. 23, 1889. She studied at Mason College, Birmingham, and became interested in sociological problems. She investigated the Herbert Spencer system of philosophy and, together with Dr. Robert Lewins, became the advocate of a doctrine called Hylo-Idealism, an attempt to furnish a metaphysical system reconciled with the science of modern times. She is chiefly remembered for her volumes of *Songs and Sonnets of Springtime* (1881), and *A Modern Apostle and Other Poems* (1887).

NADIA, nŭ'dĭ-ä, district, West Bengal, India; area, 1,600 square miles; pop. (1941) about 870,000; capital Krishnagar. It is bounded by East Bengal, now part of Pakistan, and by the Bhagirathi River, and is drained by the Jalangi River Sugar-cane processing, handloom cotton weaving, and clay-figure manufacturing are the chief industries. In 1947 the eastern part of the original district became the Kushtia district of East Bengal, Pakistan.

Nabadwip (formerly called Nadia) is an important town on the Bhagirathi River, 8 miles west of Krishnagar. It is a pilgrimage center and an ancient seat of learning, its Sanskrit schools being especially noted. Pop. (1941) 30,583.

NADIR, nā'dĕr, in astronomy, that point of the heavens which is diametrically opposite to the zenith or point directly over our heads. The zenith and nadir are the two poles of the horizon; the zenith, nadir, and center of the earth are in one straight line.

NADIR SHAH, nä'dĕr shä (originally Mohammed Nadir Khan), king of Afghanistan: b. Dehra Dun, India, April 10, 1880; d. Kabul, Nov. 8, 1933. He was Afghan minister in Paris from 1924 to 1926, then returned to Afghanistan. Following the abdication of Amanullah Khan in 1929, he seized the throne from a usurper and became king. He effected reforms and granted a new constitution in 1932, but was assassinated the next year.

NADIR SHAH (also known as Tahmasp Kuli Khan), king of Persia: b. Khurasan, 1688; d. June 20, 1747. He was of Turkish blood and poor family. He early showed his cunning by his attempts, while in the service of different governors of Khurasan, to take over that province, but was unsuccessful. Putting himself at the head of a band of robbers, he got possession of several strongholds in Khurasan. In 1726 he entered the service of Tahmasp II, for whom he checked the Afghans and defeated the Turks, and from whom he received four provinces. When Tahmasp was defeated at Hamadan by the pasha of Baghdad and was forced to cede the provinces on the Araxes to the Turks and to make a disgraceful peace, Nadir dethroned him (1732), put Tahmasp's son Abbas III in his place, and took the regency upon himself. The lost provinces were won back from the Turks, and in 1736, upon the death of Abbas, Nadir came to the throne. He invaded Afghanistan and conquered it in 1737–1738. He then seized most of India from

Mohammed Shah, the Mogul emperor. In 1739 he captured Delhi and pillaged it, the treasure he carried away including the Koh-i-noor diamond and the Peacock Throne. He subjugated Bukhara (Bokhara) and Khwarizm (Khiva), and so extended his empire that it reached from the Indus and the Oxus to the Euphrates and the Caspian. From 1743 to 1746 he was engaged in war with the Turks. Officers of his guard, weary of his brutal cruelty, assassinated him.

NAEGELE, nā'gĕ-lĕ, **Charles Frederick,** American portrait painter: b. Knoxville, Tenn., May 8, 1857; d. Marietta, Ga., Jan. 27, 1944. He studied figure and portrait painting under C. Myles Collier, William Sartain, and William M. Chase in New York City. He received many awards in competitive exhibitions and painted portraits of Peter Cooper, Charles L. Tiffany, ex-Governor Roswell P. Flower, Gen. Joseph D. Bryant, and others. For his oil painting *Divinity of Motherhood,* he won a gold medal at Boston.

NAEGELI, Karl Wilhelm von. See Nägeli, Karl Wilhelm von.

NAESTVED, nĕst'vĕth, city, Denmark, in Praestø County, southeastern Zealand (Själland). It is a market center and railroad junction. The city contains a church and Benedictine cloister dating from the 12th century. Pop. (1945) 15,104.

NAEVIUS, nē'vĭ-ŭs, **Gnaeus,** early Roman poet: b. probably in Campania between 274 and 264 B.C.; d. Utica, Africa, 204 B.C. or 202 B.C. He wrote in the old Saturnian verse an epic on the First Punic War; but he was better known as a dramatic writer, particularly for his comedies. Most of his plays, of which the earliest was produced in 235 B.C., were translations or adaptations from the Greek. His attacks on the Metelli, of the Roman nobility, provoked their anger and he was banished from the city and retired to Utica. Fragments only of his works have come down to us.

NAEVUS or **NEVUS,** nē'vŭs, a birthmark, portwine mark, or mother's mark. This disfigurement, which occurs most frequently on the head and trunk, but may also appear on the extremities, is essentially an enlargement of the minute veins or venous capillaries, which are dilated and anastomose, or unite among themselves to form a vascular patch generally of a deep-red color. The lesion is confined to the upper layer of the true skin. No pulsations are observable in the naevus, but if the circulation in the neighborhood is obstructed in any way, turgescence is seen and the color deepens. The familiar name of "mother's mark" or "longing mark," is applied to naevus, from a former belief that the lesion was the result of fear, fright, unnatural longing, or some such irritation acting upon the mother's constitution and communicating its effects to the unborn child, in the shape of this mark. Naevus, apart from questions as to its exact cause, appears to be invariably congenital in its nature. After birth it usually enlarges, and after attaining a certain size it may remain to constitute a permanent lesion or it may be absorbed with or without inflammatory action. The name birthmark is in some cases a misnomer because the naevus may appear at different periods of life. Naevus has been treated in various ways, by excision with the knife, ligature, caustics, and other methods. The ligature has until recently been most commonly employed for its removal, threads being passed under the base of the naevus and tied so as to produce strangulation of the vessels. Electropuncture and electrolysis have also been much used, but the best of all discovered means is the use of carbon dioxide snow, a cone of which is made and pressed upon the naevus for a quarter or half a minute. This causes a blister, which dries and comes off, leaving no scar. In cases where a naevus is of limited extent and does not produce disfigurement or where, from its situation, it may not be seen at all in ordinary circumstances, the surgeon's advice generally is to let it alone. In subcutaneous naevus the lesion is more deeply seated. Subcutaneous naevus generally accompanies the more superficial form, but may bleed spontaneously and weaken the patient unless removed.

NAFA. See Naha.

NAFELS, nâ'fĕls, village, Switzerland, in Glarus Canton. There are a Capuchin monastery and a museum containing antiquities of the Middle Ages. Besides agriculture, industries include printing, cotton spinning, and the manufacture of structural iron products. At Näfels, on April 9, 1388, a force of 6,000 Austrians was defeated by 400 citizens of Glarus, who thus preserved their independence. The feat is still commemorated yearly. Here, also, in 1799 a Russian force under Aleksandr Vasilievich Suvorov attempting to invade France was defeated by French troops commanded by Gen. Gabriel J. J. Molitor. Pop. (1930) 2,948.

NAFTIA, näf'tē-ä, **Lago** (Lacus Palicorum), a small lake in Sicily of volcanic origin, located in an ancient crater, over 900 feet in circumference, four miles north of Minco. Its waters are in a frequent state of ebullition from escaping carbonic acid gas; the emanations are fatal to birds and small animals. The lake was regarded with superstition by the ancients, and here the Siculi, the earliest known inhabitants, had a temple to two chthonic gods, the Palici of the Romans, which was the seat of the conspiracy and revolt against Rome 104 B.C.

NAGA, Nä'gä, name of two municipalities in the Philippine Islands. (1) On the east coast of Cebu Island, at the northern end of Bohol Strait, 11 miles southwest of the city of Cebu. It has a considerable coastwise trade. Pop. (1939) 25,850. (2) In the central part of Luzon, it is the capital of Camarines Sur Province. It stands on the Bicol River 5 miles south of San Miguel Bay. The region was visited by the Spaniards in 1573, and here the Spanish town of Nueva Caceres was shortly built on the site of the former native village of Naga. It became the capital of the united Camarines provinces; and with the division in 1919 into Camarines Norte and Camarines Sur, Naga was designated capital of the latter. Pop. (1939) 22,505.

NAGA, *in Hindu mythology,* the name given various deified serpents, which are represented as the sons of the Muni Kasyapa and his wife, Kadrii.

NAGANA. See Cattle, Diseases of.

NAGANO, nä-gä-nô, city, Japan, capital of Nagano prefecture, in central Honshu 100 miles northwest of Tokyo. It is a center of the silk industry, and there are also manufactures of woolens and other textiles. In Nagano is the great temple of Zenkoji, visited each year by large numbers of Buddhist pilgrims. The city dates from the 7th century. Pop. (1945) 89,923.

NAGAOKA, nä-gä-ô-kä, city, Japan, in the Niigata prefecture, located in the northwest of Honshu 35 miles south of the city of Niigata. With the discovery of petroleum in the vicinity it became one of the country's principal oil production centers. From 784 until 794 it was the capital of Kwammu (Kwammu Tenno), 50th emperor of Japan of the Nara period. In feudal times it was of considerable importance, but its prosperity declined with the downfall of the Tokugawa and was only regained after oil had been discovered. Pop. (1945) 38,274.

NAGASAKI, nä-gä-sä'kē, city, Japan, capital of the prefecture of the same name, in the northwest of the island of Kyushu. Located at the end of a long, narrow bay, it is one of Japan's principal and deepest seaports. The city is beautifully surrounded by high hills on three sides, and is protected on the west side by the island of Takaboko, from whose steep heights many hundreds of Christians were once thrown to death. Nagasaki is the first port of entry for vessels arriving from the south or west. There are shipbuilding yards and a coaling station, and exports are chiefly coal, cotton goods, raw silk, tea, furs, salt, paper, and fishery products. Aircraft parts and electrical equipment are manufactured, as well as such products of Japanese art as articles of tortoise shell. The importance of Nagasaki dates from the 16th century, when it was opened to foreign trade and became the center of Christianity in Japan. Hideyoshi, military dictator of the country, made it an imperial city in 1587. All of Japan was closed to foreign trade during the years 1637–1641 with the exception of Nagasaki, to which access continued to be permitted to Dutch and Chinese ships. It was not until 1859 that vessels of all nations were again allowed to visit the seaport. On Aug. 9, 1945, during World War II, nearly half the city was destroyed by an atomic bomb dropped from a United States aircraft. Pop. (est. 1945) 142,748.

NAGCARLAN, näg-kär-län', municipality, Philippine Islands, on the island of Luzon, in the southeast of Laguna Province, between the headwaters of the Santa Cruz and the San Diego rivers 12 miles south of Santa Cruz. Pop. (1939) 14,762.

NAGEL, nä'gĕl, **Albrecht Eduard,** German ophthalmologist: b. Danzig, June 14, 1833; d. Tübingen, July 24, 1895. He studied medicine at Königsberg and Berlin and established a practice in Danzig in 1856. In 1864 he was privat-docent at Tübingen and 1874 he became professor of ophthalmology there. He developed the theory of the identity of the retinas. He edited the *Mittheilungen aus der ophthalmiatrischen Klinik in Tübingen* after 1880, and published *Das Sehen mit zwei Augen* (1861); *Die Anomalien der Refraction und Accommodation des Auges* (1880); *Die Vorbildung zum medicinischen Studium* (1890).

NAGEL, nā'gĕl, **Charles,** American lawyer and Cabinet officer: b. Colorado County, Texas, Aug. 9, 1849; d. St. Louis, Mo., Jan. 5, 1940. After attending school at St. Louis he studied Roman law and political economy at the University of Berlin, and in 1873 was admitted to the Missouri bar. He practiced law at St. Louis, and during 1881–1883 was a member of the Missouri house of representatives. From 1893 until 1897 he served as president of the city council of St. Louis, and in 1908 he was named a member of the Republican National Committee. He was secretary of commerce and labor in the Cabinet of President Taft from 1909 until 1913. Thereafter he resumed law practice in St. Louis, where he was recognized as an outstanding attorney.

NAGELI or **NAEGELI,** nâ'gĕ-lê, **Karl Wilhelm von,** Swiss botanist: b. Kilchberg, near Zurich, March 27, 1817; d. Munich, Germany, May 10, 1891. Nägeli studied botany at Geneva under Augustin Pyrame de Candolle, and in 1840 graduated at the University of Zurich. In 1842 he began the teaching of botany at that university, and in 1848 was appointed professor extraordinary. In 1852 he went to Freiburg as full professor of botany, and from 1858 he occupied a like professorship at the University of Munich. He investigated the living matter and nuclei of cells and the mode of growth in cells, and he was credited with the discovery of the antheridia and spermatozoids of ferns. He also originated the micellar theory to account for the structure of organized bodies. English translations of his works included *Memoir on the Nuclei, Formation and Growth of Vegetable Cells;* and *The Microscope in Theory and Practice,* the latter in collaboration with S. Schwedener.

NAGLEE, năg'lē, **Henry Morris,** American soldier: b. Philadelphia, Pa., Jan. 15, 1815; d. San Francisco, Calif., March 5, 1886. Entering the Union Army early in the Civil War, he participated in the Peninsular campaign of 1862, and in the following year was appointed to the command of the 7th Army Corps and of the District of Virginia. He retired from the army in 1864, and later went to California, where he cultivated a vineyard at San José, and gave his name to a well-known brandy.

NAGOYA, nä-gô-yä, city, Japan, capital of Aichi prefecture, in the southern part of Honshu, at the head of Ise Bay, 75 miles east of Kyoto. It was the first city in Japan to produce cloisonné enamelware. Glazed pottery, textiles, clocks, machine tools, automobiles, and aircraft are other products manufactured in Nagoya. The most notable edifices are the Higashi Hongwanji Buddhist Temple and the castle of Owari, built in 1610, which contains a valuable art collection. In 1945, during the closing months of World War II, the city was bombed by United States aircraft. Pop. (est. 1945) 597,941.

NAGPUR, näg'pŏŏr, city, Republic of India, capital of the state of Madhya Pradesh, 265 miles north of Hyderabad; under British administration it was the capital of the Central Provinces and Berar. The city is situated at an elevation of 1,100 feet above sea level, at the foot of Sitabaldi Hill, on which stands a fort which in 1817 was the scene of a memorable repulse of a Maratha army of 18,000 men by British defenders

numbering 1,350. Nagpur is an important railroad center. Besides numerous cotton and woolen mills, there is an important hand-weaving industry. Nagpur University was founded in 1923; there are also technical and industrial schools in the city. Nagpur and the surrounding area passed under British control in 1853. Pop. (1941) 301,957.

NAGUIB, nä-gēb′, **Mohammed,** Egyptian army officer: b. Khartoum, Egypt, 1901. Commissioned a second lieutenant at the age of 19 from Cairo's Royal Military Academy, he later attended Fuad I University, and in 1948 fought as a brigadier in the Israeli-Arab war. On July 23, 1952, in a virtually bloodless coup d'état, the Egyptian Army seized control of the regime, forced King Farouk's abdication, and in September installed General Naguib as premier and president. Lt. Col. Gamal Abd el-Nasser (q.v.), the leader of the revolt, in November 1954 caused Naguib's retirement on pension.

NAGUILIAN, nä-gē-lē′än, municipality, Philippine Islands, on Luzon in the center of the Province of La Union, 9 miles southeast of San Fernando. Pop. (1939) 15,933.

NAGYAGITE, nŏd′yä-gīt, a sulpho-telluride of lead and gold with about 7 per cent of antimony, with the formula $Au_2Pb_{14}Sb_3Te_7S_{17}$. Besides these elements it often contains traces of copper and silver. It is found native in foliated masses and is hence sometimes called "foliated" tellurium, also granular.

NAGYBANYA. See Baia-Mare.

NAGYKANIZSA, nŏd′y′-kŏ-nĭ-zhŏ, city, Hungary, in the southwest part of the country. It is an important railroad center in a fertile agricultural region, and has numerous manufacturing activities. From 1600 to 1690 the city was in the possession of the Turks. Pop. (1939) 30,127.

NAGYKAROLY. See Carei.

NAGYKIKINDA. See Velika Kikinda.

NAGYKOROS, nŏd′y′-kû-rûsh, city, Hungary, in the central area of the country 47 miles southeast of Budapest. Nagykörös is a market center in the midst of an extensive vineyard region. Pop. (1939) 30,656.

NAHA, nä-hä, or **NAWA,** nä-wä, seaport at the southern end of Okinawa, largest of the Ryukyu Islands, capital of the Okinawa prefecture. Enclosed in a coral reef, it is situated on the small Naha Bay. The major exports are fiber cloth, sugar, cotton, and silk. The Japanese maintained a military base and airfield in the vicinity. During May-June 1945, in World War II, the area was the scene of heavy fighting before capture by United States troops. Pop. (1945) 65,765.

NAHANT, nä-hănt′, town, Massachusetts, in Essex County 9 miles east-northeast of Boston. It is on a long narrow peninsula which extends into the Massachusetts Bay four miles south from Lynn. There are two small villages, one Nahant, the other Little Nahant. The whole peninsula is a residential section; many of the dwellings are summer homes. Though settled in 1630, the peninsula was not purchased from the Indians until a century later, when a Lynn farmer obtained a deed from Chief Poquanum for a suit of clothes, two stone pestles and a jew's-harp. A tavern, erected in 1802, and steamboat service to Boston in 1817 popularized it. Pop. (1950) 2,654.

NAHANT BAY, an inlet of Massachusetts Bay, in the northeast corner of Massachusetts on the south shore of Essex County. The peninsula on which Nahant is located separates it from Lynn Harbor.

NAHE, nä′ĕ, a river of Germany, a tributary of the Rhine. It flows through the Rhine Province of Prussia in a northeasterly direction from Birkenfeld to join the Rhine at Bingen, on the southeast border of the Hunsrück Mountains. The length is about 70 miles.

NAHUA, nä′wä, a linguistic and cultural division of American Indians inhabiting central Mexico. Their language, Nahuatl, the language of the Aztecs and closely related dialects, is a branch of the Uto-Aztecan family. In 1940 it was still spoken by more than 700,000 persons.

NAHUEL HUAPI, nä-wĕl′ wä-pē′, or **TIGER LAKE,** Argentina, a lake on the boundary between the territories of Neuquen and Rio Negro, on the east slope of the Andes. It is 75 miles long, 10 miles broad and has an area of 300 square miles, dotted with several islands. It is fed by numerous mountain torrents and is drained by the Limay affluent of the Rio Negro. In 1690 the lake was discovered by Jesuit missionaries.

NAHUM, nā′hŭm (Hebrew for "rich in God's comfort"), one of the 12 minor Hebrew prophets of the Old Testament, whose only record is the book, attributed to 607–606 B.C., that bears his name, a reference in Nehemiah 7:7, as "Rehum" being a copyist's error. Nahum is described as "The Elkoshite," either the son of a man named Elkosh, or native of a village of that name in Galilee, the location of which is uncertain. Saint Jerome states that the village in Galilee which bore the name of Elkesi in the 4th century A.D. was the prophet's birthplace, and the Galilean village Capernaum, signifying the "village of Nahum," has also been vaguely speculated upon. The tomb of the prophet is pointed out at Alkush near Mosul—ancient Nineveh—and his life has been associated with the great city, the destruction of which he prophesied. His book entitled *The Burden of Nineveh. The Book of the Vision of Nahum the Elkoshite,* should be compared with that of Jonah which illustrates the remission of God's judgments, while Nahum describes their execution, in a style full of animation, fancy and originality, and at the same time clear and rounded. His language throughout is classical and in the purest Hebrew, belonging to the second half of Hezekiah's reign, or to the time immediately following the defeat of Sennacherib before Jerusalem. Nineveh was at that time the capital of the great and flourishing Assyrian Empire. It was a city of vast extent and population; the center of the principal commerce of the world. Its wealth, however, was not

altogether derived from trade. It was a "bloody city," "full of lies and robbery," chapter 3:1. It plundered the neighboring nations; and is compared by the prophet to a family of lions, which "fill their holes with prey, and their dens with ravin," chapter 2:11, 12. At the same time it was strongly fortified, its colossal walls, 100 feet high, with their 1,500 towers, bidding defiance to all enemies. Yet so totally was it destroyed that, in the 2d century after Christ, not a vestige remained of it; and its site was for centuries a matter of doubt and uncertainty. The book is surpassed by none in sublimity of description. It consists of a single poem which opens with a superb vision of God's coming to judge the nations, chapter 1:2-8. Then follows verses 8-14, an address to the Assyrians describing their confusion and overthrow; verses 12-13 parenthetically consoling the Israelites with promises of future rest and relief from oppression. Chapter 2 depicts in vivid colors the seige and capture of Nineveh by its foes, the Medes and Chaldaeans, and the consternation of the inhabitants. Chapter 3 describes the utter ruin of the great city and the various contributing causes. The fall of No-Ammon, Thebes in Egypt in 668 B.C., about half a century before, under the judgment of God, is cited, verses 8-10, to illustrate the punishment coming on the Assyrian Empire and the deliverance and restoration of Israel. With a wide view of the working of Providence, an avoidance of all moral or homiletic utterances, this powerful prophecy advances with majestic unity from its noble proemium to its close.

Consult Davidson, A. B., *Nahum, Habbakuk and Zephaniah* in Cambridge Bible series (London 1896); Smith, G. A. *The Book of the Twelve Prophets* (New York 1929).

NAIADACEAE, a small family comprising one genus, Naias, of submerged fresh-water plants, differing from the Zannichelliaceae in having the flower declinous, with one stamen and one ovary. There are about 12 species and varieties known to exist.

NAIDU, nä'ī-dōō, **Sarojini,** Indian poet, leader of the liberation movement, and governor of Uttar Pradesh: b. Hyderabad, 1879; d. Lucknow, March 1, 1949. Educated in England, in 1898 she married Dr. M. G. Naidu, principal medical officer of the Nizam. A decade later her flood relief work earned her the Kaiser-i-Hind medal, awarded by Edward VII. For 30 years Mme. Naidu worked for India's liberation and in 1925 she became the first woman president of the Indian National Congress. During 1928–1929 she lectured in the United States and Canada, having already achieved a reputation as a poet through the publication of *The Golden Threshold* (1905), *The Bird of Time* (1912), and *The Broken Wing* (1915). Elected president of the Asian Conference at New Delhi in 1947, later that year she was appointed governor of Uttar Pradesh (q.v.).

NAIL, an elastic horny plate on the upper or dorsal surface of the end of a finger or toe, as in man and monkeys. Hoofs, claws, talons, sheath-borns and the bills of birds are analogous. Nails and claws of all kinds are modifications of the epidermis, identical in formation and mode of growth. The root of the nail rests in a matrix, and when nails are destroyed new ones will be formed if the matrix is uninjured. Nails are a support and a defense to the ends of the fingers and toes, assist in picking up small objects, and if healthy and in good condition add comeliness to the parts to which they are attached. To most animals possessing them they are of great importance, giving a needed rigidity to fingers and toes, and adapting them to a great variety of necessary utilities, as firmly seizing and holding prey (perfected in the retractile apparatus of feline claws), scratching, digging, searching crevices for food and as formidable weapons. In horses, cattle and other ungulated animals, they enclose some or all the digits and are called hoofs. In the sloths the nails assume a relative size and are used as a chief means in arboreal progression. In the Amphibia — as in some toads, efts, etc.— the nails are represented in their simplest form and appear as mere thickenings of the skin at the extremities of the digits.

In man the nails appear about the third month of foetal or embryonic life. After birth the nails of the hand grow at the rate of about one millimeter per week, those of the foot about one millimeter per month.

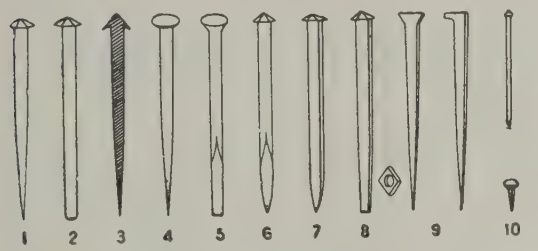
The health of the nails is affected, as is that of the skin, by local or general diseases. They may become thickened (hypertrophy) as the result of inflammation or a degeneration of nerves; diminished in size (atrophy) from traumatic influences; malformed as the result of disturbed function of the matrix; degenerated from faulty nutrition and discolored in various diseases, the discoloration probably being in the tissues beneath. Nail biting is a bad habit not only leading to a morbid condition of the nails themselves but also sometimes being an indication of some types of nervous disease. The nails are also subject to parasitic diseases. A hang-nail is a sliver of skin attached at one end; it should be cut off close to the point of attachment. The familiar white areas on the nails are considered to be injury received by the nails in being manicured. The painful affection called ingrowing nail usually occurs in the great toe, not through alteration in the nail itself, but from constant pressure of the adjacent soft parts against its edge by a tight shoe. The irritation often results in the formation of an ulcer, extremely sensitive, and subject to continual aggravation from the embedded nail.

NAILS, headed spicules of metal, varying in size from those a little larger than ordinary pins to those several inches in length and from 1/40 to ¼ of an inch in thickness. Up to the beginning of the 19th century they were made by hand as a household industry in various countries. In England, Birmingham was the centre of the industry, at one time giving employment to over 60,000 persons, and requiring a weekly supply of 200 tons of nail-rods from the iron-works of that district. In the United States, New England held a corresponding position and is even today the centre of the industry in America, with Taunton, Mass., as the great tack-making centre of the world. Almost all of the nail output of England was consumed at home and similar conditions obtained in the United States, France and Germany.

Hand-made nails were known as wrought or forged nails and were made from metal plates rolled to the required thickness and then

slit by slitting-rollers into nail-rods or split-rods of various sizes, corresponding to the required size and character of the nails to be forged and were sold to the nail-makers in bundles. The hand-nailer's outfit consisted of a forge for heating the nail-rods, an anvil (a small cube of steel), a hammer resembling that of a file-cutter (the face being sloped toward the handle), and a few "swages" (stamps or dies for producing ornamental or stamped heads).

To make a nail, a nail-rod was heated on the forge, hammered on the anvil and a portion of it the length of the required nail was cut off on a chisel attached to the anvil. The head was shaped in a vise which gripped the shank of the nail and had a counter sunk in the jaws of the vise into which the head was hammered to shape it. Various forms of heads were produced by employing different kinds



Principal Forms of Nails.

of counters. These forged or wrought nails included at least 300 different types, with at least 10 sizes in each type, representing a total of over 3,000 different names. The retail terms — fourpenny, sixpenny, tenpenny, etc.— were not only indefinite in themselves, but varied in different countries and even in different localities of the same country. Therefore, nails were generally designated by terms defining their use, as deck, scupper, pail, mop, hurdle, etc., or according to the forms of their heads, as clasp, rose, diamond, etc., or the shape of their points, as flat, sharp, spear, etc. Their thickness was expressed as fine, barbed and strong, and their length in inches, generally in connection with the weight (expressed in pounds) of 1,000 of the nails referred to. The principal forms of these old-time English nails are illustrated by the accompanying drawing and their uses may be briefly stated as follows: (1) "Rose-sharp" and "fine-rose": the former used for coopering, fencing and other rough work employing hard wood; the latter, with broad spreading heads of greater holding power, used in pine and other soft woods. (2) "Flat-point rose": used in wood liable to split by the wedge-like action of sharp-pointed nails. They were driven with the edges of their flat points across the grain of the wood and not only avoided splitting but also held more firmly. (3) "Clasp" nails: commonly used by carpenters in deal and similar woods. The edges of their heads projected downward and, when driven below the surface of the wood, held tightly by clasping a portion of it altogether, and also allowed a plane to pass over them in finishing work. (4) "Clout" nails, with flat circular heads and round sharp-pointed shanks: used for nailing iron-work and other substances to wood. (5) "Counter-clout" nails, with countersinks under their heads, and chisel points: extensively used by wheelwrights and smiths. (6) "Fine-dog" and "strong-dog," with solid, slightly countersunk heads, round shanks and speared points: used for nailing down stout iron-work, in which the heads are not required to lie flush with the face of the metal. (7) "Kent-hurdle" and "Gate" nails, with broad thin rose heads, flat shanks and good spear-points: used for nailing together and clenching the oaken bars of hurdles, fences and gates. (8) "Rose-clench" nails, with points cut square: used in nailing wood-sheathing and the manufacture of packing cases and boxes, in which the soft wood is liable to split unless bored before being nailed. The square heads of the nails punch out their own holes by driving a portion of the wood before them. The term "clench" was derived from the mode of their employment in boat-building, where they were clenched by hammering down or by riveting the end over a "rove" (a diamond-shaped metal plate), thus drawing the planks together firmly. (9) "Horseshoe" nails, with square or countersunk heads: made of the best refined iron and capable of being drawn out fine without breaking in the hoof. (10) "Brads and tacks": a class of small very useful nails, employed for a variety of purposes too numerous to mention. The latter were sometimes made so small that 1,000 did not exceed 20 grains in weight. In the United States nails are designated as to kind as wrought, cut and wire nails; as to type by the purpose for which they are to be used, as lath nails, shingle nails, etc.; and as to surface, as smooth, barbed, etc. In sizes they range from the two-penny (2-d) to the sixty-penny (60-d) nails. Above these sizes they are called spikes; below them, brads. The smooth wire two-penny nails run almost exactly 1,000 to the pound; of larger sizes the count runs about as follows: three-penny, 600; four-penny, 300 to 450, according to gauge of wire; five-penny, 275 to 400; six-penny, 175 to 300; eight-penny, 100 to 150; 10-penny, 70 to 90; 12-penny, 65; 16-penny, 50; 20-penny, 30; 40-penny, 18; 60-penny, 11. Six-inch spikes run about nine to the pound and 12-inch spikes three to the pound. For many years nails have been marketed by the keg containing 100 pounds. Through the use of a recently developed packing machine, which, through the agency of magnetism, arranges the nails in parallel, nails are in the market in cardboard cartons from 10 pounds upward and in large quantities in wooden boxes which occupy only half the space required by the "keg" with its helter-skelter contents. The small nails or brads are usually packed in telescope containers, holding from one-quarter pound up to one pound.

The credit of inventing nail-making machinery appears to belong to the United States, a patent having been granted in 1786 to Ezekiel Reed, of Bridgewater, Mass., for a "cut-nail" machine. About the beginning of the 19th century nail-making machines had been generally introduced in England, but the first English patent was granted to John Clifford in 1790. In making cut nails strips of metal of a breadth and thickness corresponding to the length and thickness of the required nail and about a foot in length are heated to a black heat and fed into the machine end first. A slicer cuts off the

nail blank, which in falling is clutched at the neck and held until a moving die strikes its upper end and forms the head; it is then liberated and passes out into the trough. In small nails the taper of the shanks and points is obtained by cutting the nail blanks alternately, the metal strip (of uniform thickness) being turned over after each cut so that the points and heads are taken from the opposite sides of the blank; while in the larger nails the metal strip is rolled so that its cross section corresponds to the required taper. These machines turn out nails at a rate of 10 to 1,000 per minute, according to the size of the nails. Cast nails are produced by the ordinary process of molding in sand. They are relatively brittle, but are cheap, and are used for rough purposes, such as lathing and in the manufacture of stout boots and shoes. Wire nails were first made in France, hence sometimes called French nails. They were used in the woodworking trades and up to 1850 were made by hand. The wire was cut into the required lengths; a wire blank was pinched in a vise, with a small portion projecting, which was flattened into a head by a few blows of the hammer. Subsequently machines were invented into which the wire was fed and the cutting, heading, and pointing were performed automatically. In the United States William Hersel, of New York City, produced the first handmade wire nails in 1850. Shortly afterward French machines were imported, but they were soon superseded by those of American make.

NAIN SINGH, Pandit, Hindu explorer: b. Numaon; d. Moradabad, United Provinces, Feb. 1, 1882. Employed as a surveyor for the government of India, during 1856–1857 he made exploratory surveys in Kashmir and Ladakh, but his chief title to fame rests on two secret journeys to Lhasa, capital of Tibet. Recording his observations on paper concealed in a prayer wheel, in 1865 he entered Tibet, from the United Provinces, near Lake Manasarowar, in Trans-Himalaya, and thence followed the course of the Tsangpo eastward to Lhasa, which he reached on Jan. 10, 1866; he remained in the city until April 21, 1867. In the second journey he set out by way of Ladakh, crossed the Tibetan plateau to Nam Tso (Tengri Nor), and from that lake went on to enter Lhasa on Nov. 18, 1874; an account of this second visit to the Tibetan capital, with map, was published in the *Geographical Magazine* (London 1876).

NAINSOOK, a soft muslin of Indian origin used for lingerie and underwear. Nainsooks are either plain or striped, the stripes running lengthways. In India nainsooks are sometimes made of silk. Nainsook is a Hindu word meaning "pleasure of the eye."

NAIRN, or **NAIRNSHIRE,** Scotland, a northeastern maritime county. It has about 10 miles of coastline on the Moray Firth; the land rises from the coastline to the south, attaining an altitude of 2,162 feet in Carn Glas; the area is 163 square miles. Agriculture and the raising of sheep are the principal industries of the people. The county town is Nairn, at the mouth of the river of the same name, 15 miles northeast of Inverness; it is a fishing center and vacation resort. Pop. (1931), county, 8,294; county town, 4,333.

NAIRNE, Carolina (nee OLIPHANT), BARONESS NAIRNE, Scottish ballad writer: b. Gask, Perthshire, Aug. 16, 1766; d. there, Oct. 26, 1845. Her father, Laurence Oliphant, was a staunch Jacobite and named her in honor of Prince Charles Edward, the Young Pretender. Her beauty and charm won for her the name of "The Flower of Strathearn." In 1792 appeared her first lyric, *The Pleuchman* (plowman), in the style of Robert Burns, and in 1798 she wrote her celebrated song of homesickness, *Land o' the Leal* (also known as *I'm Wearin' Awa'*). She was married in 1806 to William Murray Nairne, who became Baron Nairne in 1824; until his death in 1829 Baron Nairne was unaware of his wife's skill as a lyricist, for shyness led her to preserve a strict literary anonymity. Some of the nearly 100 songs which she wrote, many of them adaptations of old favorites, were first published anonymously in *The Scottish Minstrel* (1821–1824); she signed the ballads "B. B." (for "Mrs. Bogan of Bogan"). Her best known songs included *The Laird o' Cockpen, The Hundred Pipers, Charlie is My Darling, Will Ye No Come Back Again?*

NAIROBI, nī-rō'bē, British East Africa, capital of Kenya Colony, 330 miles northwest of Mombasa. Located on the Athi plains, at the foot of the Kikuyu hills, it is 5,452 feet above sea level. The site was selected in 1899 as headquarters of the Uganda Railway, then under construction, and when white settlement of the country's highlands commenced early in the 20th century, Nairobi expanded as an important commercial center. The town replaced Mombasa as capital in 1907. Neither too hot nor too cold, the climate is generally delightful; rain usually falls during each month, the total annual rainfall averaging 38.07 inches. Pop. 65,000.

NAIVASHA, nī-vä'shä, Kenya Colony, British East Africa, town on a lake of the same name, 65 miles northwest of Nairobi. It lies in the midst of a rich agricultural region at an elevation of 6,231 feet above sea level. The Uganda Railway, from Mombasa, skirts the eastern shore of Lake Naivasha. Discovered in 1883 by Gustav Adolf Fischer (1848–1886), this fresh water lake, 12 miles long and 9 miles wide, is fed by two rivers but has no known outlet; it is the haunt of millions of flamingoes.

NAJARA, nä-jä'rä, **Israel ben Moses,** Hebrew poet and liturgist: b. Damascus, Syria, 1530?–?1599. His secular poems were inspired by a remarkable mysticism, and his religious hymns, deeply emotional, were frequently set to tunes of Arabic or Turkish origin, hitherto used for light themes. Some of his hymns, dirges, and prayers for holy days were included in Jewish prayerbooks, especially in Italy and Palestine. In 1587 he published a collection of his poems under the title *Zemiroth Yisrael* (Songs of Israel).

NAKED BAT, strangest of all chiroptera is the *chiromeles torquatus* or collared bat of the Malayan region. It measures five and one-quarter inches in length exclusive of the tail and has 26 teeth. Except the collar of thinly-spread hairs surrounding the neck the puckered skin is practically naked. Its muzzle is long and piglike but the most curious characteristic

of this repulsive creature is the deep pouch on the underside of the body below the arm-pits existing in both sexes and holding the young while suckling. These strange creatures are found on the islands of Java, Sumatra and Borneo in dense forests where they repose till the sun reaches the horizon.

NAKONG, nä-kŏng, one of the four species of harnessed African antelopes. It inhabits the swamps of Central and South Africa and East Africa and is known also as the sititunga (*Tragelaphus spekei*). This species has the distinction of having a perfectly uniform grayish brown color, while the young are faintly striped and spotted, the hair being more silky and longer than the others; the horns, forming nearly two complete turns, are smooth, slender and strongly ridged. The male stands about three foot seven inches. They go in pairs never in herds. They are highly prized by the natives as game.

NAKSHATRA (Sanskrit, «Celestial luminary» or «star»), in the Vedas simply means a star, but later was used of what in the mythological astronomy of India are called mansions of the moon, in which that planet periodically rests in its course through the heavens; these were small clusters of stars or asterisms, 27 or 28 in number. They were mythologically personified as the daughters of Daksha, wives of the moon. Their introduction into the Hindu system has been variously accounted for. Consult Thibaut, G., 'Astronomie, Astrologie und Mathematik'; 'Grundriss der Indo-Arischen Philologie und Altertumskunde' (Strassburg 1899).

NAKSKOV, nąk'skôv, Denmark, seaport town on the west coast of the island of Laaland, on Nakskov Fiord and on the Nykjöbing-Nakskov Railway. Its chief industries are the manufacture of sugar and machines, a trade in grain, besides its ship-building and shipping. It was once fortified and was captured by the Swedes in 1658. Its inhabitants number about 10,000.

NALA, nă'lą, in Hindu mythology, a legendary king of ancient India, whose love for Damayanti, the daughter of Bhîma, king of Vidarbha, and the adventures arising therefrom, forms a celebrated episode of the 'Mahâbhârata' (q.v.), as also of a separate poem, the 'Nalodaya,' attributed to Kalidasa. Consult Macdonell, A. A., 'A History of Sanskrit Literature' (London 1900).

NALTUNNETUNNE (näl-tŭ-nā'tŭ-nā') **INDIANS,** an American tribe of the Athapascan family, formerly residing on the Pacific Coast south of Rogue River, in southwest Oregon, between the Tututni on the north and the Chetco on the south. They had no separate villages, and spoke a dialectic variation of the Tututni language. Their tribal name signifies «people among the mushrooms.» A few descendants of the race now live on the Siletz reservation, Oregon.

NAMALAND. See South West Africa.

NAMANGAN, nä-män-gän', Russian Turkestan, a town of Ferghana, on the Sir-Daria, near the confluence of the Narin, about 50 miles northeast of Khokand. It is in a rich oasis, and is the trading centre for the surrounding nomadic tribes. Near it naphtha and coal are found. The principal industries are soap and leather manufactures. Pop. 78,942.

NAMAQUALAND. See South West Africa.

NAMAS. See Hottentots.

NAMAYCUSH, the great lake-trout (q.v.).

NAMES of persons in the very earliest ages no doubt had some significance and meaning, but no record is handed down to us. The Old Testament names are almost all original, that is, given in the first instance to the individual bearing them, and either originated in some circumstance of birth as an expression of some religious sentiment, thus — Jacob (supplanter), Isaac (laughter), Isaiah (salvation of Jehovah), etc. The names of women had equal significance: Rachel (ewe), Hannah (favor), Deborah (bee), etc. In Old Testament times the name was often changed on the occasion of an important event in one's life, Abram becoming Abraham, Jacob becoming Israel, and so on. Neither the Hebrews, Egyptians, Assyrians, Babylonians, Persians nor Greeks had surnames; and in the earliest period of their history the same may be said of the Romans. In course of time, however, every Roman citizen had three, the prænomen or personal name, which was placed first, and commonly written with one or two letters, for example C. for Gaius, Cn. for Gneius, M. for Marcus, Q. for Quintus, and so on. Then followed the nomen, the name of the gens or clan, as Cornelius, Julius, Fabius, from the Cornelian, Julian and Fabian gentes. Lastly came the cognomen or family name, as Cicero, Cæsar, Scipio, etc. Conquerors were occasionally complimented by the addition of a fourth name or agnomen, commemorative of their conquests, as Coriolanus, Africanus, Germanicus, etc. While the earliest Greek names were expressive of some quality in high estimation, as Callimachus (excellent fighter), Apollodorus (gift of Apollo), the Roman names were less dignified and ambitious in their origin; thus Porcius (swineherd), Cicero (vetch grower); some from personal peculiarities, as Naso (longnosed), Paulus (little), Crassus (fat), Cocles (one-eyed). Celtic and Teutonic names had often equal significance, as Gottfried (God's peace), Conrad (bold in counsel), Bertha (brightness), Ethel (noble), etc. Times of great public excitement have had very considerable influence in modifying the fashion in names. Thus the English Puritans preferred Old Testament names and such as directly expressed religious sentiment. Among the Scottish Covenanters Old Testament names were also prevalent. At the French Revolution the names of the most famous Greek and Roman republican heroes were in general favor. Among primitive races, names of familiar objects were first given to clans, local groups, and finally very loosely to individuals.

The principal of the modern system of personal nomenclature now adopted in most countries in Europe is to have one name for the individual (Christian or baptismal name) joined to a second name which is common to the family to which he belongs (surname). It is impossible to state with any degree of certainty when this system became general. No instance is known, we believe, of any Anglo-Saxon family bearing a surname from generation to gen-

eration. They were introduced by the Norman adventurers, but were for centuries confined to the upper classes. Surnames became general in Scotland about the 12th century.

The principal sources from which surnames are derived are the following:

Personal characteristics: Black, Brown, Grey, Green, Whyte; Little, Long, Short, Broadhead, Lightfoot, Cruickshank.

Rank or profession: King, Prince, Pope, Bishop, Abbot, Prior, Stewart or Stuart, Smith, Wright, Carpenter, Taylor, Baker or Baxter, Weaver or Webster, Falconer, Fletcher (arrow maker), Glover, Bowman, Chapman or Marchant, Miller, Brewer or Brewster, Shepherd.

Localities, animals, or natural objects: Hill, Dale, Wood, Forest, Brookes or Burns, Grove, Shaw; Bird, Lyon, Hogg, Crabbe, Fox, Roebuck, Bull; Stone, Tree, Flint, Steele.

Patronymics: Andrews, Anderson, Alexander, Sanderson, Sandison; James, Jameson, Jamieson; Jones, Johnson, Jonson, Jackson; Williams, Williamson, Wills, Wilson; Thom, Thomson; Roberts, Robertson, Robinson.

Surnames in many other languages are derived from like sources: thus Black, White, and Brown *in German* become Schwartz, Weiss, Braun; *in French,* Lenoir, Leblanc, Lebrun.

In the matter of *prefixes and suffixes,* the Gaelic prefix Mac, the Irish O', the Norman-French Fitz, the German suffix -shon or -son, the Scandinavian -sen, and the Russian -vitch are all equivalents of the English -son.

The Hebrews, as already stated, had no surnames proper, nor had the Arabians; but to distinguish two men of the same name, the Hebrews used the form *ben* (Solomon ben David, meaning son of David), and the Arabians used *ibn* (Abraham ibn Ezra, or son of Ezra). The Welsh used the word *ap* in the same way (Evan ap Richard, meaning John son of Richard).

In most nations, a woman upon marrying changes her surname to that of her husband. In Spain, however, she retains it, while the son may adopt either the paternal or maternal name.

In Great Britain a man may change his Christian name and surname without an act of Parliament, royal license, or even public advertisement; but there is no law to compel third parties to use the new name. In the United States names can be changed only by courts of record.

Nicknames.—It is most difficult to classify nicknames of persons owing to the great variety of origins. Some of the chief sources from which they are derived are the following:

Physical peculiarities, complimentary or derogatory terms: Strongitharm, Spindleshanks, Sheepshanks, Crookshanks, Heavisides.

Mental attributes: Grave, Stern, Wise, Sage, Moody, Proud, Courteous or Curteis; Blythe, Gay, Foolhardy, Jolly, Meek.

Complexion and color of hair: Black, White, Brown, Browning, Ruddy, Readman, Hoare, Grey.

Peculiarities of dress; social position: Curtmantle, Shorthose; Bastard, Lacklands.

Animal and vegetable kingdom: Bird, Fish, Fox, Wolfe, Bean.

Compounds are made by applying a sobriquet to a Christian name; for example: Micklejohn, Littlejohn, Properjohn. These names appear again in Norman guise as Grosjean, Petijean, and Bonjean; from the latter comes Bunyan, so that when we speak of "good John Bunyan" we are (perhaps unconsciously) only translating the name. See also NICKNAMES, NATIONAL AND POPULAR.

Consult Weekly, E., *Romance of Names and Surnames* (New York 1922); Withycombe, E. G., *Oxford Dictionary of English Christian Names* (New York 1943).

NAMOUNA, nä-mo͞o-nä′, in Persian mythology, an ever young and beautiful enchantress, born long before any other created thing, yet still retaining all her youthful attractiveness. The idea probably originated in the observation of the changes of nature, the dying of vegetation and its renewal. The same conception has been held concerning the moon for the same reason.

Among various American Indian tribes a very similar myth prevailed. The Navajos personified nature in their goddess Estsánatlehi, "the woman who rejuvenates herself." When she grows to be an old woman she becomes a young girl again. She is always changing but she never dies. She was the mother of the twin war gods by the sun. These sons destroyed the alien gods and bad spirits, and aided the sick suffering from witchcraft. The power of her two sons over witchcraft would seem to connect Estsánatlehi with the moon and also with the sun of whom the moon is generally the wife.

NAMPA, năm′pȧ, city, Idaho, in Canyon County; altitude 2,480 feet; 18 miles west of Boise; on the Union Pacific Railroad. Located in an irrigated area, its chief industries are the processing of dairy products and sugar beets. There are also seed and storage plants and railroad shops. Nazarene College is located here and there is a state institution for the feebleminded. Nampa was incorporated in 1890. Pop. (1930) 8,206; (1940) 12,149; (1950) 16,185.

NAMUR, nä-mo͝or′; Fr. nȧ-mür′ (Flem. NAMEN), city, Belgium, capital of the Province of Namur, located at the confluence of the Sambre and Meuse rivers, 35 miles southeast of Brussels. Of its old fortifications only a picturesque citadel remains, now surrounded by a park and playground. The town is strategically situated and well-built, with spacious streets and several handsome squares. Among its most notable buildings is the 18th century Cathedral of St. Aubain, the archaeological and forestry museums, and public library. The city is famous for its manufacture of fine cutlery and it possesses important leather works and iron and brass foundries. Its trade since early ages had been greatly favored by the two navigable rivers, and as the junction of five main railways it has direct communication with Brussels, Mons, and the French frontier.

Namur dates from the 7th century, under the various names of Namucum, Navinucum Castrum, and Namon. It was taken by Louis XIV in 1692 and retaken by William III of England in 1695. In August 1914 it was occupied by the Germans and again during World War II it suffered great damage. Pop. (1948 est.) 31,637.

NAMUR PROVINCE is bounded on the north by Brabant Province, on the northeast by Liége, on the east by Luxembourg Province, on the south and southwest by France, and on the west by Hainaut. The greatest length, north to south, is 57 miles; the greatest breadth, 37 miles; the total area is 1,413 square miles. The surface

is greatly diversified, well watered by the Meuse, with its tributaries, the Lesse and the Sambre. About one half of the whole surface is cultivated. The chief vegetable productions are the ordinary cereals, oilseeds, chicory, fruit, and medicinal and dye plants. In some places the vine is cultivated. The extensive forests furnish good timber and the prevailing carboniferous strata yield coal, iron, limestone, etc. The industry of the province, both manufacturing and commercial, is largely developed. Namur was an independent country as early as the 10th century. At the close of the 12th century it came into the possession of the counts of Hainaut, and early in the 13th century fell to Peter of Courtenay, emperor of Constantinople. It was sold by his son Baldwin to Guy of Dampierre, count of Flanders, with whose descendants it remained till 1420, when it was purchased by Philip the Good, duke of Burgundy, for 132,000 gold ducats, and afterward shared the fate of the other Burgundian states. Pop. (1944 est.) 350,529, nearly all of whom speak the Walloon dialect. See WAR, EUROPEAN.

NANA, a novel by Emile Zola published in 1879, the ninth in a series of 20 related novels issued, 1871–1893, under the general title, *Les Rougon-Macquart.* Nana, the beautiful daughter of the drunkard Coupeau and the laundress Gervaise (characters in *L'Assommoir,* another of the series) becomes mistress of a shady banker, and next of an actor who beats and finally deserts her. Embittered by these early disappointments in her courtesan career, Nana determines thenceforth to ruin all her lovers. Her victims include a captain who steals from his regimental funds for her, and his brother who commits suicide. In the end she suffers a horrible death in a hotel bedroom. A brutal but powerful story, its implicit theme is the vengeance of the common people meted out to their aristocratic oppressors.

NANAIMO, nä-nī'mō, Canada, a city of the Province of British Columbia, situated on the east coast of Vancouver Island two or three miles south of Departure Bay, and opposite the city of Vancouver on the mainland. Steamers ply daily between the two cities. It is approximately 65 miles northwest of the city of Victoria, with which it is connected by the Esquimault and Nanaimo Railway. There are coal mines and large sawmills in the vicinity, and coal and lumber are exported. Nanaimo is the distributing center for practically the whole of Vancouver Island north of Victoria, and is the headquarters of Vancouver Island Union Library. Pop. (1941) 6,635.

NANAK, nä'nȧk, **NANEK,** or **NANUK,** Hindu religious leader, founder of the sect of the Sikhs: b. Talwandy (now Nankana), in Lahore, 1469; d. Kirtipur, 1538. A member of the warrior caste, he early associated with Kabir, leader of a monotheistic sect, and came under other mystical influences. He traveled to all the holy places of India, made the pilgrimage to Mecca and Medina, and as a result of his studies of Brahmanism and Islam wrote the *Adigranth,* which frequently quotes Kabir, and in general is a mixture of the Vedas and the Koran. This gospel he preached through India; it became the national religion of the Sikhs and was proclaimed by Nanak's successors from Labona down to Govind Singh, who died in 1708. The *Adigranth* preaches the worship of one god, the equality of man, the duty of loving all men, and the need for frequent ablution. See SIKHS.

NANA SAHIB, nä'nä sä'hĭb, real name DANDHU PANTH (dŭn'dōō pŭnt') Maratha leader of the Sepoy Rebellion: b. near Cawnpore, 1825; d. Nepal, about 1859. He was the adopted son of the last Maratha peshwa of Poona, whose great wealth he inherited, but whose annual pension of about $400,000 was not continued to him by the British government. He lived as a native prince, moving in European society, and when the Sepoy mutiny broke out he secretly encouraged it, but openly offered aid to the English. He marched on Delhi at the head of native troops; promised the English a safe conduct from Cawnpore, but shot or drowned all of them but four; and before leaving the city killed all Europeans, women and children included, that he found in the city and threw their bodies into the famous well of Cawnpore. He fled to Nepal, was repeatedly defeated by the English, who ultimately drove him out of the English province into the jungle, and was not heard of after 1859. Consult Landon, P., *Under the Sun, Impressions of Indian Cities with a Chapter Dealing with the Later Life of Nana Sahib* (London 1906); Burgess, J., *The Chronology of Modern India, 1494–1894* (Edinburgh 1913).

NANCHANG, nän'chäng', capital of Kiangsi Province, China, on the Kan River, near Lake Poyang. Linked by rail with Nanking, Hankow, Canton, and Hangchow, it is noted for its porcelain. Pop. (official est. 1945–1946) 203,101.

NANCREDE, C(harles) B(eylard) Guérard de, American surgeon: b. Philadelphia, Pa., Dec. 30, 1847; d. Ann Arbor, Mich., April 12, 1921. Educated at the University of Pennsylvania and at Jefferson Medical College, he practiced in Philadelphia; and after 1889 was professor of surgery and clinical surgery and surgeon of the university hospital at the University of Michigan, retiring in 1913. In the Spanish American War he served as surgeon at the front; and in 1908–1909 was president of the American Surgical Association. He wrote *Essentials of Anatomy* (1888), and *Lectures upon the Principles of Surgery* (1899); and contributed to various reference works, including the *International Encyclopaedia of Surgery* (1881–95), Wood's *Reference Handbook of the Medical Sciences* (1887), *Cyclopedia of the Diseases of Children* (1890), C. H. Burnett's *System of Diseases of the Ear, Nose, and Throat* (1893); and F. S. Dennis' and J. S. Billings' *System of Surgery* (1895).

NANCY (Fr. nŏn-sē), France, the capital of ancient Lorraine, of the former department of Meurthe and since 1872 of the department of Meurthe-et-Moselle, situated in a fertile plain, near the left bank of the Meurthe, 218 miles east of Paris, on the railway to Strasbourg. It is divided into the old and the new town, has extensive suburbs and is strongly defended by isolated *forts d'arrêt.* The old town is irregularly built, with streets narrow and winding; but has several fine public buildings. The new town has straight and spacious streets, intersecting each other at right angles, and traversed by tramways; the houses, almost without exception, are handsome. The Place Stan-

islas, surrounded by several fine public buildings, and communicating, by a triumphal arch, with the Place Carrière, has a fine statue of Stanislas Leszczynski, king of Poland, who passed the latter years of his life here as duke of Lorraine and bestowed upon the town many of its finest modern embellishments. There are statues also to General Antoine Drouot, Louis Thiers and other notabilities. The Cours Léopold, occupying the highest part of the town, and finely planted, is the principal promenade; another is the Pépinière, a large planted area. Among the chief edifices are the cathedral, a modern structure in the Italian style; the church of Saint Epvre, with a lofty tower and a fine portal, one of the finest specimens of modern Gothic in France; the church of the Cordeliers, built in 1484, and containing the tombs of several dukes of Lorraine; the 19th century churches of Saint Peter, Saint Vincent and Saint Leon; Hôtel de Ville (17th century); ducal palace, an elegant specimen of flamboyant Gothic, with a fine porch (16th century); public library; seven handsome gates or triumphal arches. Nancy is the see of a bishop and the headquarters of the 20th Army Corps. At the head of its educational institutions is the celebrated university founded at Pont-à-Mousson in 1572 and removed to Nancy in 1768; it has faculties of law, philosophy, natural science, mathematics, medicine and a school of pharmacy; Nancy also has a lyceum, a botanical garden, a school of forestry, and a theological seminary. The manufactures consist of broadcloth and other woolen stuffs; cotton and cotton yarn, hosiery, lace, all kinds of embroidery, stained paper, and tobacco. There are also ironworks, dyeworks, breweries and tanneries. In a battle fought under its walls, the duke of Burgundy (Charles the Bold) was defeated and slain by René II, duke of Lorraine, in 1477. On Aug. 12, 1870 it surrendered to the Germans, by whom it was occupied until Aug. 1, 1873. The population was largely increased by the influx of Alsatians after the annexation of Alsace to Germany. During World War I Nancy was an important railway center, and as such was frequently under the fire of German artillery and aircraft. An attack made in 1914 was repulsed, and the city remained in French hands during the war. It suffered some damage from shelling by "Big Bertha" and from German bombing. Under German occupation during World War II from June 1940, it was subjected to heavy Allied bombing. Pop. (1936) 121,301.

NANDUS, a Brazilian name for the South American ostrich or rhea. See RHEA.

NANEK, or **NANUK.** See NANAK.

NANINI, nä-nē'nē, or **NANINO,** nä-nē'nō, **Giovanni Maria,** Italian composer: b. Tivoli, c. 1545; d. Rome, March 11, 1607. A pupil of Palestrina, he opened, in Rome, the first Italian public school of music there. He was appointed Maestro di Cappella at Santa Maria Maggiore in 1571. In 1577 he became a member of the Pontifical Choir, and in 1604 maestro of the Sistine Chapel. His compositions are of great value; among them are *Hodie nobis Coelorum Rex; Cento cinquanta sette Contrappunti e Canoni.* His manuscript works are preserved in the private collections of the Sistine Chapel and the Vatican Library. His published compositions take various forms: motets, madrigals, canzonets as well as church music. They are of the Palestrina period. Consult Radicotti, G., *Giovanni Maria Nanini* (Pesaro 1906).

NANKEEN, or **NANKING CLOTH,** a cotton cloth originally manufactured in Nanking. It was imitated in other cotton-producing countries, and has been largely superseded.

NANKING, capital of China, is on the south bank of the lower Yangtze River, about 160 miles from Shanghai. It is about 20 miles in circumference, and is surrounded by a high wall, sections of which were torn down after Nanking became the national capital in 1927. The city and its surroundings are notable for green hills, winding streams, and charming lakes. The principal streets are of moderate width, clean, well-paved, and lined with handsome stores. There are many modern buildings, but most of the houses are only one story high. There are extensive manufactures of fine satin, crepe, and nankeen, the cotton cloth which derives its name from the city. Many modern industries built in and around Nanking since it became China's capital were destroyed when the Japanese captured the city in December 1937. The National University, Ginling College for Women, the University of Nanking, and other schools, with their students and faculties, left Nanking before its capture. When the Japanese armies entered the city they carried out a systematic murdering of Chinese civilians, raping of women, and burning of property. After Japan's surrender the personnel of the cultural and educational institutions of Nanking returned there.

Nanking has long been an important political center. It was the capital of China during several dynasties, including the early Ming period, the Ming emperors subsequently moving their capital to Peking. In 1853 the Taiping rebels proclaimed the Taiping Heavenly State there. When the Chinese Republic was first proclaimed it had its seat in Nanking. Before the Nationalists established their capital there in 1927 it was the capital of Kiang-su Province. After occupying Nanking the Japanese set up a puppet regime there called the Reformed Government of the Republic of China, which collapsed after Japan's surrender. On September 9, 1945, China formally took over the city from the Japanese, and on May 5, 1946, the national government formally returned to Nanking. Pop. (est. 1945–1946) 856,364.

NANNA, nän'nä, in Scandinavian mythology, the wife of Balder and the goddess of immaculate purity. Her name means "blossom" and she was the daughter of Nip, which means "bud," and a goddess. In the myth of the *Death of Balder the Beautiful,* his wife, Nanna, falls dead by the side of the corpse of her husband and is placed upon the bier with him that she may accompany her beloved even in death. When Hermod visited the land of the dead to gain the freedom of his brother, he found Nanna ministering to him as he lay sick and pale on a couch. Balder wished Hermod to take Nanna back with him; but she refused to leave her husband. Balder is the personification of life-giving light and his wife,

Nanna, is the personification of vegetation which dies when the great light giver, the sun, goes on his winter journey to the south. Balder is generally called the radiant god of sunshine; and his wife, like the classical Proserpina, goes down into the underworld.

NANNING (YUNGNING), an important city in southwest Kwangsi Province, China, is on the north bank of the Yukiang, chief southern tributary of the Sikiang. Linked by rail with French Indochina and by road and river with Kweilin, capital of Kwangsi, and with Canton, it is a trading center for rice, hemp, tobacco, and cotton cloth. Pop. (official est. 1945–1946) 409,613.

NANSEN, Fridtjof, frēt'yŏf nän'sĕn, Norwegian Arctic explorer, zoologist, statesman, and humanitarian: b. Fröen, Norway, Oct. 10, 1861; d. Oslo, May 13, 1930. He studied zoology at the University of Christiania (now Oslo), and in 1882 made an Arctic voyage in a sealing vessel for the purpose of studying animal life in the higher latitudes. On his return he was appointed curator of the Museum of Natural History, Bergen. In 1888, he led an expedition across Greenland a little north of latitude 64°N., an account of this journey being published in England in 1891, under the title *Across Greenland.* He returned to Norway the following year and was appointed curator of the Museum of Comparative Anatomy at the University of Christiania. In 1893, he sailed aboard a specially built steamer, the *Fram,* in the expectation that, entering the polar ice in the neighborhood of the New Siberian Islands, the ship would drift eastward south of the pole and come out on the east side of Greenland. This expectation was based on the fact that articles belonging to the *Jeannette,* an Arctic expedition vessel lost in 1881 (see JEANNETTE EXPEDITION), had drifted in about three years from Bering Strait across the polar regions to Greenland. After being carried to latitude 83°59'N., he left the *Fram* and, with a single companion, Lieut. F. H. Johansen, took to the ice, equipped with sledges, dogs, and kayaks. In this way he reached a higher latitude than any previously attained, 86°14'N. (April 8, 1895), and then turned southwestward to Franz Josef Land (now Fridtjof Nansen Land), where he spent the winter of 1895–1896. On June 17, 1896, he fell in with members of the Jackson-Harmsworth Expedition (see JACKSON, FREDERICK GEORGE), with whom he returned by ship to Vardö, Norway. The *Fram* (under Capt. O. N. Sverdrup), which had reached latitude 85°57'N., arrived in Norway eight days later via the west coast of Spitzbergen (Svalbard). Numerous honors were conferred upon Nansen, including a professorship of zoology at the University of Christiania. In 1900, he joined an expedition to explore the North Atlantic, and in the following year became director of the International Commission for Study of the Sea. He was strongly favorable to the separation of Norway from Sweden (1905), and served as the first Norwegian minister to Great Britain (1906–1908). He resigned his diplomatic post in 1908 to become professor of oceanography at the University of Christiania. Between 1910 and 1914, he made four oceanographic expeditions in the North Atlantic and Arctic oceans. At the close of World War I, he was placed in charge of the repatriation of about 500,000 prisoners of war from Siberia, China, and other parts of the world. Under the sponsorship of 12 governments and 48 national Red Cross societies, he directed the administration of relief to sufferers from famine in Russia (1921–1923). He also served as League of Nations high commissioner for relief work among Russian, Armenian, and Greek refugees. For these activities, he was awarded the Nobel Peace Prize for 1921–1922. A strong supporter of the League of Nations, Nansen subsequently served as Norwegian delegate to the League. In 1925, he was chosen rector of St. Andrews University, Scotland. Among his published works are *Eskimo Life* (1891), *Farthest North* (1897), *Norway and the Union with Sweden* (1905), *Through Siberia* (1914), *Armenia and the Near East* (1928), and numerous scientific books, including reports of his various expeditions.

NANSEN, Hans, Danish statesman: b. Flensburg, Schleswig-Holstein, Nov. 28, 1598; d. Copenhagen (Köbenhavn), Nov. 12, 1667. As mayor of Copenhagen, Nansen was the leader of the antiaristocratic party whose influence resulted in the abolition of the privileges of the nobility and the institution by Frederick III of the absolute monarchy in Denmark (1660).

NANTERRE, nän-târ', France, town in the Department of Seine, located at the foot of Mount Valérien, eight miles west of Paris. Its chief industry is the manufacture of chemicals. It is the traditional birthplace of St. Geneviève (q.v.), patron of Paris. Pop. (1946) 41,860.

NANTES, nänt, France, capital of the Department of Loire-Inférieure and an important commerical port, situated on the right bank of the Loire at its confluence with the Erdre, 248 miles by rail west-southwest of Paris. The usefulness of the port was enhanced by the construction of a ship canal in 1891 to St. Nazaire, 40 miles to the west at the mouth of the Loire, and by extensive harbor improvements undertaken after 1914. The city is the see of a bishop; it has courts of first resort and of commerce, a chamber of commerce and an exchange, a college, a seminary, a secondary ecclesiastical school, a secondary school of medicine, and a hydrographic school. Among its products are blankets, textiles, ship machinery and supplies, cordage, chemicals, glue, and various food products, including biscuits, sugar, sardines, and preserved meats. There are also cotton mills, iron works, glass works, and important shipbuilding docks. Nantes carries on an extensive trade with the French Union and with foreign countries. Among the more interesting public buildings are the cathedral, in flamboyant Gothic style, which was begun in the 15th century and completed in the 19th; the ducal castle, which dates back to the 9th or 10th century and was rebuilt in the 15th century, flanked with massive round towers; the Palais des Beaux Arts (1900), which contains a fine collection of paintings.

Before the conquest of Gaul by the Romans, Nantes was the principal town of the Namnetes, a leading Gallic tribe of Brittainy. During the 9th century it was thrice taken by Norse raiders and almost entirely ruined. In 1118, when it had again become prosperous, a fire reduced the greater part of the town to ashes. During the Hundred Years' War, it suffered much, repeatedly falling into the hands of the opposite parties. For a long time it formed one of the most valuable

possessions of the dukes of Brittany, but in 1499 the heiress of the dukedom, Anne of Brittany, who was born here, having married Louis XII, it passed with the rest of her possessions to the Crown of France. The most memorable event connected with the history of Nantes is the famous edict (see EDICT OF NANTES) issued by Henry IV, April 30, 1598, securing the Protestants in the free exercise of their religion, and making them eligible to all civil and military employments. This edict was revoked by Louis XIV in 1685. The *noyades* or drownings of the monster Jean Baptiste Carrier (q.v.) during the revolution were perpetrated here. Pop. (1946) 195,185.

NANTES, Edict of. See EDICT OF NANTES.

NANTEUIL, năn-tû'y, **Robert,** French copperplate engraver: b. Reims, 1623; d. Paris, 1678. His father-in-law, Nicolas Regnesson, was his first instructor and in 1647 he went to Paris and worked under the eye of Philippe de Champaigne (q.v.). Louis XIV appointed him designer and engraver to the king. He employed in his work a simple line which grew gradually thicker at the shade point and died away toward the high light in faint and fainter stipple points; in this way he produced the fine color values which characterize his engravings. In his portraits, of which about 200 exist, he exhibits powerful modeling and lifelike drawing. They include portraits of Louis XIV, Anne of Austria, Madame de Sévigné and other renowned persons. Some of these latter works are after the paintings of Charles Lebrun. He also executed some excellent pastels.

NANTICOKE, năn'tĭ-kōk (Nentigo, "tidewater people"), a former American Indian tribe of the Algonquian family residing, when first discovered by the whites, on the east shore of the Nanticoke River, where their principal village, also called Nanticoke, was situated in 1608. Their language was very closely related to that of the Delaware. They were great fishers, trappers and hunters and according to tradition they had, at an earlier period in their history, gone southward in search of game, when their old hunting grounds had become too densely populated for a nomadic race. Tradition also says that a league existed between the Nanticoke and other tribes covering a large extent of territory, for many generations. Already in 1642 the Nanticoke had been declared enemies of the Maryland colony; but in 1678 a treaty was made with them; and 20 years later reservations were set apart for them. About 1725 they began to move northward gradually, going up the Susquehanna and finally settling at Oswego, Chenango and Chugnut in the State of New York. A part of the tribe, however, under the name of Wiwash, remained behind in Maryland. Some of those in New York State amalgamated with the Iroquois; but most of them, feeling the pressure of civilization, went west into Ohio and Indiana and there joined the Delawares about 1784.

Among all the neighboring tribes the Nanticoke Indians had the reputation of being great magicians; and they were greatly feared on this account. A head chief ruled over all the villages, thus binding together the interests of the tribe or tribes composing the Nanticoke people. Apparently this chief was sometimes a woman. They fortified their towns against the enemy. In the "Nanticoke Confederacy" were included the Nanticoke proper, Arseek, Cuscarawaoc, Nause and Sarapinagh and perhaps Ozinies and other sub-tribes. In southern Delaware there are still numerous half-breed Nanticoke.

NANTICOKE, city, Pennsylvania, in Luzerne County; altitude 538 feet; on the Susquehanna River; 7 miles southwest of Wilkes-Barre; on the Central of New Jersey and Pennsylvania railroads. Nanticoke is a coal producing center, situated in one of the richest anthracite coal regions in the world. A large portion of Pennsylvania's anthracite is taken from the Luzerne deposits. In addition to the mining of coal, its principal industry, there are manufactures of silk and rayon yarns, cigars, and mining and foundry equipment. Nanticoke Falls furnish the water power for local mills and factories. The city is a wholesale and retail trading center for several smaller municipalities near by. Across the Susquehanna from Nanticoke is the village of West Nanticoke, near which is the only tract of land still in the possession of descendants of William Penn. The property, on Tillsbury Knob (a high, cone-shaped brownstone hill), is a part of the original land grant. The land on which Nanticoke is built was once occupied by a Nanticoke Indian village. Surveyed and platted in 1793, Nanticoke was incorporated as a borough in 1874; in 1926 it was granted the city charter under which it now operates. The government is administered by a mayor and council. Pop. (1950) 20,160.

NANTUCKET ISLAND, Massachusetts, is situated about 25 miles south of Cape Cod across Nantucket Sound. To the west Muskeget Channel separates it from Martha's Vineyard. Extending 14 miles in an east-west direction, Nantucket, with two small islands off its western extremity, Muskeget and Tuckernuck, constitute Nantucket County, area 46 square miles; the county and Nantucket town are coextensive. The village of Nantucket, located on a good harbor on the north shore, is the county seat and chief trading center; it has steamer connections with Wood's Hole on Cape Cod.

The town has a public library (the Athenaeum), the Jethro Coffin house (1686), an old mill, and a fine whaling museum. Its historic houses built by whaling captains from the profits of voyages to the Pacific islands and the Orient, its Old New England atmosphere, and natural advantages for boating and bathing have made it a popular summer resort and artists' colony. Smaller communities on the island are Siasconset (skŏn'sĭt) on the east coast, Wauwinet, Quidnet, and Squam Head.

Visited by Bartholomew Gosnold in 1602, it was first settled in 1659 at a place called Madaget by families from Salisbury, Mass., led by Thomas Macy, and was long a center of Quaker influence. The town was incorporated in 1687 and the county formed in 1695. In the 18th century it became a famous whaling port, and it continued a center of the industry until the mid-19th century. There are regular town meetings and officials are elected annually. Pop. (1950): village, 2,901; town, 3,484.

NAON, nä-ōn', **Rómulo S.,** Argentine diplomat: b. Buenos Aires, Feb. 17, 1876; d. there

Dec. 30, 1941. He studied at the University of Buenos Aires and later became professor of philosophy at the Colegio Nacional de Buenos Aires, then professor of constitutional law and member of the directive council faculty of law and social sciences. He entered political life (1902) as representative of the National Congress and was re-elected (1906), becoming minister of justice and public instruction (1908). He was (1910–1914) envoy extraordinary and minister plenipotentiary to the United States and in the latter year became the first ambassador of Argentina to the United States. He was re-elected (1912) to the National Congress but resigned to remain with the United States. In 1917 he resigned his office because his country's government refused to declare war against Germany. He served as general secretary of the Argentina delegation to the second Hague Peace Conference, was a member of the A.B.C. (Argentine-Brazil-Chile) Peace Conference (1914) at Niagara Falls, to avoid war between the United States and Mexico, a delegate at the Pan American Conference (1915). For his services he was awarded numerous decorations. He wrote several works on political science and constitutional law, and received the honorary degree of LL.D. from Pittsburgh, Yale, Harvard and Brown universities.

NAOROJI, nou-rō'jē, **Dadabhai,** first Indian member of the British Parliament: b. Bombay, Sept. 4, 1825; d. July 2, 1917. The son of a Parsi priest, he was educated in the Bombay school, later the Elphinstone School and College, where he was the first native professor of mathematics and natural philosophy (1854). In 1855 he went to England, where he afterwards, for the most part, resided. In 1867 he assisted in founding the East India Association; through his efforts in 1870 the civil service was opened to native Indians; and he accomplished much for the improvement of Indian finance and industries. He became prime minister to the prince of Baroda in 1874; from 1875 to 1887 he held important municipal and legislative positions; and in 1886 and 1893 was president of the Indian National Congress. For many years he was president of the London Indian Society. From 1892 to 1895, as a Liberal, he represented Central Finsbury in the House of Commons, and in the latter year was made a member of the royal commission formed to inquire into Indian expenditure, etc. He published *England's Duties to India* (1867); *The Wants and Means of India* (1870); articles collected in 1887; *Poverty and Un-British Rule in India* (1901), and *The Rights of Labour* (1906).

NAPA, năp'ȧ, city, California, and Napa County seat; altitude 20 feet, 49 miles northeast of San Francisco, on the Napa River.

The city is a trade and shipping center for the farmers and residents of Napa Valley. The transportation facilities are excellent. They include railroad (the Southern Pacific); navigable water (the Napa River), four lane highways, and air (the city has a modern airport).

The chief manufactures are: steel pipe, building blocks, gloves, paper boxes, shirts, wine, and leather. Agricultural products include grapes and other fruits.

The California Veterans' Home and Napa State Hospital are located nearby. Tourist attractions include the petrified forest, mineral springs, and the Napa redwoods.

Settled in 1840, the city was incorporated in 1872. The government is administered by a mayor and 5 councilmen. Pop. (1950) 13,542.

NAPANEE, county town, Canada, of the united counties of Lennox and Addington, Ontario, on the Napanee River which is navigable from Napanee to its mouth (7 miles) in the Bay of Quinte. It is on the main line of the Canadian National Railway between Toronto and Montreal, 135 miles east of the former. The town, which originated in a mill on the river in 1785, has 15 industries, the principal ones being a concentrated milk plant and a furniture factory. It is in a good farming district and has five churches, a public school and collegiate institute, two weekly newspapers, three banks, and a park and athletic field of 32 acres. Pop. (1951) 3,863.

NAPERVILLE, nā'pĕr-vĭl, city, Illinois in Du Page County; altitude 693 feet; on the Du Page River; 28 miles southwest of Chicago; on the Chicago, Burlington and Quincy Railroad. Its industrial products are furniture, bags, ice cream, and cement blocks; and there are boiler works. Naperville is also a college town, seat of North Central College (Evangelical, coeducational) founded at Plainfield in 1861, removed to Naperville in 1870. Affiliated with it is the Evangelical Theological Seminary. Naperville, first settled in 1831, was named for Joseph Naper who platted the townsite in 1832 and built the first sawmill. It was incorporated as a village in 1857, as a city in 1890, and was county seat from 1839 to 1868. The city has commission form of government. Pop. (1940) 5,272; (1950) 7,013.

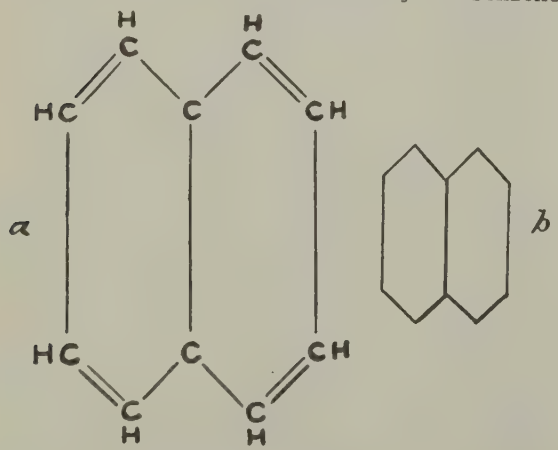
NAPHTALI, năf'tȧ-lī (Hebrew, "wrestler"), the sixth son of Jacob by Bilhah, Rachel's maid (Genesis 30:7, 8), one of the 12 patriarchs and eponymous founder of one of the 12 tribes of Israel. The territory of Naphtali lay to the northwest of the Sea of Galilee; of this tribe was Barak, the hero and deliverer of Israel in the days when Deborah, the wife of Lapidoth, judged Israel. This frontier tribe was exposed to the incursions of the adjoining heathen, and is specially mentioned in the Song of Deborah as among those who "jeopardized their lives under the death" in the battle against Jabin the Canaanite king. Tiglathpileser, when he overran the north of Palestine, carried off the whole population to Assyria, after which Naphtali disappears from history. The district became famous under the name of Galilee as the home of Jesus Christ and most of his apostles. Capernaum, Tiberias, Magdala and Chorazin lay within the ancient boundaries of the tribe of Naphtali.

NAPHTHA, năf'thȧ, in the commercial sense a product of the fractionation of crude petroleum, obtained by the redistillation of benzine, being the heavier constituent after the benzoline has distilled over. It is also called "mineral naphtha." Another commercial article is "solvent naphtha," a somewhat similar liquid obtained in the fractionation of coal-tar, distilling over between the temperatures of 250° and 330°F. In the chemistry of the ancients the term included all inflammable liquids, especially the more fluid sorts of asphalt or bitumen; the word which is of Persian origin and signifies "moist" being

first used of the Persian product and then applied more generally. In modern usage and among chemists the term is applied to any volatile inflammable liquid product of organic decomposition, as the distillation products from peat, wood, india-rubber, bones, etc. These vary in density from 0.67 to 0.72, and in gravity from 90° to 60° Beaumé. American petroleum naphtha constitutes from 6 to 20 per cent of the crude petroleum. Russian petroleum is only 5 or 6 per cent naphtha. Scotland produces a naphtha called shale-spirit, being 4 or 5 per cent of the crude shale oil, and rather heavier than most other naphthas, but not so heavy as the coal-tar naphthas, which vary in specific gravity between .850 and .950. Caoutchine is another name for india-rubber naphtha. The uses of naphtha are various, the lighter grades being utilized as detergents in the cleansing processes preparatory to dyeing, and in the dry cleaning of clothes and gloves. The coal-tar naphthas are largely employed as solvents in making india-rubber goods. The Scotch shale-spirit is the liquid component of a wood preservative. Naphtha is also used very largely as a solvent in the extraction of oils from oil seeds, and of essential oils in the manufacture of perfumes and essences.

NAPHTHA-POISONING. While the vapors, and even the ingestion of naphtha in small quantities, have not been found poisonous to human beings, the fumes resulting from the burning of naphtha are deadly if in admixture with the air in a confined place. This poisoning effect is due to the large proportion of carbon monoxide — about 7 per cent — contained in the residual gases. A proportion of one-tenth of 1 per cent in the air renders it dangerous to the majority of persons. A considerable number of fatal accidents have been caused by breathing the exhaust gases from a gasoline-burning automobile in the restricted space of a small garage. See PETROLEUM-POISONING.

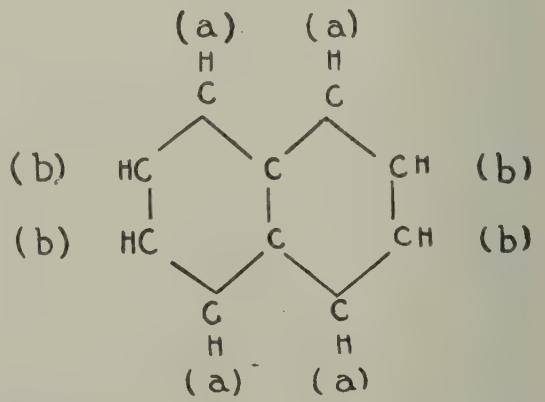
NAPHTHALENE, or **NAPHTHALIN,** a coal-tar product consisting of carbon and hydrogen, with the chemical composition $C_{10}H_8$ and a certain chemical similarity to benzene.



Its peculiar chemical composition may be represented by the graphic formula known as the condensed benzine rings, as below. These are generally written without the letter symbols, as at b.

Naphthalene is prepared from the middle or "carbolic" oil obtained in the distillation of coal-tar between the boiling point temperatures of 410° and 460° F. The naphthaline crystallizes out on cooling, is then centrifugalized, pressed, warmed, stirred with caustic soda and, after the addition of sulphuric acid and several washings with hot water, is either sublimated or distilled. Physically, naphthalene is a white solid, with brilliant, leafy crystals, melting at 175° F. to a colorless liquid, which boils at 425° F. It burns with a sooty flame and pitchy odor. It is insoluble in cold water, slightly soluble in water at a higher temperature and easily soluble in the essences, in boiling alcohol or in ether. Naphthalene forms a multitude of various compounds, mostly by simple addition; the most important are the various sulphonic acids, such as $C_{10}H_7SO_3H + H_2O$, used in the manufacture of dyes. The nitro-derivatives of naphthalene are also extensively used as intermediates in dye-making. Under the popular name of "moth balls" or "coal-tar camphor," naphthalene is used to keep moths and other insects from clothes. It vaporizes slowly with no residue, and is useful to some extent as a disinfectant and deodorizer. Consult Tinkler, C. K., and Challenger, F., 'The Chemistry of Petroleum and Its Substitutes,' (New York 1915).

NAPHTHOL, in chemistry, a substance derived from naphthalene in the same way that phenol is derived from benzene.— that is, by replacing one of the hydrogen atoms of the



hydrocarbon by a molecule of hydroxyl, OH. Its chemical name is hydroxynaphthalene. The empirical formula for naphthalene being $C_{10}H_8$, the corresponding formula for naphthol therefore is $C_{10}H_7.OH$. In benzene the substitution can be made in only one way, because the molecule of that substance is chemically symmetrical, its hydrogen atoms being all similarly related to one another, and to the carbon atoms. In naphthalene, however, two essentially different kinds of substitution are possible, according to the position of the hydrogen atom that is replaced. This will be understood by reference to the structural formula of naphthalene, as presented herewith. The hydrogen atoms in the positions marked "a" are more directly associated with the central pair of carbon atoms than are those in the positions marked "b"; and we must therefore admit that two chemically different naphthols are possible, according as the hydrogen that is replaced by hydroxyl is an "a" atom or a "b" atom. These two naphthols are in fact known, and to distinguish them from each other the prefixes

«alpha» and «beta» are attached to the name. Thus «alpha-naphthol» is the compound obtained by replacing one of the «a» hydrogen atoms by OH, and «beta-naphthol» is the compound obtained by a similar replacement of a «b» atom. Both of the naphthols resemble ordinary phenol (or carbolic acid), and both are used as antiseptics and also in the preparation of certain of the coal-tar colors. The naphthols exist in coal-tar in very small quantities in the fractions made at a high boiling point and may also be prepared by the action of fuming sulphuric acid upon naphthalene, followed by treatment with sodium hydroxide. In the making of a naphthol the sulphuric acid treatment is conducted at a temperature ranging from 175° to 190° F. For B-naphthol the temperature is kept at 390° F. Alpha-naphthol crystallizes in short lustrous monoclinic needles, which melt at 201° F. and boil at 543° F. Beta-naphthol crystallizes in flat plates or tablets, melts at 253° F. and boils at 547° F. Both are slightly soluble in hot water, and both dissolve freely in alcohol, ether and benzene. The solution of A-naphthol in water has a violet color; that of B-naphthol a yellow color. The naphthol derivatives of most value in the arts are their sulphonic acids, and di-sulphonic acids, and the tri-sulphonic acid of A-naphthol, and chromotrope acid or chromogen; all used in the production of coal-tar dyes.

NAPHTHYL, a hyrocarbon radical $C_{10}H_7$, occurring in the compounds and derivatives of naphthalene. It is a merely hypothetical group as it appears only in compounds. If its existence be assumed, naphthalene ($C_{10}H_8$, or $C_{10}H_7.H$) is merely its hydride; naphthol or naphthyl alcohol in the same way might be considered a hydrate of naphthyl, since its formula may be written $C_{10}H_7OH$. Dinaphthyl ($C_{20}H_{14}$) is a carbide formed by the action of heat upon naphthalene; it is a solid and is fusible at 154° C.

NAPIER, nā'pĭ-ẽr, Sir **Charles,** British naval commander, cousin of Sir Charles James and Sir William Napier (q.v.): b. Merchiston Hall, Stirlingshire, 6 March 1786; d. Merchiston Hall, Hampshire, 6 Nov. 1860. At 13 he entered the navy as a volunteer and in 1805 was promoted lieutenant. In 1807 he became commander, and from the gallantry he displayed in the pursuit of three French line-of-battle ships in 1809 was shortly after made post-captain. He was then put on halfpay and joined the British army in Portugal where he took part in the battle of Busaco. In 1814 he was dispatched to the United States, and led an expedition against Baltimore. In 1827 he received the command of the *Galatea,* in which he was employed on the coast of Portugal and the Azores. Becoming acquainted with the Duke of Terceira and other Constitutionalists, he accepted the command of their fleet, and by his defeat of the Miguelites in a naval engagement effected the relief of Oporto and the establishment of Donna Maria on the throne. For his services the Portuguese government created him Count Cape Saint Vincent and nominated him admiral-in-chief. He soon returned to England and in 1839 was ordered to the Mediterranean, where, upon the outbreak of the war between Mehemet Ali and the Porte, and the co-operation of Britain with Russia and Austria on behalf of the latter power, he performed some of his most gallant exploits, including the storming of Sidon and the capture of Acre. Having blockaded Alexandria, he concluded on his own responsibility a convention with Mehemet Ali, by which the latter and his family were guaranteed in the hereditary sovereignty of Egypt on resigning all claim to Syria. In 1841 he was elected member of Parliament for Marylebone, and proved himself a warm advocate of liberal measures and naval reform. In 1847, while in command of the Channel fleet, he compelled the emperor of Morocco to grant compensation for the injuries inflicted by him on British commerce. On the commencement of the Crimean War he was nominated to the command of the Baltic fleet, but in this capacity had few opportunities for striking a decisive blow, which at the time somewhat disappointed his country. Sir Charles Napier was an author as well as a commander and published 'The War in Portugal' (1836); 'The War in Syria' (1842); 'The Navy, its Past and Present State' (1851). Consult Elers Napier, 'Life and Correspondence of Admiral Sir Charles Napier' (1862); Williams, H. N., 'The Life and Letters of Admiral Sir Charles Napier, K.C.B.' (London 1918).

NAPIER, Sir **Charles James,** English soldier and administrator: b. London, 10 Aug. 1782; d. Oaklands, near Portsmouth, Hampshire, 29 Aug. 1853. He entered the army as ensign in his 12th year and within four months was gazetted lieutenant. Having become captain in 1803, he accompanied his regiment to the Peninsula and distinguished himself at Coruña, where he had the rank of major, and where, after receiving five wounds, he was taken prisoner. In 1810 he returned to the Peninsula and fought at Busaco. After obtaining the rank of colonel and taking part in most of the leading events of the Peninsular campaigns, he returned to England on the conclusion of peace. He was in the United States during the War of 1812, and after his return took part in the storming of Cambrai in 1815. From 1822 to 1830 he was governor of the island of Cephalonia, where he pleased the inhabitants better than the authorities at home. In 1841 he sailed for the East to assume the chief military command within the presidency of Bombay. He was shortly afterward called to Sind in consequence of the determination of Lord Ellenborough, then governor-general, to punish the ameers for alleged misconduct during the Afghan war. This policy was ably carried out by Napier, first by the splendid victories of Meanee (17 Feb. 1843) and Hyderabad (24 March) and afterward by the administration of Sind as a conquered province, of which Lord Ellenborough made him governor. He retired in 1841, but during the Sikh war of 1848–49 he sailed once more for the East as commander-in-chief of all the forces in India. Having taken a step which subjected him to an unceremonious rebuke from the Marquis of Dalhousie, the governor-general, he resigned and returned to England the next year. Consult Bruce, 'Life of General Sir Charles Napier' (1885); Butler, 'Sir Charles Napier' (1890).

NAPIER, John, Scottish mathematician: b. Merchiston, near Edinburgh, 1550; d. there, April 4, 1617. He was educated at St. Andrews, traveled in Europe, returned to a life of proprietorship and leisurely study, and published in 1593 his *Plaine Discovery of the Whole Revelation of St. John,* which was an original work, without a predecessor in its line. For a time he busied himself with devising instruments of war, such as "burning glasses" for firing hostile vessels; a piece of artillery for destroying everything round the arc of a circle; and a round metal chariot, from which shot might be fired through small openings while the enemy became "abased and altogether uncertain." Sir Thomas Urquhart (*The Jewel,* 1652) says that the artillery was tried on a Scottish plain with the slaughter of many sheep and cattle. His great work, *Mirifici Logarithmorum Canonis Descriptio,* appeared in 1614. This explained the nature of logarithms (q.v.), then styled "artificial numbers," and supplied the table for their application. It astonished Europe and deeply interested Kepler, who helped to extend the use of logarithms. With Henry Briggs (q.v.), Napier devised the new canon in which 0 represented the logarithm of unity and 10,000,000,000 that of the entire sine. His *Mirifici Logarithmorum Canonis Constructio* (1619) explained the method of constructing the table; and the *Rabdologia* (1617) was a description of enumeration by bone or ivory rods, which, known as "Napier's rods," were widely employed in Europe for assistance in multiplication, division and the extraction of the square and cube root. Consult Napier, Mark, *Memoirs* (1834).

NAPIER, Robert Cornelis Lord Napier of Magdala, English soldier: b. Ceylon, Dec. 6, 1810; d. London, Jan. 14, 1890. Educated at the Military College, Addiscombe, he entered the Bengal Engineers, and during the second Sikh war (1848) was present as chief engineer at the siege of Multan, and after its fall took part in the battle of Gujarat. When the Mutiny broke out in 1857 he was appointed chief of the staff to Sir James Outram (q.v.), and in the second relief of Lucknow he constructed the engineering works which enabled Sir Colin Campbell (q.v.) to capture the city. In the Chinese campaign of 1860 he was second in command, and in 1865 became commander in chief of the Bombay army. He commanded in 1868 the expeditionary force against King Theodore of Abyssinia, defeated the king's forces, released the English prisoners and stormed the mountain fortress of Magdala (April, 1868). For his services in this short but brilliant campaign he was rewarded with a peerage and a pension. Subsequently he was appointed commander in chief in India (1870), governor of Gibraltar (1876) and constable of the Tower (1887). At his death he was buried in St. Paul's with military honors. Consult Markham, *History of the Abyssinian Expedition* (1869), and Escott, *Pillars of the Empire* (1879).

NAPIER, Sir William Francis Patrick, British soldier and author, brother of Sir Charles James Napier (q.v.): b. Kildare, Ireland, Dec. 17, 1785; d. Scinde House, Clapham, London, Feb. 12, 1860. At 14 he entered the army with his brothers Charles and George, took a distinguished part in the Peninsular campaigns, received seven decorations for the share borne by him in as many principal actions, including Busaco, Salamanca, the Nivelle and Orthez. Some years later he began his celebrated *History of the Peninsular War* (6 vols., 1828–1840). It furnishes the best and most interesting record existing of the momentous transactions which it chronicles, though from its opposition to the prevailing politics of the day, its merits were at first insufficiently appreciated. In 1841 he was advanced to the rank of major general, was appointed lieutenant-governor of Guernsey the following year and in 1848 created a K.C.B. Criticisms on his brother's proceedings in India called him forth as his champion, and produced successively the *Conquest of Scinde* (1845); *History of Sir Charles Napier's Administration of Scinde* (1851); and *Life and Opinions of the Late Sir Charles Napier* (1857). He also wrote *English Battles and Sieges in the Peninsula.* Consult *Life* by Lord Aberdare (1864).

NAPIER OF MAGDALA. See Napier, Robert Cornelis.

NAPIER. The chief town and port of the district of Hawkes Bay, east coast of North Island, New Zealand. It is the center of a large district of squatters and is rather wealthy for its size. Being a peninsula, it has excellent harbors. Its bay ranks with that of Naples for picturesqueness. The exports are wool and frozen meats. The town has freezing plants and a number of other prosperous industries. It has a beautiful cathedral, the Church of St. John. Napier is a famous winter resort. Pop. (1936) 15,302 (with suburbs, 18,689).

NAPIER'S RODS, *in mathematics,* a set of rods contrived by John Napier in 1617 for the purpose of facilitating the numerical operations of multiplication and division.

NAPLES, nā'plz (It. Napoli, nä'pō-lē; anc. Neapolis), commune and city of Italy, the capital of the province of the same name and of the region Campania, is situated on the north shore of the Bay of Naples (q.v.), 120 miles southeast of Rome. For centuries the capital of the Kingdom of Naples (q.v.) and of that of the Two Sicilies (see Sicilies, The Two), it is still the commercial and cultural center of southern Italy. It ranks as the country's third largest city in population and is, after Genoa, its busiest port. The incomparable natural beauties and balmy climate have charmed visitors from all over the world, starting with Virgil, who is buried in nearby Posillipo, down to Wolfgang Goethe, Percy B. Shelley, Giacomo Leopardi and the innumerable tourists who visit it every year. Its gay festivals and songs have also acted as a special attraction.

Naples occupies a fan-shaped area about five miles long along the bay and stretches inland up the slopes of the surrounding hills. The older quarters—among them Santa Lucia, still the most characteristic—and the business districts lie near the coast and on the lower slopes, while the more modern residential sections extend well up the hills, especially the Vomero. Along the waterfront, from Castel Nuovo to the little fishermen's inlet of Mergellina, runs a beautiful thoroughfare: here is the picturesque little port of Santa Lucia. Beyond Mergellina, the road

winds up the hill to Posillipo, noted for its beautiful villas. The slums of Naples have long been among the worst in Europe, overcrowding, disease, crime, and misery plaguing its narrow alleys. A modernization program, which had a slow start after the cholera epidemic of 1884, is still under way and progress is being made.

Tourist trade is one of the city's sources of income, as its industrial development has never been commensurate to its commercial and cultural importance. In and around Naples there are, however, food processing plants, railroad shops, shipyards, iron and steel works, an oil refinery, and factories producing leather goods and chemicals. Naples is still the import and export center for all of southern Italy. Improvements of the natural harbor were first started in the 13th century, continued by the Bourbons, and more efficiently undertaken by the Italian government in recent years. During World War II the harbor facilities were practically obliterated by Allied bombings and pitiless demolition by the retreating Germans. Reconstruction is now almost completed.

The seat of an archbishop, Naples boasts more than 200 churches: many date back to the 13th and 14th centuries, but were extensively restored in the 17th and 18th centuries, the golden era of the Neapolitan baroque, when a large number of new churches were also erected. Santa Chiara, the church of royalty and nobility, is perhaps the finest; it has tombs of the Angevins and a beautiful 17th-century cloister. It suffered severe damage during World War II as did the Church of Monteoliveto, rich in Renaissance sculpture. In the cathedral is the chapel of San Gennaro (St. Januarius), an example of 17th century Neapolitan art; it contains, among other relics of the saint, who is the patron of Naples, two vials of his blood, said to come to a boil twice a year, a miracle witnessed excitedly by hundreds of Neapolitans. San Giovanni a Carbonara, San Domenico Maggiore, i Gerolomini, and Santi Severino and Sosio are but a few of the churches deserving special mention. The Royal Palace (1600–1602) contains the National Library.

Of the city's medieval castles, Castel Nuovo (13th century) dominates the port and has a sculptured Renaissance triumphal arch; Castel dell'Ovo, on a rocky islet off the promenade, dates from 1128; and imposing Castel Sant'Elmo (14th century) overlooks the city from a hill. On another hill stands the Royal Palace of Capodimonte, with a collection of 19th century Neapolitan paintings and fine specimens of the ceramics made here in the factory founded by Charles of Bourbon in 1737, now closed. The National Museum of Naples is one of the richest in Italy: it contains the famous Farnese collection and all findings from Pompeii, Herculaneum, and other neighboring towns.

Naples had also a rich cultural life: in the 17th century a painting school flourished, and in the 17th and the 18th the greatest musical brilliance was achieved with Alessandro and Domenico Scarlatti, Giovanni Paisiello, Domenico Cimarosa and G. B. Pergolesi. The Conservatory of Music and the San Carlo Opera House, founded in 1737, are among the country's best. Founded by Emperor Frederick II in 1224, the university is southern Italy's chief school of higher learning and has a brilliant law school. The archives of state contained a great amount of important documents, but many of them, together with books from the National Library, were burned by the Germans in 1943. The Zoological Station has a world-famous aquarium where the incredible variety of the bay's submarine life can be admired.

History.—Naples was founded by Greek colonists, probably from Cumae, in the 7th century. The settlement (or settlements) was known by the names Parthenope, Palaepolis, and Neapolis, but the distinction does not seem clear. The town emerged as a center of Greek culture, and such it remained even after the Roman conquest (4th century B.C.). Attracted by its beauty, climate, and culture, the Romans soon started to build their villas in the area, which became one of their favorite resorts. In the 6th century Naples passed to the Byzantines, but it gradually developed an independent government. As a duchy (763–1139) Naples prospered, but the Norman conquest of southern Italy ended its liberty; after a prolonged resistance it had to yield in 1139 to Roger II, who incorporated it into his Kingdom of Sicily. With the advent of the Angevin dynasty (1266) Naples gained new importance; after the loss of Sicily, Charles I transferred his capital here and the city gave its name to the Kingdom of Naples. Later it was also the capital of the Kingdom of the Two Sicilies, until Giuseppe Garibaldi made his triumphal entry on Sept. 7, 1860. Annexation to the Kingdom of Sardinia (of Italy after 1861) followed soon after. During World War II Naples suffered severe damage; Allied troops liberated it Sept. 30, 1943. Pop. of the commune (1951) 1,011,919.

NAPLES, Bay of, a semicircular inlet of the Tyrrhenian Sea, about 20 miles long and 10 miles wide, on the west coast of the Italian peninsula, between Cape Miseno and Punta Campanella. Surrounded by green hills and dominated by the imposing Mount Vesuvius (q.v.), the bay is considered one of the most beautiful in the world. The coastline is dotted with towns and resorts, among them Naples, Pozzuoli, Portici, Torre Annunziata, Castellammare di Stabia, and Sorrento. The semitropical islands of Capri, Ischia, and Procida stand at the entrance of the bay.

NAPLES, Kingdom of, a former state of Italy, covering the southern portion of the peninsula, south of the Papal States. Although it existed at various times as a completely separated entity, it was long united with Sicily to form the so-called Kingdom of the Two Sicilies (see SICILIES, THE TWO). Naples was the capital. After the 12th century, southern Italy was a part of the Kingdom of Sicily founded by the Normans. When Charles I of Anjou (q.v.), who was invested with the crown in 1266, lost Sicily following the Sicilian Vespers (1282), the mainland territories left under Charles became known as the Kingdom of Naples. The Angevin claim to Sicily, now ruled by the Aragonese, caused a series of wars, until Queer Joanna I of Naples gave up her claims in 1372. Long and bloody dynastic struggles within the Kingdom of Naples among the Houses of Anjou, Durazzo, and later Aragon, ended only in 1443, when Alphonso V of Aragon won the throne of Naples by defeating René I of Anjou (q.v.). However, the Angevin claim, which had passed to the

French crown, led Charles VIII and Louis XII of France to invade Naples; the last Aragonese king was deposed in 1501. After the defeat of Louis, the Treaty of Blois assigned both Naples and Sicily to Spain, which ruled jointly the two kingdoms through viceroys from 1504 until 1707. This was a period of decay: Spanish officials exploited the countries, the creation of large estates depressed agriculture, no commercial nor cultural progress was made. Poverty, ignorance, and superstition reigned supreme. A popular revolt in Naples (1647) led by Masaniello (q.v.) was violently suppressed. During the War of the Spanish Succession the kingdom was conquered by Austria, but Charles of Bourbon (later Charles III of Spain, q.v.) succeeded in recapturing both Naples and Sicily in 1734. The direct rule by the cadet line of the Spanish branch of the Bourbons did not improve the situation. Some reforms were occasionally made, only to be revoked as soon as conditions permitted. In 1799 the liberal revolution in Naples, supported by French arms, resulted in the creation of the short-lived Parthenopean Republic (q.v.). Finally in 1805 King Ferdinand IV was forced by the French to flee to Sicily, which remained under his rule throughout the Napoleonic period. Napoleon placed on the throne of Naples first his brother Joseph, then his brother-in-law Joachim Murat (q.v.). After the fall of Napoleon, Ferdinand, who had hitherto borne the titles of Ferdinand IV of Naples and Ferdinand II of Sicily, returned to Naples and formally merged the two kingdoms (1816), styling himself Ferdinand I of the Two Sicilies.

NAPLES YELLOW (Antimony Yellow or Neapolitan Yellow) is a very poisonous lead antimonate pigment, varying in color from orange-yellow to sulphur-yellow. Although seldom used in paints, it has been applied in ceramics since ancient times. Because various substitute mixtures such as Venetian red with zinc white and cadmium yellow are called by the same name, it has come to identify a general shade of yellow rather than a specific pigment or chemical compound.

NAPO, nä'pō, river, Ecuador, an affluent of the Amazon, which rises on the north side of Cotopaxi, and after a southeasterly course, forming for a considerable distance the boundary between Colombia and Ecuador, joins the Amazon just beyond the eastern boundary of Peru. It is navigable for nearly 500 miles for steamers; it flows through a region rich in mineral and vegetable wealth.

NAPOLEON I, nȧ-pō-lē'ŭn (full French name Napoléon Bonaparte; Ital. Napoleone Buonaparte; called le Petit Caporal and The Corsican), emperor of the French: b. Ajaccio, Corsica, Aug. 15, 1769; d. Longwood, St. Helena, May 5, 1821. His father, Carlo Maria Buonaparte, a lawyer, claimed nobility, and his claim was accepted by the French authorities, although the grand dukes of Tuscany had never recognized the pretentions of the Corsican Buonapartes to kinship with the noble Florentine family of the same name. Carlo, in 1764, at 18, had married Maria Letizia Ramolino. Eight of their 13 children survived, and were destined to live illustrious lives: Joseph (1768–1844), the future king of Naples; Napoleon (1769–1821, the emperor; this first name had been adopted from an old Corsican family, the Bozzis, with whom the Buonapartes were allied; their first child, b. and d. 1765, had already been named Napoleon); Lucien (1775–1840); Marie Anna Elisa (1777–1820); Louis (1778–1846, king of Holland, the father of Charles-Louis-Napoleon who was to reign as Napoleon III); Maria Paulina (originally Carlotta, 1780–1825, married first to Gen. Emmanuel Leclerc, later to Prince Camillo Borghese); Maria Annunciata, later Carolina (1782–1839, married Joachim Murat, king of Naples); and Jérôme (1784–1860, king of Westphalia). The father died in 1785, and thenceforth Napoleon, the strongest-willed of them all, was head of the family. During all his life he showed a kind of clannish loyalty which made him shower honors and riches on all members of the tribe, and extend his generosities to the protectors of his youth. For parentage and family relationships see Bonaparte articles.

Corsica had been acquired by the French from Genoa in 1768, and secured just before the birth of Napoleon, after the defeat at Ponte Novo of the forces of resistance led by Pasquale di Paoli, who fled to England. Carlo Buonaparte had first fought the French, but he quickly rallied to their side and befriended the governor, Gen. L. C. R. de Marbeuf; in January 1779, he went to France with his two older sons, placed them in the college at Autun, in east central France, and secured a king's scholarship for Napoleon at the Military Academy at Brienne, 25 miles from Troyes. The boy was not yet ten when he entered this school (March 23, 1779), where he was to stay until October 1784. His school years were neither particularly happy nor brilliant; he seems to have made few real friends, except for L. A. F. de Bourrienne (q.v.) and to have felt like a stranger among the French boys. He had a very perceptible Italian accent, yearned for the liberation of Corsica, and still looked up to Paoli as his hero. His marks were not outstanding except in mathematics, and at the final examination, he placed 42d out of 58. Upon being graduated as a second lieutenant in September 1785, he was assigned to an artillery regiment, and was stationed in turn at Valence, Lyon, Douai, Auxonne, and again at Valence (1791) as a first lieutenant. Having no liking for garrison life in provincial towns, he obtained numerous lengthy leaves which he spent in Ajaccio and Paris. During the period 1785–1793 he managed to spend 59 months on more or less regular furloughs.

As a son of the Enlightenment Napoleon had welcomed the dawn of the revolution, from July 1789 on, and after Corsica had been incorporated into France in November, and Paoli allowed to return, he took advantage of the opportunity to play a role in the politics of his native island. He was elected lieutenant colonel in the Corsican national guard. A rift had developed between Paoli and Count Carlo Andrea Pozzo di Borgo on one side and the Buonaparte clan on the other, and Napoleon used such violent methods against the faction of Pozzo di Borgo in the spring of 1792 that he had to go back to Paris to justify himself. He was reinstated in the regular army as a captain in July. In Paris, he witnessed the bloody events of June 20 and August 10, which gave him a healthy scorn for mob violence as well as for the vacillations of Louis XVI. In January 1793, he took part in the abortive inva-

sion of the Sardinian island of Maddalena. When England entered the war against France, Paoli, whose pro-English sympathies were well known, was denounced as an English agent, and his arrest was ordered by the Convention. The break between Paoli and the French became open, and the Buonaparte family had to flee the island and take refuge in Marseille. Corsica was taken over by the British Navy, which was to keep it until the fall of 1796. Thus was Napoleon finally compelled to renounce his Corsican dreams and to turn to France for his destiny.

During his garrison years, he had equipped himself with a considerable amount of knowledge, reading voraciously anything at hand and taking abundant notes, on Voltaire, Rousseau, the writers of the Enlightenment, a host of history books, and especially manuals on tactics, like the *Essai de tactique générale* (1772) of Count J. A. H. de Guibert, which brought to his attention the need for speedy offensive, for a lightening of striking columns, for a concentration of forces: all the principles he would later apply in such masterly fashion. He even published in July 1793 a short political pamphlet in dialogue form, the *Souper de Beaucaire,* in which the weaknesses of the federalist movement of the Girondins are analyzed; it constitutes an unequivocal profession of the tenets of the centralist Parisian group called the Mountain. At the end of August, Toulon and the French Fleet were delivered to the British by rebellious federalist and royalist groups. The Army of Italy was entrusted with the task of recapturing the harbor, and here we find the first real opportunity for Napoleon. Thanks to his Corsican friend, A. C. Saliceti, he was placed in command of the artillery of the besieging forces and given a free hand to put into effect his plan of concentrating the attack on the fort of Eguillette, which dominated the roadstead. After violent action, in which Napoleon was twice wounded, the fort fell on Dec. 17, 1793, and the British retired, leaving a good part of the French Fleet and the port installations intact. Two months later, Napoleon Buonaparte was promoted to brigadier general.

The upheaval of 9 Thermidor (July 27, 1794) threatened to put a stop to his progress; he had come to be identified with the Robespierre faction, and was arrested and detained some time at Antibes. But at the beginning of 1795, he was entrusted with the preparation of a new expedition against Corsica which, however, came to naught. Then he received an order to rejoin the Army of the West, to campaign against the insurgent Vendéens. This he refused to do and was struck off the list of active officers.

Marriage and the Italian Campaigns.—The crisis of Vendemiaire (October 1795) offered him his second decisive opportunity. The Convention was confronted by an incipient insurrection of monarchist forces gathered around the St. Roch Church. One of its members, Vicomte Paul François Jean Nicolas de Barras, remembering Napoleon at the siege of Toulon, called upon him to save the Convention, which he did by having Joachim Murat bring in artillery from the Camp des Sablons, thus checkmating the insurgents. His stature having grown considerably, he was a few months later named by the succeeding government, the Directory, to the command of the Army of Italy (March 2, 1796). This promotion was perfectly proper since he had been connected before with this army and had drafted strategic plans for it, but it was helped by his new friendship with Barras and the elegant circles he was now frequenting. He had fallen violently in love with one of the queens of fashion of the time, Joséphine de Beauharnais, whose husband, an erstwhile commander of the Army of the Rhine, had been guillotined in 1793, and whose languid charm (she was born in Martinique) fascinated him. Despite the difference in age—she was 33, he 27—despite the fact that she had two children, Eugène and Hortense, and had no financial resources, they regularized their situation and were married on March 9, 1796. All through the years, in spite of her infidelities, of the barrenness of their union, even of his repudiation of her in 1810, he always kept for her a deep and warm feeling, tinged with passionate romanticism. Her death in May 1814 caused him genuine sorrow.

At the time of his marriage Napoleon changed his name from Buonaparte to Bonaparte. He arrived at his headquarters in Nice on March 27, 1796, and soon afterwards initiated the series of Italian campaigns which were to last 20 months, until November 1797, and which were destined to reveal his military genius and provide an unequalled classic to students of strategy. He had under his command an army of 38,000 fairly good troops and he was opposed by Gen. J. P. de Beaulieu with 30,000 Austrians, and Gen. Michele Colli with about 25,000 Piedmontese. In a few days, Bonaparte defeated Beaulieu at Montenotte, west of Genoa, Colli at Mondovì, and signed with the latter an armistice at Cherasco (April 28, 1796). Pursuing Beaulieu, he crossed the Adda at Lodi, after a brilliant action—about which he would write at St. Helena, "It made me conceive the ambition of performing great things"—and entered Milan on May 14. Beaulieu had retreated towards the Mincio and Mantua. Bonaparte beat him again and laid siege to Mantua.

Italy, however, was only a secondary theater of war, the main one being on the Rhine, where Gen. J. V. Moreau had about 200,000 troops facing a similar force of Austrians. But the enemy, with interior lines of communications, was freer to shift troops from one theater to the other, which he did, thanks to Moreau's inaction, at the end of July. Count D. S. von Wurmser, succeeding Beaulieu, descended into Italy on both banks of Lake Garda, with 45,000 men in three columns. Abandoning the siege of Mantua, Napoleon established himself south of Lake Garda, and struck successively at Wurmser's columns at Lonato (July 31) and Castiglione (August 5). While Wurmser was re-establishing himself on the Brenta, Napoleon advanced up the Adige to take Trent, then came down on Wurmser's rear, forcing him to retreat to Mantua, where he was surrounded. A new Austrian commander, Josef Alvinczy, descended into Italy through the Brenner Pass with 50,000 men. Napoleon, having established himself at Verona, advanced 15 miles to Arcole to meet him; three days of hard fighting ensued (November 15–17) in the course of which Napoleon personally led an assault on the bridge across the Alpone River, administering a severe defeat on the new Austrian commander.

At that time, the Directory decided to make Italy a more important theater of war at the beginning of 1797 and to send Napoleon 40,000 reinforcements; but they did not arrive until

March, after the main battles had been fought. Alvinczy, having been ordered to try once again to relieve Mantua, advanced from Roveredo in three columns. Napoleon smashed the main one at Rivoli (Jan. 14, 1797), then hastened back to Mantua to block a relief column coming from Padua. On February 2, Wurmser was forced by famine to surrender Mantua, and on the same day Napoleon ended his armistice with the pope and occupied the Papal States. Final victory was now in sight. Napoleon had about 80,000 men with whom he pushed via the Trieste route into the Tirol, pursuing the Archduke Charles to Klagenfurt, then to Leoben, where, on April 18, he signed peace preliminaries.

The personal policy of Bonaparte was now everywhere in evidence: his excessive requisitions; the occupation of Venice; the organization of the Cispadane Republic (q.v.) in 1796, merged a year later into the Cisalpine Republic (q.v.); his direct negotiations with the pope—everything shows the civilian power of the Directory consistently neglected, and compelled to follow the initiatives of the victorious general. The Treaty of Campoformio (Oct. 17, 1797) gave to France Belgium, the Ionian Islands, the promise of the left bank of the Rhine, and recognized the Cisalpine Republic, while Austria received Venice, with her territories up to the Adige.

Egypt.—In December 1797, Napoleon, back in Paris, was acclaimed a triumphant hero. But England had not disarmed, and the Directory proposed an expedition across the English Channel, naming Bonaparte commander of the Army of England. An inspection of the Channel bases, however, convinced him of the impracticability of the project. Another idea already had taken root in his mind, and was being nurtured by Talleyrand: strike at England by cutting her Mediterranean commercial route to India. That meant an expedition to Egypt. It was rapidly organized from March to May 1798, in the harbors of Toulon, Genoa, Civita-Veccia, and in Corsica and comprised 280 transports, protected by more than 55 war vessels, and carrying 38,000 troops, 1,200 horses, and 171 guns. Moreover, it was to transport a mission of almost 200 scientists including archaeologists. A contribution of 3 million francs levied upon Switzerland had helped finance the enterprise. The fleet sailed on May 19, concentrated off Sardinia, then took over Malta with little difficulty. The British were still uncertain of its destination, but Horatio Nelson sailed towards Alexandria, where he arrived two days before the French, then returned to Sicily.

The French expedition disembarked at Adjmir on July 1 and occupied Alexandria the next day. Then the advance began to Cairo, across a desert and up the Nile's left bank. Napoleon expected a popular uprising against the feudal Mamelukes, but this failed to materialize. After a preliminary clash with the Mameluke cavalry on July 13, he defeated them on July 21, near the Pyramids, forming his infantry in squares to repel their charges. Entering Cairo, he established his headquarters there and attempted to gain the good will of the Egyptians. However, on August 1, Nelson surprised the French Fleet at Aboukir and annihilated it, except for two ships.

Thus marooned in Egypt, Napoleon spent the rest of the year establishing his domination over the country, trying vainly to discover ways of pushing on to India, and participating in the work of the scientific mission, which in particular was preparing the first draft of what was to become the Suez Canal. At the beginning of 1799 he had to forestall an attack on Egypt by invading Syria and taking Jaffa, infested by the plague (March 6). But he failed before Acre (May 20), defended by Commodore William Sidney Smith and Colonel A. Le Ricard de Philippeaux, an émigré whom he had known at Brienne. Back in Egypt, he annihilated a Turkish force which had landed at Aboukir (July 25). The Directory had tried to re-establish communications with Egypt by sending Admiral E. E. Bruix into the Mediterranean, but to no avail. It also had authorized Bonaparte to return; these instructions never reached him, but he had decided on his own to sail back, upon learning disquieting political and military news from France. He left secretly August 24, managed to escape, with great luck, the British blockade and landed at Fréjus October 9.

The Consulate.—He was acclaimed by the populace. The Second Coalition had inflicted severe reverses upon France and Italy had been lost. Gen. André Masséna, it is true, by his victory at Zürich had begun to re-establish the situation; but internally, the Directory could only govern by alternate illegal blows on the right and on the left. Inflation was rampant, the capitalist bourgeoisie was fearful, the troops extremely dissatisfied, and many people were thinking of a change in the constitution and looking around for a savior. Bonaparte allied himself with one of the five directors, Abbé Sieyès, and a coup d'état was engineered: on November 9 (18 Brumaire) the transfer of the two assemblies, the Ancients and the Five Hundred, to a Paris suburb, St. Cloud, was voted, and Napoleon received command of the Paris garrison. The next day, after a great deal of floundering, and when he had been saved from possible physical violence and outlawing only by the presence of mind of his brother Lucien, who was president of the Five Hundred, Napoleon finally sent in Murat's grenadiers to expel the deputies. During the evening the Ancients named three provisional consuls—Sieyès, (Pierre) Roger Ducos, and Napoleon.

Sieyès had expected to be able to keep Napoleon in secondary position; but it soon became apparent who would be the master. The admirably coordinated physical and mental abilities of Napoleon proclaimed his superiority. He was endowed with an amazing capacity for work, an astonishing speed of judgment, and an extraordinary power of assimilation, capped by untiring imagination. He possessed, moreover, a great deal of charm, and a natural authority based on a wide gamut of attitudes, from calculated simplicity to a skillful use of violence. Having climbed almost to the top, he was playing a sharp and prudent game to reach the pinnacle of power.

Now he came near to assuming the garb of an intellectual, and expressed the sentiments of a middle-of-the-roader. He proclaimed his desire for internal security and social order, and for the peace which he knew France craved. While thus cultivating popularity, he carried on discussions on the draft of a new constitution, which was to be a compromise between the ideas of Sieyès and his own authoritarian tendencies. The provision of a list of notabilities from which eligible candidates must be chosen effectively smothered democratic suffrage. The legislative power was broken down into four assemblies: the Tribunate,

the Legislative Body, the Council of State, and the Senate. The executive was in the hands of three Consuls, of whom the First Consul had the widest executive powers, together with the power of initiating laws. Sieyès, on the invitation of Napoleon, designated as Consuls the minister of justice, J. J. R. de Cambacérès and Charles François Lebrun, Napoleon himself to be First Consul. A plebiscite ratified the constitution by 3,011,007 ayes against 1,562 noes (February 1800).

Now in the saddle, Napoleon began to consolidate his power and to pursue the two policies which were expected of him: peace and the establishment of internal order. Taking command of the Army of Reserve, he crossed the Alps at the Grand St. Bernard (May 15, 1800) and entered Milan on June 2. In the Piedmont plain, his army unexpectedly met a much stronger Austrian force at Marengo on June 14. The French troops were retreating in disorder, when the arrival of Gen. L. C. A. Desaix de Veygoux and a strong charge by François Christophe Kellerman saved the day. The first couriers had brought to Paris reports of a defeat, which caused rejoicing among the First Consul's enemies. But news of the victory supervening silenced the opposition and, as a royalist agent said at the time, "Marengo was the christening of Napoleon's personal power." The peace with Austria was secured only after the success of Jean Victor Moreau at Hohenlinden December 3, and was signed at Lunéville (Feb. 9, 1801), giving France the left bank of the Rhine, extending the Cisalpine Republic to the Adige and generally confirming the clauses of the Treaty of Campoformio. As for England, faced by an economic crisis and by the dissolution of the Coalition, she signed a peace treaty at Amiens (March 25, 1802), keeping Ceylon and Trinidad, but giving up Egypt, Minorca, Elba, and Malta, the last of which was supposed to be evacuated inside of three months. That peace, however precarious, was the first general peace in Europe in a decade.

At the same time Napoleon was reorganizing France and giving her a body of institutions which were to last through the 19th century and to a certain extent still form the basis of her present structure: he maintained the administrative divisions created by the revolution (departments, etc.) but put at their head appointed functionaries (prefects, etc.) and generally emphasized centralization. He reorganized justice and took an active part, although more modest than has been believed, in framing the Civil Code (see CODE—*Code Napoléon*), which reaffirms the judicial conquests of the revolution: personal liberty, freedom of conscience and of work, property rights, equality. Consecrating the ruin of legalized privilege, the code was to serve as a model for many European and American states during the 19th century. It is the main basis for Napoleon's claim that he was the heir and savior of the revolution.

Napoleon also made important reforms in government financing. The assessment and collection of taxes were thenceforth reserved to functionaries of the central power, and collectors were required to make a deposit in advance of their collections. He established the Bank of France and fixed the relation of 15.5 between gold and silver and the value of the gram of gold at 3 francs 10 centimes; that standard was to last until 1926. He was much interested in education, as a way of controlling the minds of men, and as a means of training military officers and civil servants. After several years of discussion he created the Université de France, really a ministry of education to license teachers, set the program of studies and control the examinations. This centralized and near-monopolistic conception of education has prevailed in France to the present time. In this work of reorganization, he lacked the omniscience which has sometimes been attributed to him, but he had the good sense to make use of the best experts, regardless of their political inclinations and of their past. Napoleon may be said to have consolidated the conquests made during the revolution by the bourgeoisie, and to have solidified the French civil service, for better or for worse, into the form it still retains.

Despite the victory of Marengo, opposition to the First Consul was not immediately disarmed. The royalists were agitating in Vendée and, in Paris, Georges Cadoudal exploded an infernal machine which killed 22 people but missed Bonaparte. He retaliated against both the right and the left, transporting republicans to Guiana, and executing some monarchists. To undermine the royalist party, he decided on a rapprochement with the church: this was attained by the Concordat (July 15, 1801), which recognized Catholicism as the religion of the majority of Frenchmen. The First Consul would nominate the bishops, the pope give them the spiritual investiture; the clergy would be paid by the government. The *Organic Articles,* a law regulating public worship comprising 77 articles relating to Catholicism and 44 to Protestantism, were combined with the Concordat and both ratified on April 8, 1802. Not accepted by the pope, the *Organic Articles* made the church more subservient to state authority. The Concordat and *Organic Articles* were to govern the relations of church and state in France for more than a century until their abrogation in 1905 by the law of separation. The other cults, Protestant and Jewish, were similarly reorganized. Some opposition to these clerical measures continuing in the Tribunate, he broke it by skillful manipulation of the procedure for renewal of members. He also had his police disperse the opposition which gathered in Mme. de Staël's salon and kept her in semiexile 60 miles from Paris. His aim to achieve absolute power was now unmistakable. On Aug. 4, 1802, a new constitution made him Consul for life, and subordinated the Assemblies to him.

Emperor.—The final break with the royalists came after another plot by Cadoudal was discovered, and its organizer shot. On the night of March 15, 1804, Napoleon had his troops kidnap the duke of Enghien (Louis Antoine Henri de Bourbon-Condé) at Ettenheim, Baden, and had him shot summarily at Vincennes; thus he proclaimed himself an accomplice of the regicides of 1792. After further manipulation of public opinion, the question arose of giving Bonaparte supreme powers. On May 18, 1804, the Senate declared that "it was of the highest interest of the French people to entrust the government of the Republic to an hereditary Emperor," and established the order of succession by male primogeniture. A plebiscite accepted the proposal by 3,572,329 ayes against 2,579 noes.

The pope was induced to come to Paris and preside at coronation ceremonies held in the Cathedral of Notre Dame on Dec. 2, 1804. Na-

poleon, however, made a point of crowning himself to avoid any quarrel over investiture; he also crowned Josephine. Catholic France was now obliged to acquiesce in Bonaparte's elevation. To give the new dynasty a prestige comparable to the monarchy's a court was organized; some émigrés were induced to return, while a new nobility was created, based on military exploits or civilian services, which has survived to this day. This new imperial court never attained the elegant nonchalance of the *ancien régime;* it was too military, sometimes vulgar, and could never shake off the memories of its origins. But it helped establish the imperial domination, which asserted itself also through a servile press, a subservient literature, an efficient police, a regimented university system, and even a controlled church. The institution of the Legion of Honor (1802), with its ranks (*grand officier, commandeur, officier, chevalier*), and the selection of its members reserved to Napoleon, was another means of gaining the loyalty of a new hierarchy of talents. The master supervised everything, from the building of strategic highways in the Alps, to the Sèvres manufacture of porcelain. In 1812, in Moscow, just before the retreat, he gave the Comédie-Française a statute which is still in force in its general lines. Napoleon's authority, much tighter than the Bourbons', smacked of enlightened despotism; it foreshadowed modern totalitarianism.

The Peace of Amiens (March 25, 1802) was short-lived. English businessmen were disappointed by French tariff restrictions which hampered trade. France, with her purchase of Louisiana from Spain (1800) and the San Domingo expedition of 1802, seemed bent on acquiring another colonial empire. Moreover, early in 1802 Bonaparte intervened in Switzerland to have the Valais canton constituted an independent republic (later annexed to France); and in August of the same year he annexed Elba, then Piedmont in September, and Parma in October. By the Act of Mediation (Feb. 19, 1803) he restored the Swiss confederation, re-establishing the cantonal system. In the same month he suppressed free cities and ecclesiastical principalities in Germany. England seized upon these aggressions as a reason for declining to evacuate Malta. It is idle to speculate on the responsibilities for the renewal of the war. The fact is that French continental dynamism and English ambition for sea domination simply could not coexist peacefully. On April 26, 1803, an English ultimatum left no alternative but war. Early in May, France sold Louisiana to the United States, Napoleon realizing that the vast province, so difficult to defend, would be a liability, and American gold an asset in the coming conflict.

The war started slowly, for lack of a convenient theater. Napoleon had already begun before 1802 to assemble a barge flotilla as a threat to invade England. It was considerably enlarged in 1803 and 1804 and the decision for an invasion was finally made in the latter year. An expeditionary force was concentrated at Boulogne and a plan was devised to obtain French control of the English Channel for a period long enough to ensure the safe convoy of the troops. Vice Admiral P. C. J. B. S. de Villeneuve was ordered to sail for the West Indies, in order to attract Nelson's English Fleet there, and then to return in haste to cover the Channel crossing. The plan started well enough, Villeneuve sailing from Toulon on Jan. 18, 1805. He succeeded in luring the English Fleet to the Antilles, but due to a combination of bad luck, poor orders and incompetence, he found himself on the return voyage blockaded in Cádiz by Nelson's superior fleet. The invasion was doomed and Napoleon abandoned it on August 24. Upon orders to sail for Naples, Villeneuve sallied forth and was caught off Trafalgar by Nelson, who attacked his line of 33 ships with two columns, ruptured it and annihilated the center and rear guard (Oct. 21, 1805). Though Nelson was killed at Trafalgar, thenceforth command of the sea was assured to England and Napoleon was forced to limit his ambitions to continental conquests.

A new coalition, the third, had already been formed (Aug. 9, 1805), between England, Russia, and Austria, which had been affronted by the transformation of the Republic of Italy into an hereditary kingdom, with Napoleon as king, and his stepson Eugène as viceroy. Napoleon shifted his army from Boulogne to the Rhine, the Main and the Danube, there to surround the forces of the Austrian general, Karl Mack von Leiberich at Ulm (October 18), to take Linz and Vienna and, shifting north, to meet the Russians and Austrians at Austerlitz (December 2). Although outnumbered, 65,000 to 82,500, Napoleon succeeded by a feint on his right in throwing the enemy center out of balance, then breaking through, he put the allied troops to flight across frozen marshes, where French artillery decimated them. The French suffered 6,800 casualties and inflicted 27,200 (including 12,200 killed and wounded and 15,000 prisoners). Austerlitz is surely the most brilliant and most decisive of Napoleon's victories. It has become the mainstay of his military glory. Austria, by the Treaty of Pressburg (Bratislava, Dec. 26, 1805), gave up Venetia and recognized Bavaria, Württemberg, and Baden as independent kingdoms, thus excluding herself from southern Germany.

Prussia had stayed out of the third coalition. But during the summer of 1806, she became annoyed and worried by the double-dealing diplomatic maneuvers about Hannover and by the formation of the Confederation of the Rhine (July 12), which excluded her from western and southern Germany. A Prussian ultimatum demanded that the French withdraw behind the Rhine (Oct. 1, 1806). Upon its rejection, the fourth coalition was organized, grouping England, Russia, and Prussia. The Prussians had an army of 130,000 men, steeped in the tradition of Frederick the Great, and enjoying a high military reputation, but cumbersome, slow-moving, and unable to cope with the newer, lightning-like strategy of the emperor. Napoleon had concentrated his army, roughly equal to the Prussian force, along the Main Valley. Each army tried to cut the other's communications on the left, but the slower Prussians were forced to retreat and Napoleon with 95,000 troops met the corps of Gen. Friedrich Ludwig Hohenlohe, 40,000 strong, at Jena, while Louis Nicolas Davout, with 26,000 men, contained and finally routed the main Prussian corps at Auerstedt (Oct. 14, 1806). Twelve days later Napoleon was in Berlin, having shattered the myth of Prussian invincibility, and determined to punish Prussia through heavy contributions and requisitions. To strike at the Russians, he pushed east, met them in hard and indecisive clashes, the most celebrated of which was the bloody battle at Eylau (Feb. 8, 1807), and in the spring

won a decisive victory at Friedland (June 13), which led to the Treaty of Tilsit (July 7) and to a kind of reversal of alliances. Czar Alexander I, irritated by British delays in sending forces to the Continent, and seduced by the blandishments of Napoleon, whom he met on a raft on the Niemen (Neman) and who unfolded before his eyes a project of co-domination of the Continent, not only renounced the British alliance, but promised to take an active part in the Continental System. This moment may be considered the apogee of Napoleon's power.

The Continental System had been devised to stifle British economy, based on credit and exports, and by the decrees of Berlin (Nov. 21, 1806), Fontainebleau (Oct. 13, 1807), and Milan, it prohibited the importation of British goods. There was no thought that it would starve Britain into submission (at that time she imported less than 20 per cent of her wheat); but it did create a serious economic crisis in England, despite the fact that it soon became inefficient through a huge amount of contraband and a system of licenses by which Napoleon authorized trade with England for a fee. The system helped France develop her industries and some agricultural products, like sugar beets, but created in Europe an enormous amount of ill-will against French economic imperialism.

The empire extended from Hamburg to Rome, comprised 130 departments and was surrounded by kingdoms given to members of Napoleon's family: Naples to Joseph, later king of Spain; Holland to Louis; Westphalia to Jérôme; Cleves (Cleve) to Murat, Caroline's husband, and so on. In 1810, 7 kingdoms and 30 principalities were vassals of France. Even Sweden called upon a French marshal, Jean Baptiste Jules Bernadotte, to be heir to her childless king. Only Russia kept her independence. And everywhere the Civil Code, religious tolerance, and the revolutionary principles in Napoleonic garb followed French arms.

But Portugal, for a century under British influence, was a big loophole in the Continental System. In agreement with Manuel de Godoy, the corrupt favorite of the queen and the real ruler of Spain, Napoleon sent an expedition to subdue Portugal and left enough troops in Spain to dominate the country. But an insurrection in Madrid compelled the French to a ferocious repression. Guerrillas then attacked the French armies and inflicted on them their first resounding defeat in the capitulation of Gen. Pierre A. Dupont de l'Etang at Baílen (July 23, 1808). Napoleon tried to secure his rear by a spectacular but inconclusive meeting with Czar Alexander at Erfurt (September-October). He then invaded Spain, entered Madrid, took revolutionary measures in favor of the peasantry, in order to break the power of the clergy, but to no avail; and the holy war continued against the French, pushing them back slowly with the help of the duke of Wellington, whom Masséna had been unable to dislodge from his lines at Torres Vedras.

Napoleon still dreamed of universal monarchy on the Roman pattern while nationalisms were awakening everywhere, particularly in Germany, Italy, and Austria. In 1809, Austria again challenged Napoleon, who succeeded in entering Vienna, was held in check at Essling (May 22), but won at Wagram (July 5), and imposed the treaty of Schönbrunn (October 14) which gave him the Illyrian provinces. But the French forces were showing signs of strain, and Napoleon noted a new spirit of resistance in Austria. He wanted now to establish a legitimate dynasty, and since Josephine could not give him an heir, he decided to divorce her. He could not marry his great love, the Polish Countess Marie Walewska, who, however, would bear him a son (May 4, 1810). He requested the hand of the 18-year-old Archduchess Marie-Louise of Austria and married her by proxy on March 11, and formally on April 2, 1810. The desired legitimate son, named even before his birth king of Rome, was born March 20, 1811.

Invasion of Russia, and the Abdication.— The Napoleonic regime seemed for the moment more secure than ever. But Russia had abandoned the Continental System which was making the czar unpopular, and was almost openly preparing for war. In France, military classes were being mobilized in anticipation, a severe economic crisis was creating unemployment, taxes were growing heavier, and definite signs of lassitude and disaffection were appearing. The break with Russia came in June 1812. The czar had contrived to sign an alliance with Bernadotte of Sweden and a peace treaty with the Turks, while Napoleon was heavily engaged in Spain. Even so, Napoleon had a 3 to 1 numerical superiority against the Russians when he crossed the Niemen (Neman) on June 22. But his strategy, suited to the narrow confines of the northern Italian plains, was ineffective in the vast open spaces of Russia; his supply system, always poor, since his troops lived on the country during his short, sharp campaigns, collapsed when the Russians applied the scorched earth policy; the medical system, never too brilliant, disintegrated. Napoleon pursued the retreating Russians with a speed unequalled even in our day: Vilna, June 26; Vitebsk, July 24; Smolensk, August 16. At Borodino the Russians made a stand and a bloody battle ensued (September 7). Napoleon entered Moscow on September 14. But the city was on fire the next day, and since the czar refused to negotiate, and lack of supplies made it unfeasible to spend the winter in the city, there seemed no choice but to lead the victorious army home. The retreat began October 19. Starvation, defections, harassment by the Cossacks, the early and bitter cold, the fighting (crossing of the Berezina, Nov. 26-28), ravaged the Grand Army. When it reached the Niemen (December 14), it comprised only about 30,000 survivors; more than 500,000 men had disappeared in Russia.

It was clearly the beginning of the end, and Europe sensed it. Napoleon had left the army on December 5, leaving Murat in command, and hurried back to France, concerned over a plot of Gen. Claude François de Malet against his regime. Arriving in Paris on the 18th, he succeeded in raising another army; but officers were lacking, the generals suffered from war fatigue, and he was now overextended, with commitments from Spain to Poland and a great number of fortresses to garrison. In spite of victories at Lützen (May 2, 1813), and at Bautzen (May 21), peace negotiations came to naught, and after his setback in the Battle of Leipzig (October 16-19), Napoleon had to retreat behind the Rhine. The Allies pressed their advantage in the early months of 1814 and France was invaded. Napoleon showed his old tactical genius in that campaign, by beating one after the other the Allied columns converging upon Paris (Montmirail, Cham-

paubert, Feb. 10-11, 1814). But the jig was up for the balance of numbers was now irretrievably on the side of the Allies. On March 22 the English government announced that it would never treat with Napoleon, and eight days later the Allies entered Paris. On April 6 Napoleon agreed to an unconditional abdication. We know now with certainty (since the publication of Armand A. de Caulaincourt's *Mémoirs* in 1933) that he unsuccessfully attempted suicide by poison during the night of April 12. On the 20th, he bade farewell to his troops in the courtyard of Fontainebleau.

Elba, the Hundred Days and Waterloo.—The Allies had granted him sovereignty over the island of Elba. On the trip south he encountered hostile manifestations around Avignon, and had to disguise himself in an Austrian uniform. At Elba, he showed his old activity, reforming and reorganizing the island, but only his mother, his sister Paulina Borghese, and Marie Walewska with their son came to see him. Marie-Louise refused to come (he had seen her and their son for the last time on Jan. 24, 1814). Knowing that France was restive and dissatisfied, he escaped from Elba and on March 1, 1815, landed in France near Antibes, to begin that brief adventure known as the Hundred Days. His trip to Paris, by way of the Alpine road and Grenoble, was an incredible, exhilarating, romantic triumph. The government of Louis XVIII fled. Napoleon tried to assume the posture of the liberal heir of the revolution and of the peaceful sovereign. But Europe would not relent, nor forget her ten years of fear. War was necessary again. Napoleon invaded Belgium with the hope of defeating the Anglo-Prussian armies. When, after a few days of secondary skirmishes, he came in contact with Wellington at Mont-Saint-Jean, near Waterloo, he was unable to break the English lines and after the arrival of Prussian reinforcements, the French troops broke and could not be reorganized before Laon (June 18).

Defeated, Napoleon hurried back to Paris. Unable to gain support for further resistance, he abdicated in favor of his son. But this proposal was ignored and on July 8, Louis XVIII reentered Paris. Napoleon now decided to place himself under the protection of his greatest enemies. He boarded the British warship *Bellerophon.* "I come, like Themistocles, to claim a seat by the hearth of the British people," he wrote the prince regent. It was decided that he should be sent to St. Helena and held there a prisoner for the rest of his life. He was transferred to the *Northumberland* with his small retinue for the three months' voyage. Upon his arrival, he was at first lodged with an English family, and the episode of his good-natured friendship with their 13-year-old daughter, Betsy Balcombe, casts light on the human side of his nature. Transferred to the estate of Longwood, under the petty surveillance of Sir Hudson Lowe, he spent the time reminiscing for the benefit of his followers (Comte Henry Gratien Bertrand; Comte Charles Tristan de Montholon; Baron Gaspard Gourgaud; Comte Emmanuel A. D. de Las Cases; his valet Marchand), writing his *Mémoirs,* and in general building up the Napoleonic legend. From the end of 1819 on, he suffered from a stomach disease, now diagnosed as a gastric ulcer, from which he died May 5, 1821.

The prodigious adventures of Napoleon, giving a preview of the rise and fall of the modern dictators, created a legend which presented him as the champion of liberalism and nationalism, and as an architect of the United States of Europe. Surrounded by an enormous aura of military glory, it was to become for the next generations a deep nostalgia which found its first expression when Napoleon's body was brought back triumphantly in 1840 and which explains the astounding success of the plebiscite of his nephew, Napoleon III, in 1851.

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NAPOLEON II, son of Napoleon I. See REICHSTADT, DUKE OF.

NAPOLEON III (known as LOUIS NAPOLEON; full name CHARLES LOUIS NAPOLEON BONAPARTE), emperor of the French, nephew of Napoleon I; b. Paris, France, April 20, 1808; d. Chislehurst, England, Jan. 9, 1873. He was the third son of Louis Bonaparte, younger brother of Napoleon I, and Hortense de Beauharnais, daughter of Josephine, first wife of Napoleon I. After the final exile of Napoleon I to St. Helena (1815), Hortense took refuge at Constance, then Augsburg, and finally, in 1819, in Arenenberg Castle on Lake Constance in the Swiss canton of Thurgau. Separated from her husband, she had received custody of Louis Napoleon who, at the Augsburg Gymnasium, received an essentially German education. At 23, in 1831, he took part in an insurrection against the pope in Romagna, fell sick and was saved from the Austrians by his mother, who took him to Paris, to England, then back to Arenenberg Castle. The death of his older brother Napoleon Louis (1804–1831) in the Romagna insurrection, and of the duke of Reichstadt (q.v.), Napoleon I's only son, a year later, left him as the chief representative of the Napoleonic tradition and heir presumptive to the imperial crown. For five years he devoted himself to writing. The works of this period include *Rêveries Politiques, Considérations Politiques et Militaires sur la Suisse,* and an artillery manual. He was made an honorary Swiss citizen and an artillery captain in the Bern regiment. On Oct. 30, 1836, he attempted a *Putsch* at Strasbourg; it failed and he was arrested and deported. After briefly visiting the United States in April 1837, he returned to Switzerland, which he left for England in the fall of 1838 to avoid a Franco-Swiss incident over his presence.

The return of the body of Napoleon I from St. Helena in 1840 caused an upsurge of the Napoleonic popularity. Louis Napoleon tried to use this popularity by fomenting another rising at Boulogne (August 5), which failed miserably. He was condemned to perpetual imprisonment and was detained for six years in the fortress of Ham in Picardy. There he read widely and wrote such books as *Fragments historiques,* and

L'extinction du paupérisme (1844). The latter reveals a socialistic utopian turn of mind; it advocates the resettlement of underprivileged families on parcels of land in order to make them self-sufficient. On May 25, 1846, he escaped by donning the clothes of a workman while the fortress was under repairs and fled to London. Three days after the outbreak of the Revolution of 1848 he returned to France, but he was requested to leave the country. On June 4 he was returned by four constituencies, but declined the election when still declared under the law exiling the Bonapartes. On September 17 he was elected in five departments and could not therefore be kept out; he took his place in the National Assembly on the 26th. During the discussions on the new constitution it was decided, upon the insistence of Alphonse M. L. de Lamartine, to have the president elected directly by the people (October 9). An amendment which would have barred Napoleon's candidacy was thought unnecessary after his lamentable, stammering defense at the tribune. But soon his propaganda was in full swing and his election came as a thunderbolt when he polled 5,400,000 votes, against 1,400,000 for Louis Eugène Cavaignac, 370,000 for the socialist, Alexandre Auguste Ledru-Rollin, and 17,000 for Lamartine——the provinces had asserted themselves and had followed the call of the Napoleonic legend.

Louis Napoleon always considered his amazing triumph as a direct, popular, democratic mandate to put an end to social unrest and parliamentarian prattling and to establish an authoritarian democracy. He took every opportunity to recall the "origins of his power." But the elections of May 13, 1849, returned a strong majority of conservative monarchists who soon opposed the president, and he became hopelessly entangled in the Roman question. The latter dated back to March 1849, when the Constituent Assembly voted to safeguard the liberal institutions established in Rome by the uprising of February 9th against attempts of the Austrians and Pope Pius IX to destroy them. But the objectives of the expedition, sent according to that vote under Gen. Nicolas Charles Victor Oudinot, were completely reversed when Oudinot's troops were fired upon by the Romans. After a month's siege the French Army captured Rome on July 3, suppressed the new-born republic, and restored the temporal power of Pius IX. Thus Napoleon was trapped for 21 years into supporting a government inimical to his own democratic ideals, and later into preventing the Italians from making Rome the capital of their kingdom. Pope Pius IX, the most conservative of pontiffs, refused to be reconciled with "progress, liberalism, and modern civilization," ideas he detested, but which were the ostensible mottoes of Louis Napoleon's regime.

Through fear of the left, he was forced to lean towards the conservative Catholics, and that uneasy alliance has cast a shadow of misunderstanding upon every act of the regime. A leftist insurrection on June 13, protesting the Roman imbroglio, was easily crushed. Special elections on March 10, 1850 having returned 21 out of 31 invalidated Red deputies, a new, undemocratic electoral law was passed. Napoleon made a triumphant tour of the country, proclaiming his intentions of "saving, through order, the great principles of the French Revolution." He requested that a constitutional provision forbidding a second term be repealed, and that the electoral law be abrogated; but both motions were rejected. Finally, on Dec. 2, 1851, a coup d'état dissolved the National Assembly, reestablished universal suffrage, and appealed to the people to support the president. There was little popular resistance, except on the 4th, when troops had to storm a few barricades. The plebiscite gave 7,400,000 ayes, 600,000 noes. The new constitution gave the chief executive a term of 10 years, authority over the ministers, and created two assemblies. The empire was restored by another plebiscite, 7,800,000 for, 250,000 against (Nov. 21, 1852). Napoleon assumed the name of Napoleon III since the king of Rome had been formally, even if ephemerally, recognized as Napoleon II. See REICHSTADT, DUKE OF.

The Second Empire.—Politically, the empire was to evolve, in the following 18 years, from an authoritarian to a liberal (1860), then to a parliamentary form (April 1870), while the opposition grew ever stronger. Economically, it was a period of expansion, fostered by the dynamism of the St. Simonians and the social interest of the emperor. Credit institutions were developed (Crédit Foncier, 1852; Mobilier, 1852; Industriel, 1859; Lyonnais, 1863; Société Générale, 1864). The railroad network was actively pushed (13,000 kilometers in the first 6 years). The capitalistic and industrial structure of France then assumed its modern form. Paris was transformed by Baron Georges Eugène Haussmann. Universal Expositions in 1855 and 1867 proclaimed the eminence of French industry and its progressive outlook. After ten years of work, a French company opened the Suez Canal on Nov. 17, 1869. Prosperity was generally high, unionism was getting its start; the rate of economic expansion of the Second Empire is possibly the fastest of French history.

Napoleon III on Jan. 30, 1853 married a Spanish beauty, Eugénie de Montijo, who gave him a son (March 16, 1856). The tone of the court was at the same time brilliant and family-like. The empress was pious, charitable, but in the later years of the empire, she exerted a dangerous influence on foreign policy. Externally, the empire was marked first by the Crimean War (March 18, 1854-March 30, 1856), in which France and England defeated Russia. Then came the Italian campaign (April 20-Nov. 11, 1859), by which Austria was compelled to cede Lombardy to Italy and France received Savoy and Nice. The expedition to Mexico began as a common Anglo-Franco-Spanish venture (October 1861) to secure the payment of public debts; but England and Spain soon withdrew their troops and only France kept an army in the country. French troops were used to support the Archduke Maximilian of Austria as emperor of Mexico from the moment of his arrival at Veracruz in May 1864. When they withdrew, his tottering regime fell under the blows of the Juaristas, and he was captured and shot at Querétaro (June 19, 1867). This expedition was a considerable strain on the French Army, and a totally futile expenditure of blood and money. A showdown with Prussia was brewing since her victory at Sadowa (July 3, 1866) against Austria. War came suddenly (July 19, 1870) as an aftermath of the Hohenzollern candidacy to the Spanish throne, and as a result of the doctoring by Bismarck of the Ems Dispatch (q.v.). The French Army was poorly led, followed obsolete tactics, suffered many reverses

(Wissembourg, Forbach), and was finally trapped with Achille François Bazaine at Metz and Napoleon at Sedan. The emperor capitulated on September 1st. On the 4th the empress fled Paris and the republic was proclaimed. Napoleon remained a prisoner of war until March 19, 1871, when he went to Camden Place, Chislehurst, where he died on Jan. 9, 1873. During the last years of his reign his sufferings from a kidney stone had broken his spirit. Eugénie survived until July 11, 1920.

Perhaps no other sovereign has been as maligned and misrepresented by political passion as Napoleon III, a victim of the fiery diatribes of Victor Hugo. But the time has come for a cool reappraisal of his aims and realizations as a Caesarian democrat and a social planner. Besides the works quoted above, see also his *History of Julius Caesar* (1865); *Letters to Prince Napoleon* (1927); *Lettres à Mme. Cornu* (1937).

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NAPOLEON, Eugène Louis Jean Joseph (known as PRINCE IMPERIAL), only son of Napoleon III: b. Paris, France, March 16, 1856; d. Zululand, South Africa, June 1, 1879. After the fall of the empire, he went to England with the empress and entered the military school at Woolwich. He volunteered for service in Zululand, where he was killed in an ambush.

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NAPOLEON, PRINCE. See BONAPARTE, JÉRÔME.

NAPOLEON, city, Ohio, county seat of Henry County, on the Maumee River, 36 miles southwest of Toledo. It is served by two railroads, the Wabash and the Detroit, Toledo, and Ironton and is a marketing center for the agricultural products grown in the area. Industries include food and dairy products, metal products, tile and brick. The government is by mayor and council. Pop. (1950) 5,335.

NAPOLEON, a former piece of French money valued at about $4 or 20 francs. See LOUIS D'OR.

NAPOLEON LE PETIT (*Napoleon the Little*), the title of Victor Hugo's savage satire on Napoleon III (Brussels 1852).

NAPOLEON'S TOMB, the burial place of Napoleon Bonaparte under the dome of the Invalides in Paris. It has the form of a circular crypt 20 feet deep and 36 in diameter, open at the top. The tomb was designed by Ludovico Tullio Visconti, and on the walls are 10 marble reliefs by Pierre Charles Simart. The sarcophagus is 13 feet long, 6½ feet wide, 14½ feet high, cut from a single block of red porphyry, 67 tons in weight, surrounded by 12 victories by James Pradier. The inscription above the entrance to the crypt is taken from Napoleon's will: "I desire that my ashes shall rest on the banks of the Seine, in the midst of the French people that I have loved so well." Two adjoining tombs are those of the emperor's friend, Géraud Christophe Michel Duroc, and his companion, Henri Gratien Bertrand. Napoleon's remains were brought here in 1840 from St. Helena. In December 1940 the Germans reburied his son, the king of Rome (1811–1832), in an adjoining chapel.

NAQUET, nȧ'kȧ', **Alfred Joseph,** French chemist and social reformer: b. Carpentras, France, Oct. 6, 1834; d. Paris, Nov. 10, 1916. In 1867 he lost his professorship in the faculty of medicine in Paris and was condemned to 15 months' imprisonment for his share in the activities of a secret revolutionary society. In 1869 he fled to Spain after the publication of his book, *Religion, propriété, famille.* He returned to France in September 1870 and in the revolution became secretary of national defense. Soon after he was elected to the Chamber of Deputies and began agitation against the French marriage laws. His agitation for the re-establishment of divorce resulted in the law of 1884, and in 1886, through his continued efforts, divorce became legal after three years of definite separation, on the demand of one of the parties concerned. He was the author of a number of books on chemistry, the divorce question, and economic and political problems.

NARAKA, nŭr'ȧ-kȧ, in Hindu theology, a term equivalent to the English word hell. In Naraka there are 28 divisions, in which sinners of as many different classes are confined and subjected to tortures corresponding to the gravity of their offenses.

NARBADA, nĕr-bŭd'ȧ, or **NERBUDDA** (ancient NAMADOS), river in central India, about 775 miles long, rising in the mountains near the border of Madhya Pradesh and Vindhya Pradesh. It flows generally west and west-southwest across north Bombay Province and enters the Gulf of Cambay below Broach. Only about 60 miles of its lower course are navigable. The river is sacred to the Hindus, who make pilgrimages to its banks at Suklatirtha, Marble Rocks, Nemawar, and Amarkantak.

NARBONNE, när-bŏn', France, the chief town of an arrondissement in the Department of Aude, in a beautiful hill-girt plain, eight miles from the Mediterranean and 31 miles east of Carcassonne, commanding the entrance into Spain by the southwest. It is of historical interest as the Roman Narbo Martius, reputedly the earliest Roman colony (118 B.C.) beyond the Alps. About 309 A.D. it became the capital of Gallia Narbonensis, and had its capitol, forum, theater, aqueducts, and triumphal arches, of which there are few remains. In 412 (A.D.) it was taken by the Visigoths, and in 719 by the Saracens, from whom it was recovered by Pepin in 759. During the 11th and 12th centuries it was a prosperous manufacturing city, but subsequently deteriorated owing to the silting of its harbor. Its port, La Nouvelle, is 13 miles distant by canal. The principal edifices are the 12th and 13th century Romanesque church of Saint Paul Serge; the unfinished cathedral of Saint Just (13th-15th century); and the former archbishop's palace, now the city hall, in which are a good museum and a picture gallery.

A seminary and hydrographical school are among its educational institutions. The white-heather honey of Narbonne maintains its ancient celebrity; wine is produced, chiefly for blending purposes. The manufacture of bricks and tiles, sulphur refining, cooperage, and the distillation of brandy are among its industries. Pop. (1946) 26,301.

NARCISSISM, när-sĭs'iz'm, in orthodox psychoanalysis, an intense degree of self-love. The sexual instinct is directed towards one's own body or psychological attributes. By corollary, the narcissist is indifferent to other persons, unless by attracting their favorable attention his self-admiration is proportionately enhanced. The libido (sexual energy) is directed solely upon the self, or, in psychoanalytic terms, is "cathected" to the self. Narcissism is the primitive counterpart of egotism. It is contrasted with libidinal cathexis towards other persons. The psychoanalyst believes that a narcissistic individual is incapable of bestowing love upon anyone other than himself. In certain forms of mental disorders extreme narcissism is said to occur, and a mild degree of self-love is said to be present in many psychological functions.

Psychoanalysts differentiate between primary and secondary narcissism. Primary narcissism is normal among young infants, who find autoerotic gratifications in their own bodies. Secondary narcissism Freud defined as that which occurs when love-objects are taken away or when the libido is redirected from the external objects or persons toward which it has been flowing. Various psychopathologies eventuate from the latter type of narcissism.

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NARCISSUS, när-sĭs'ŭs, in Greek mythology, the son of the river god Cephissus. Narcissus was of surpassing beauty, but excessively vain and inaccessible to the feeling of love. Echo pined away to a mere voice because her love for him found no return. Nemesis determined to punish him for his coldness of heart, and caused him to drink at a certain fountain, wherein he saw his own image, and was seized with a passion for himself. As a result, he pined away, and the gods transformed him into the flower which still bears his name. See also ECHO.

NARCISSUS, a genus of plants of the family Amaryllidaceae (q.v.). The species, numbering from 16 to about 50, according to different authors, have bulbous roots, narrow grass-like leaves, and generally white or yellow flowers borne singly or in small clusters and protruding from a dry spathe at the summit of a leafless scape. Because of their hardiness, ease of cultivation, habit of blooming in early spring, beauty and fragrance, many of the species and their numerous hybrids and varieties have been general garden favorites for centuries. Some are useful for winter forcing, especially the polyanthus narcissus (*N. tazetta*) with its popular forms the paper white and the Chinese sacred lily. In general, the garden species succeed best in well-drained garden soil of medium texture and richness. The bulbs should be planted in autumn about five inches deep and three inches apart, and should not be disturbed until they appear to be failing, perhaps after three years. Then when the foliage has died down the clumps may be dug, the bulbs divided, cleaned and stored in a cool dry place until planting time. Among the most popular species are the poet's narcissus (*N. poeticus*), also known as pheasant's eye, the jonquil (*N. jonquilla*), and *N. tazetta* mentioned above. The Lenten lily (*N. pseudo-narcissus*), or daffodil, is also one of the most widespread and hardy. See also DAFFODIL.

NARCOSIS, när-kō'sĭs, a state of profound stupor, unconsciousness, or arrested activity. The condition is produced by the action of one or more of a large list of drugs known as *narcotics.*

NARCOSYNTHESIS, när-kō-sĭn'thē-sĭs, a form of treatment used in psychoaneuroses, especially in what is known as the war neuroses. One of the sleep-inducing drugs is injected intravenously into the patient, to produce stupor or arrested activity. In successful cases this brings forth emotionally charged conversation in which the patient unburdens his mind. The discussion ensuing is known as *synthesis.*

NARCOTICS, när-kŏt'iks, drugs which produce stupor, complete loss of consciousness, or sleep. These are divided into 3 principal groups, the opium group causing sleep, the belladonna group which produces illusions and delirium, and the alcohol group which brings on exhilaration and exaltation, followed by sleep. Narcotic drugs should be distinguished from *hypnotics* such as the barbiturates, amytal, etc., which produce sleep only. The more important narcotics are opium, morphine, codeine, belladonna, hyoscyamus, and hyoscine (scopolamine). Most are habit forming and are given in medicinal doses to relieve pain and induce sleep. In large doses they may produce coma and if the dose is sufficient death results. Even including ethyl alcohol all narcotics should be regarded as dangerous drugs not to be taken in poisonous amounts. This is especially important since tolerance for a drug has wide variation in different individuals. In the case of children even moderate doses may produce alarming symptoms with depressed respiration which, if not treated promptly, may result fatally.

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NARCOTICS, Traffic and Control. The problem of narcotics traffic and control is complicated by the dual nature of these substances. They are indispensable to surgery because of their pain killing and other properties and at the same time they can become the source of a terrible social evil—drug addiction.

Narcotic drugs have been in the past and are still to a very large extent extracted from plants: the opium poppy, the coca shrub, and the cannabis. The first two grow only in a limited number of countries—"the producing countries." The countries in which the alkaloids of opium and coca are extracted are "the manufacturing countries." Most countries are neither "producing" nor "manufacturing." In recent years a new complication has occurred in the problem of narcotic drugs; the rapid development of synthetic narcotic drugs which contrary to the "natural" narcotics derived from agricultural plants can be extracted from a wide range of other raw ma-

terials. The role of the national and international authorities in the field of narcotic drugs has been to create rules by which the production would be made to coincide with the scientific and medical needs: the distribution should be proof against leaks to the illicit traffic and illicit traffickers would be tracked and prosecuted.

Historical Development of the Control.—Since opium smoking used to be the most important form of drug addiction before the discovery of manufactured narcotics, the control began with attempts to suppress it. In 1909, on the initiative of President Theodore Roosevelt, an international opium commission was convened at Shanghai and recommended the gradual suppression of opium smoking. The government of the United States proposed to convoke a conference which met at The Hague in December 1911 and adopted on Jan. 23, 1912, a convention formulating the basic principles for the control of narcotic drugs: control of the production of opium, limitation of manufacture, sale, use, etc., of narcotics to medical and scientific needs.

After World War I the control became the responsibility of the League of Nations which established a policy making body formed of representatives of governments: the Advisory Committee on Traffic in Opium and other Dangerous Drugs. That body was to study the problem and propose the measures that it deemed necessary in order to solve it.

Under the auspices of the League two very important conventions have been signed (and are still in effect) in which the principles of The Hague Convention are put into practical application. (1) The Convention of 1925 provides for a tight control of the legal international trade in drugs by creating a system of import certificates and export authorizations such that no amount of drugs may be exported or imported without the knowledge and control of the governments of the countries of both parties to the transaction; by establishing the Permanent Central Opium Board to keep watch over these transactions (each government has to furnish to the board periodical reports on the consumption and movement of drugs on to and from its territory). In cases where the board feels that there is a dangerous situation developing in a country, it can ask for explanations and even recommend an embargo of narcotics for that country. (2) The Convention of 1931 aims to limit the production and to regulate the distribution of manufactured narcotics. It establishes a system of estimates by which each country has to tell each year the amount of narcotics it needs for the following year. These estimates are binding and determine the maximum amount to be imported or manufactured. They are examined by a special body, the Supervisory Body, which can ask for explanations, recommend modifications to the estimates, and establish them for the countries which fail to furnish them. The convention also sets up a procedure for placing new drugs derived from opium or coca leaf under international control following a decision of the World Health Organization (under the League of Nations such decisions were made by the League of Nations Health Committee together with the Office International d'Hygiene Publique in Paris).

These two conventions are the most important of a group of international instruments aiming at controlling the use of narcotic drugs. During World War II the control was maintained in spite of the obvious difficulties and when the United Nations Organization was set up it took charge of the functions of the League of Nations in the field of narcotics: the administrative bodies (Permanent Central Opium Board, Supervisory Body) remained unchanged and the policy-making body became the Commission on Narcotic Drugs of the Economic and Social Council (15 nations represented). Under the new setup two important agreements have been concluded: the Protocol of 1948 which provides for control of the new synthetic drugs; and the Protocol of 1953 for the limitation of the production of opium, according to which opium will be produced only for medical and scientific needs and the right to export it will be limited to seven "producing countries" (Bulgaria, Greece, India, Iran, Turkey, USSR, and Yugoslavia).

Present State of the Legal Trade.—Each year the Permanent Central Opium Board publishes its report on the legal world trade in narcotics, based on the statistics furnished by the different governments. That report shows the following figures for the production of narcotics in 1952: raw opium, 1,067 tons; morphine, 75.7 tons (*222* per cent of which was manufactured not from opium but from poppy straw); diacetylmorphine (heroin), 120 kilograms (kg.) (heroin is derived from morphine and has been manufactured legally in 1952 by five countries); codeine (codeine is derived from morphine), 63.8 tons; cocaine, 2.14 tons; pethidine, 12 tons; methadone, 381 kg. (figures incomplete; production in 1951, 521 kg.)

The main producing countries were (in order of importance): opium—Turkey, India, Iran, USSR, and Yugoslavia (there is only fragmentary information available concerning the situation in the mainland of China in 1952 but it is to be assumed that even if the production of opium is forbidden, that country is still probably by far the most important producer). Morphine—United States, United Kingdom, USSR, Hungary, Germany, and France. Cocaine—United States, United Kingdom, France, and Germany. The countries manufacturing morphine, cocaine, etc., buy the raw material from the countries producing it and export the drugs to all the countries of the world. The importance of the consumption generally corresponds more or less to the amount of population of each country.

Illicit Traffic.—The illicit traffic in narcotics is closely linked with the existence of drug addiction. An important incentive for illicit traffic is the fact that addicts who are ready to pay high prices for drugs, the legal consumption of which is forbidden, have no medical prescription. The more organized the control the more so the illicit traffic and the higher the prices. The traffickers can get their material from licit or illicit sources. Licit—that is, from legitimate sources by robbery (for instance, at the end of World War II important stocks of the German Army were pillaged); by forgery of medical prescriptions (but it is mainly the individual addict who resorts to that method and then it is for his own consumption); or by misappropriation of drugs legitimately produced (as has been the case in 1951 and 1952 in an important factory manufacturing heroin in Italy).

Illicit Sources.—These are probably by far the most important. Opium poppies or cannabis are illicitly produced in an inaccessible part of a country or in a country where the control is not

very well organized (for instance, in the northwestern states of Mexico in the years 1946–1950). The raw material is then either processed on the spot or sent to clandestine laboratories where morphine or heroin is produced (for instance, in 1952 five such laboratories were discovered by the police in France). Once the material is ready, the traffickers who are organized in powerful gangs with international ramifications will try to sell it where it will fetch the highest price. The two countries which seem to be, probably because of their hard currency, the main destination of the traffic are the United States and Canada. When the material has been delivered, it is "cut"—that is adulterated with other substances (heroin is usually cut up to 90 per cent before it is sold to the addicts), then distributed to wholesale peddlers who in turn sell it to the "pushers" who are in direct contact with the addict. In that way an ounce of heroin which cost $30, for instance, will be sold for as high as $500.

It is obvious that the volume of this traffic cannot be known. However, it is generally thought that the amount seized by the customs or other authorities represents about 10 per cent of the total quantities. It is of interest to quote a few figures of the total of some of the narcotics seized in the world during one year (1948, figures in kilograms): opium, 12,923; prepared opium, 4,444; dross, 15; morphine, 24; heroin, 36; cocaine, 19; cannabis (marihuana and other products of Indian hemp), 80,297. There seems to be a certain geographical localization for the drugs: Asia is the country of opium, Africa of Indian hemp, and North America of the "white drugs," as is clearly shown by the following figures: 75 per cent of the opium seized in the world was seized in Asia; 85 per cent of the cannabis products in Africa; and 65 per cent of the heroin in the United States (about 28 kilograms).

The routes of the illicit traffic are very often complicated. In order to evade suspicion, the traffickers will plan an indirect route so that their material will reach its destination on a ship coming from a port from which there is no reason to think that narcotics could come. Such a route was discovered in 1947, reaching the United States from Turkey by way of New Caledonia. The main routes are by sea, but of course there are land routes between neighboring countries: Syria-Israel-Egypt, the "Burma Road," the Mexican-United States boundary, etc. Since World War II the traffickers have begun to use air routes, parachuting narcotics at a given point through the complicity of crew members of an airplane. The traffickers are well organized and very alert; moreover, the huge profits derived from a shipment are sufficient to compensate for the loss of many others. They have perfected literally hundreds of ways of concealing their wares; from the stomach of a camel to semisubmersible containers provided with the latest gadgets (they are dropped outside territorial waters at a given point, stay under water for—say—two days, then pop up and emit short wave radiations which are picked up by a waiting boat).

Conclusion.—Society in order to protect itself prohibits the use of narcotics for nonmedical purposes; an international machinery has been designed to ensure that narcotics will be produced and used for medical purposes only. However, the addicts want their drugs, and the traffickers supply them, taking risks and profits. Against them each nation uses its own defense forces: customs, police, special narcotics administration (in the United States the Bureau of Narcotics, a federal agency which has the responsibility of enforcing the special narcotics legislation). Besides, through the international agencies the nations work together in order to stop the illicit traffic. Apart from the international setup previously analyzed there is the collaboration of the different police forces directly or through the International Criminal Police Commission.

The results of the control have been more than satisfactory. Since the beginning of the 20th century, drug addiction has been tremendously reduced and the illicit traffic has decreased regularly. If the figures of seizures for 1948 are compared with those for 1936 the drop is obvious: 124,497 kilograms (kg.) of opium seized in 1936 compared with the 12,923 kg. in 1948; 867 kg. of heroin seized in 1936 compared with 36 kg. in 1945, etc. Thus through national and international efforts a terrible potential evil is slowly and surely defeated.

NARCOTINE, när'kŏ-tēn, an alkaloid of opium. It is present in opium to the extent of 0.5-10 per cent, according to the source, and is isolated after the morphine and codeine have been removed. It has the formula $C_{22}H_{23}NO_7$ and belongs to the isoquinoline types; it is closely related to hydrastine, differing only by an additional methoxyl (OCH_3) group. The principal use of narcotine is in the preparation of cotarnine, which is formed when the molecule is split by oxidative hydrolysis. Cotarnine, in the form of its salts, is of considerable value as a styptic agent.

NARDINI, när-dē'nē, **Pietro,** Italian violinist and composer: b. Leghorn, Italy, April 12, 1722; d. Florence, May 7, 1793. He studied the violin first in Leghorn, then in Padua with Giuseppe Tartini, becoming his teacher's most successful pupil. In 1753 he was chosen for the post of solo violinist at the court of the duke of Württemberg in Stuttgart, where he remained until 1767. After his return to Italy, he became in 1770 musical director at the court of Grandduke Leopold of Tuscany in Florence. Nardini was not only a great performer, admired for the exceptional purity of his tone, but also a gifted composer of chamber music. He wrote six concertos for violin and orchestra, 15 sonatas for violin and bass, six string quartets, six duets for two violins, and six trios with the flute. Some of his sonatas are still included in the repertory of great violinists. The sonatas were re-edited by J. D. Alard and by Ferdinand David

NARDO, när-dô', town and commune of Italy, in the Province of and 15 miles southwest of Lecce, in Apulia, six miles from the Gulf of Taranto. Situated on the railroad from Lecce to Gallipoli, in the heel of Italy, it is a busy trade center for wine, olive oil, and cereals, the chief products of the area. There are several baroque churches and houses, but the most notable construction is the cathedral, founded by the Benedictines in 1090, which was later enlarged and restored.

Neritum was an ancient town of the Messapii, later a Roman municipium. After the fall of

the Roman Empire it came under the Byzantines; Greek influence remained so strong here, that the Greek rite of the local churches was entirely Latinized only in the 15th century. Nardo was sacked by the Saracens in 901 and conquered by the Normans in 1055. It was a fief of several lords and witnessed long and fierce struggles. Pop. of the commune (1951) 26,223.

NAREW, nä'rĕf, river in northern Poland rising in the district of Grodno out of the swamps of Byelovyezh and becoming navigable near Tikozyn, it flows past Lomza and Pultusk entering the Bug below the latter town. It has a length of 271 miles. The Niemen is connected with this river by the Augustowo Canal.

NARIAKI, Daimyo, of Mito, a member of the Gonsanké, or three princely Tokugawa families of Kiushiū, Owari and Mito, who ranked first among the territorial nobility of Japan. He flourished in the middle of the 19th century, and was noted as the leader of the seclusion policy of Japan. While working hard to improve the military and educational systems and to stir up her warlike spirit which the long years of peace had greatly diminished, he recognized that his country must soon be called upon to take her place among the nations of the world, yet he deliberately proclaimed the doctrine of the seclusion of Japan, in the meantime working strenuously to transform Japan along the lines of the very civilization and culture he pretended to be fighting. Nariaki's personality was the strongest and his intelligence the keenest, in his day, in Japan, and he soon was able to make his cry of the «expulsion of the barbarians» that of the whole country. History shows that he was, by far, the best informed man in his day, in Japan, on «foreign ways.» He fully appreciated the importance of providing Japan with the armaments and sciences of the western nations; and as early as 1849 he had begun spending comparatively large sums of money in the manufacture of arms along the latest European models. Against all opposition he prepared Japan for her wonderful leap into the arena of western civilization, while all the time he was misunderstood at home and abroad. Consult Okuma, Count Shigénobu, 'Fifty Years of Japan' (English trans. by Marcus B. Huish, London 1909).

NARINO, nä-rē'ño, **Antonio,** Colombian politician: b. Bogota, Colombia, 1765: d. Leiva, Colombia, 13 Dec. 1823. He was educated in the college of San Bartolome in Bogota and entered the magistracy. His writings of a revolutionary character brought him into trouble and in 1795 after a tedious trial he was transported to Spain under sentence of 10 years' penal servitude. Escaping in 1797 he returned to his own country but was again imprisoned and not released until the Revolution of 1810, when he joined the patriot army. He was elected President in 1811 and later dictator. On the outbreak of civil war Nariño defeated the Federalists, and then resigning his dictatorship marched against the Royalist forces in the south. His success was followed by defeat at Pasto in 1814 when he was captured and sent a prisoner to Spain. He was held a prisoner until 1820 when he returned to his own country. In 1821 he was elected senator, but declined the vice-presidency in 1822, and ill-health compelled him to retire soon after his appointment as commander-in-chief in 1823.

NARNI, när'nē, Italy, town known to the ancients as Nequinum and later as Narnia. It is located in the province Perugia on a cliff beneath which, in a deep ravine, flows the Nera (the ancient Nar). It is on the Rome-Foligno Railway, is seat of a bishop and has a cathedral dating from the 11th to 15th centuries, besides other churches erected from the 9th to the 15th century. Here are also ancient dwellings and castle, a town-hall dating from the 13th to 16th century, strong remains of a Roman bridge (of Augustus), an ancient aqueduct, etc. Its industries number leather and rubber-ware factories and oil presses. This is the birthplace of the Emperor Nerva and of Pope John XIII. Pop. 12,943.

NARO, nä'rō, Italy, town in the province Girgenti, Sicily, on the coastal river Naro, 12 miles from Girgenti. It has a castle dating from the Middle Ages and Early Christian catacombs. In the vicinity are large sulphur pits. The population is about 13,000.

NARRAGANSETT (năr-ą-găn'sĕt) **BAY,** an inlet of the Atlantic Ocean, extending into the State of Rhode Island about 28 miles. At its entrance, from Sakonnet Point to Point Judith, the bay is about 8 miles wide. One of its channels, on the east, is called Sakonnet River, and the chief arms of the bay are on the east, Mount Hope Bay, on the west, Greenwich Bay. The principal rivers which enter the bay are, at its head, Providence River, from the east Taunton, from the west Pawtuxet. The largest island in the bay is Rhode Island, and others are Conanicut, Prudence and Hog. Several places of importance are on the shores of the bay, chief of which are Providence at the mouth of the Providence River, Newport on Rhode Island and Fall River, at the mouth of the Taunton. Narragansett Bay is of great importance to the State, as it gives opportunities for commerce and transportation. The first explorers of the northeast coast of the United States mention this bay. Consult Bacon, E. M., 'Narragansett Bay' (New York 1904).

NARRAGANSETT INDIANS, an American tribe formerly occupying the territory now comprised in the State of Rhode Island and the eastern part of Long Island. Shortly after the arrival of the pilgrims they manifested symptoms of hostility; and as an expression of sentiment Canonicus, their chief, sent to Plymouth a bundle of arrows wrapped in the skin of a rattlesnake; to which Bradford, the governor, replied with the same skin filled with powder and shot. This significant retort secured, if not the good-will, at least the peaceableness of the sagacious chief. In the Pequot War they aided the colonists, but not unanimously. In the winter of 1675, during King Philip's War, that chief having taken refuge with the tribe, the colonists, apprehending that they would join his cause, made a secret attack upon their principal fort, killing about 1,000 warriors, destroying all their provisions, and exposing those who escaped to cold and famine, of which very many died. The Narragansetts from this time waged incessant war with the whites. They have now entirely disappeared as

a race, although some of their descendants of mixed blood are to be found in one or two localities in Rhode Island.

NARRAGANSETT PIER, village, Rhode Island, in Narragansett Township, Washington County; altitude 11 feet; on open ocean near the mouth of the West Passage to Narragansett Bay; about 30 miles south of Providence; served by the Narragansett Pier Railroad (connections with the New York, New Haven, and Hartford Railroad at Kingston). Narragansett Pier is best known as a beach resort, though some farming and fishing is done in the region. There are several beaches in the township, both public and private, as well as numerous inland ponds affording saltwater fishing. North of the village is the exclusive Dunes Club; to the south, Scarborough Beach, state-owned and operated. Further south, approximately six miles, is Point Judith, one of the most dangerous spots along the Atlantic Coast. Narragansett Township did not come into existence as a political unit of Rhode Island and the Providence Plantations until 1901, though its reputation as a beach resort area dates from the middle of the 18th century. It was a district of South Kingston from 1888 until its incorporation as a separate township in 1901. Pop. of the village (1950) 1,247.

NARRATIVE POETRY. The telling of a story in verse is in modern times rather exceptional than normal, owing to the extraordinary rise in importance of prose fiction. But in early periods narrative poetry was the most abundant and important kind, owing to the primitive tendency to devote poetry largely to objective purposes, in contrast with the subjective tendency of modern poetry. For the various types, see under LITERARY FORMS.

The Ballad.—In general this is the most primitive type of narrative poetry, and is assumed to have existed among practically all peoples, though in many instances no early examples have survived. This proportionately large disappearance of early ballads is due to their belonging to the period of oral composition and transmission, as distinguished from that of written literature; and this oral element is the fundamental characteristic of the type. It is connected, too, with the element of song; for the primitive ballad may always be assumed to have been sung. A surviving evidence of this is the frequent appearance of a refrain, perhaps originally joined in by the whole company of persons present at the ballad singing. Closely connected with these characteristics is the *communal* spirit of the old ballad: the form arises from a state of society when the individual poet is of relatively slight importance and when the content of poetry is not the experiences and feelings of the individual singer but those of the group. Hence in the ballads we do not look for individuality of style; of this their universal anonymity is a sign. Their language is simple, unsophisticated, but conventional, marked by abundant repetition yet by rapidity of narrative method,—in a word, the language of an age, as Ten Brink put it, whose poetry is «oscillating perpetually between reminiscence and improvisation.» Very many of the ballads, if not all, had their origin in the versifying of a real fact, gathering up mythical elements in the manner of popular tradition. Often there are many different versions of the same story, some differing only in details, others in essential elements, such as changes from supernaturalism in the direction of realism, or variants characteristic of particular localities or social groups.

Of ancient ballads of Greece and Rome no remains survive, though evidence of their nature is thought to be traceable in elements of the ancient epics. Macaulay, in his 'Lays of Ancient Rome,' made a brilliant but rather sophisticated attempt to conceive the matter and spirit of ballads of the early Roman people. Of the Latin races the Spanish branch has preserved the greatest number of ballads, some of those still extant dating from the early 11th century; most famous are those concerned with the story of «the Cid,» in the 12th century. Of French balladry the remains are more fragmentary. The early Germans are known to have made abundant use of ballads, and a collection of them was made under the direction of the Emperor Charlemagne; a surviving fragment of a «Hildebrand song» is supposed to date from the 8th century. Later, in the 15th and 16th centuries, a new era of German balladry developed; and toward the end of the 18th century modern scholars, led by Herder, began the systematic collection of the ballads of the race. There are also rich remains of the ballads of the Scandinavian peoples, dating from the 11th, 12th and 13th centuries; a collection was made in Denmark as early as 1591, while one of the greatest of modern ballad collections is that of the Danish scholar Grundtvig. The Slavic peoples have preserved an abundant ballad tradition, and some of them, notably the Serbians, are to this day in the ballad-making and ballad-singing period. Of the early English ballads no remains are preserved; but there are numerous survivals of the mediæval and modern periods of ballad-making, both in Scotland and England, beginning perhaps in the 13th century and extending as late as the 18th. The Robin Hood group includes the most famous of these, — a cycle thought to have originated in the 13th century. A monumental collection of the English and Scottish ballads was made by the American scholar F. J. Child.

The revived interest in balladry characteristic of the romantic movement in the late 18th century led to the writing of various modern adaptations and imitations, of which one of the most famous is the German poet Bürger's ballad of 'Lenore,' which was translated by Walter Scott. Wordsworth and Coleridge also adapted the ballad form to two different types of narrative verse found in their volume of 'Lyrical Ballads' (1798),— types represented respectively by Coleridge's 'Ancient Mariner' and Wordsworth's 'Lucy Gray.' Finally, one must note the distinction between these ballads which in one way or another hark back to the old folk poetry and the so-called ballad which is characteristic of the age of printing, and was abundantly produced, in doggerel verse, in the 16th and 17th centuries; these compositions, which are usually destitute of literary value, are sometimes called «broadside ballads,» from the most common form of their printing.

The Epic.—This type may be viewed as an elaboration of the ballad, developing similar

material more formally and at greater length, and representing a state of society more highly organized, socially and politically. Frequently a definite racial or national spirit underlies the epic, its subject, as Hegel expressed it, being some action which "includes the whole life of a nation and the history of an epoch." Like the primitive ballad, the primitive epic belongs to the period of oral transmission, but is associated with recitation rather than song, and with the art of professional entertainers, such as the German *scop* and the French *jongleur*. In some of the more elaborate ballads, notably the expanded ballad called 'A Gest of Robin Hood,' one may see something of the transition to epic elaboration and individual art-composition; and certainly when we reach the full epic form, though it is still representative of communal material and interests, we recognize the skill of highly developed individual workmanship, giving unity and form to great masses of material. It is customary to distinguish between the folk-epic, based originally on ballad tradition, and showing comparatively little of the spirit of the individual artist, and the art epic, consciously and imitatively developed by a poet of a literary age. Of the former the conventional example is the Greek 'Iliad' of Homer, dealing with the hero Achilles and the Trojan War; of the latter, the Roman 'Æneid' of Virgil. But the distinction cannot be maintained with accuracy, since there is indefinite gradation from the communal to the individual method. Thus the Greek 'Odyssey,' on the wanderings of Ulysses, which is traditionally attributed to the same poet as the 'Iliad,' shows far less of the national and communal, and more of the individual, spirit. Other epics of the more or less primitive type are the 'Mahabharata' of India, based on the mythologic legends of the Hindu people; the German stories of the 'Nibelungen' and 'Gudrun,' dating from the 13th century; the French *chansons de geste*, or heroic songs, abundant in the 11th and 12th centuries, of which the chief is the 'Song of Roland'; the Spanish 'Poem of the Cid,' of the 12th century; and the old English 'Beowulf,' in its present form dating from the beginning of the 8th century, but representing an earlier period and Scandinavian rather than English matter. The old Norse lays of the 'Elder Edda' approximate epic form, but in unity and elaboration the prose 'Saga of the Volsungs' is nearest, for the Scandinavians, to the true epic. Epics half way, in a sense, between the primitive and the sophisticated type, are the Indian 'Ramayana,' the Persian 'Shah-Nameh' (made by the court poet Firdausi from primitive epic material), and the Finnish 'Kalevala' (compiled by the modern philologist Lönnrot). To the same hybrid class belong the partly compiled, partly composed Celtic "epics" of James Macpherson, 'Fingal' and 'Temora' (1762–63), based on more or less genuine materials from the Scottish Highlands, attributed to a traditional bard named Ossian.

The imitative or art epic has been well represented in every literature which came under the influence of the classical tradition. For Greece itself there was a considerable number of these poems, commonly called the "epic cycle," whose authors undertook to complete the epic treatment of national material left untouched by Homer; and, in the Alexandrian age, the 'Argonautica' of Apollonius of Rhodes. For Rome, as we have seen, the great example is the 'Æneid,' which remains the most successful reproduction by art of the spirit of the folk epic; for Virgil celebrated a theme of national significance at the moment when the national life of the Romans was at its height. Later Roman epics were the 'Pharsalia' of Lucan and the 'Thebais' of Statius. In the mediæval period the epic form, like all literary forms, was turned to the service of the Church, and there was a considerable production of Christian epics, beginning with the 'Historia Evangelica' of Juvencus, in the 4th century. Highly characteristic, too, of this era are narrative poems of allegorical or symbolic type, having something of the dignity and elaboration of the epic but without its usual themes or methods; one may note examples as different as the great 'Divine Comedy' of Dante and the English poem of 'Piers Plowman.' The Renaissance was followed by various experiments in formal epic, such as the 'Lusiad' of Camoens in Spain (1572) and Tasso's 'Gerusallemme liberata' (1581) in Italy. In the 18th century Voltaire attempted to revive the glory of the form in his 'Henriade' (1723). In Germany the most notable modern epic is Klopstock's biblical 'Messias' (1773); there is also a 19th century version of the Nibelungen epic by Wilhelm Jordan. In England the Renaissance poets were rather less interested in the epic than those of the Continent, though Spenser doubtless regarded the allegorical narrative of his 'Faery Queene' (1590–96) as in the epic tradition; and the same thing is true of historical poems like Warner's 'Albion's England' (1586), Daniel's 'History of the Civil Wars' (1595), and Drayton's 'Mortimeriados' or 'Barons' Wars' (1596, 1598). It was reserved for Milton to make the only really vital application to English poetry of the old epic method, in his 'Paradise Lost' (1667), a work dealing with the supreme conflict of the whole human race instead of a special branch of it. Cowley had already produced a biblical epic in the 'Davideis' (1656), and Davenant an historic epic in the 'Gondibert' (1651),—both highly praised in their time, but now considered unreadable. Equally lacking in vitality were the English epics of the 18th century, such as Blackmore's 'Alfred' (1723); Glover's 'Leonidas' (1737), and Wilkie's 'Epigoniad' (1757); on the other hand the taste of this age for the epic form found expression in Pope's famous translation of Homer. In the early 19th century the epic method was revived by Southey in a series designed to represent the great religions of the world: 'Thalaba,' 'Madoc,' 'The Curse of Kehama,' and 'Roderick' (1801–14). The taste of the modern period, however, turned very definitely either to romance or realism, both of which found expression in Byron's great satiric-romantic-realistic epic of 'Don Juan' (1819–24). Something of the old epic method was again revived by Tennyson for his rather mysteriously termed 'Idylls of the King' (1859–85), and—with far more regard for the primitive tradition—by William Morris in 'Sigurd the Volsung' (1876). But the finest example in modern poetry of classical epic style is found in the episodical 'Sohrab and Rustum' of Matthew Arnold (1853),—a version of a brief

portion of the Persian 'Shah-Nameh.' Once more, at the opening of the 20th century, a vigorous effort has been made to revive the national epic, in the 'Drake' of Alfred Noyes.

Finally, we may note that in every period there have been burlesque or satiric epics, taking their point from the very dignity of the traditional form in contrast with the triviality or meanness of its new application; such are the ancient Greek 'Battle of the Frogs and Mice,' Butler's 'Hudibras' (1662); Boileau's 'Lutrin' (1674), and Pope's 'Rape of the Lock' and 'Dunciad' (1712 and 1728).

The Metrical Romance.— This type of narrative poem is especially characteristic of the mediæval period, or, more generally, of the age of chivalry as distinguished from that of primitive heroic life and literature. Between many of these poems, however, and the epic, the line is a very doubtful one. The greatest representatives of the type are found in Chrestien de Troyes, a *trouvère* of France in the late 12th century, and two German poets of the early 13th century, Gottfried of Strassburg and Wolfram of Eschenbach, of whom the former rewrote the story of Tristan and Isolde and the latter the story of Parsifal. But besides these, in every country of western Europe, there were uncounted nameless authors both of individual poems and of those which go to make up the great «cycles» like those of Arthur, Tristram, Gawain and other popular heroes. It is common to divide these romances according to the geographic source of their material, which is thus classified as «Matter of France,» «Matter of Britain» (that is, the primitive Celtic region, whether continental or insular), «Matter of the Orient,» etc. But in the actual authorship and distribution of the romances, linguistic, racial and geographic lines play comparatively little part, a good portion of them having become the property of all the European peoples of their age. Like the epic, these romances represent the age of recited poetry and of professional entertainers; Scott's 'Lay of the Last Minstrel' at once describes the type and exemplifies the way in which he came to pass from the study of the early romances to the writing of modern originals. In England the finest of the romances are as late as of the 14th century; notably, for the more popular sort, the 'Sir Gawain and the Green Knight' of a genius whose name has been lost, and for the more literary, the 'Troilus and Criseyde' of Chaucer, in which a familiar episode of the old Trojan war story is treated with an interest in characterization and in realistic humor which make it anticipatory of the modern novel. On the border, again, between the mediæval and the modern spirit was the popular Italian romance of the Renaissance, Ariosto's 'Orlando Furioso' (1515). In the neo-classical period, especially the 18th century, this loose and unauthenticated type of poetry was naturally regarded with little favor, and for equally obvious reasons it was enthusiastically revived by the representatives of the «romantic revival.» In England the metrical romances of Scott, already referred to, were the most important results of the movement, especially 'Marmion' and 'The Lady of the Lake' (1808 and 1810). In the introduction to 'The Bridal of Triermain,' Scott distinguished the form from epic poetry as being free from all rules save «those which good sense, good taste and good morals apply to every species of poetry.» In the later 19th century it was again revived by William Morris in various imitations of the work of mediæval romancers; while in Germany a notably successful specimen was Scheffel's 'Trompeter von Säckingen' (1853).

The Tale, etc.— In all periods, and especially in modern times, narrative poetry tends to overrun the bounds of fixed types, and to appear in forms which may be vaguely called metrical tales or otherwise. In classical literature the most influential example of this form is the 'Metamorphoses' of Ovid, whose material sifted down into a great part of mediæval and Renaissance poetry. In the mediæval period the supreme example is the 'Canterbury Tales' of Chaucer, which drew upon every type of story material, combining sentiment and humor, realism and romance. In the Renaissance the Ovidian type of narrative poem is represented by Marlowe's 'Hero and Leander' and Shakespeare's 'Venus and Adonis' and 'Lucrece.' Dryden's 'Fables' (1700) are a landmark in another period, but are largely versions of tales by earlier poets. Like the metrical romance, the poetic tale was abundantly revived in the period of the romantic revival, sometimes with a view to the attainment of realistic simplicity, as in Wordsworth's 'Michael' or (in Germany) Goethe's 'Hermann and Dorothea,' sometimes with a preference for highly romantic elaboration, like 'The Eve of Saint Agnes' of Keats. Byron's «tales,» nine in number, published between 1813 and 1823, went far to supplant the popularity of Scott's metrical romances, and in some cases might very well be called by that name themselves. Space does not permit the tracing of the varied development of the less defined types of narrative poetry through the 19th century. Perhaps the most remarkable experiment made in that period was Browning's 'The Ring and the Book' (1868), in which a single story is told 10 times over, in a series of monologues supposed to be uttered by various persons concerned. Tennyson, on the other hand, told the story of 'Maud' (1855) in a series of monologues and lyrics supposed to be uttered by a single person, forming a «monodrama.» Both these works are characteristic of the trend of narrative poetry in modern times, toward subjective and spiritual qualities, as opposed to the objectivity of the increasingly rare epic method. On the other hand, the early 20th century has seen some return to the more objective tale in the Elizabethan narratives of Alfred Noyes's 'Tales of the Mermaid Tavern' and the realistic contemporary narratives of John Masefield, notably 'Dauber.'

Bibliography.— For the nature and development of the more primitive types of narrative poetry, consult Gummere's 'The Beginnings of Poetry' (New York 1901) and 'The Popular Ballad' (Boston 1907); Ker's 'Epic and Romance' (London 1897); Hart's 'Ballad and Epic' (Harvard Studies and Notes, Boston 1907); Saintsbury's 'The Flourishing of Romance and the Rise of Allegory' (London 1897); Billings's 'Guide to the Middle English Metrical Romances' (New York 1901); Schofield's 'English Literature from the Norman Conquest to Chaucer' (New York 1906); the introductions to the translations of 'Beowulf'

and the 'Song of Roland' in the 'Riverside Literature Series' (Boston); and the volume of 'Arthurian Chronicles' in 'Everyman's Library.' On the Greek epic, consult Lang's 'Homer and the Epic'; on epic poetry in general, Dryden's Preface to his translation of Virgil and Clark's 'History of Epic Poetry' (Edinburgh 1900); on English narrative poetry, Dixon's 'English Epic and Heroic Poetry' (1912); Murray, G., 'Classical Tradition in Poetry' (1927). RAYMOND M. ALDEN, *Late Professor of English, Leland Stanford Junior University.*

NARRENSCHIFF, när'ĕn-shĭf, **Das** ('The Ship of Fools'), Sebastian Brant's celebrated work (1494). See BRANT, SEBASTIAN.

NARROWS. See TRELLISED DRAINAGE and STREAM PIRACY.

NARROWS, The. narrow part of New York Bay, a channe. .vhich connects Upper New York Bay with Lower New York Bay, and separates Long Island and Staten Island. At the south entrance of The Narrows are two forts, Fort Hamilton on Long Island and Fort Wadsworth on Staten Island. See map of Greater New York and vicinity under NEW YORK.

NARSES, när'sēz, Byzantine general: b. Armenia, 472; d. Rome, 568. He was a eunuch when he entered the imperial household in Constantinople, of which he soon became chamberlain. His ability soon advanced him to the office of treasurer to Justinian, who sent him to Italy in 538 to keep an eye on Belisarius. Narses was recalled in 539 and in 551 succeeded Belisarius as commander-in-chief in Italy and speedily drove thence the Franks and Goths, and re-established Byzantine control. He took possession of Rome and was appointed prefect of Italy in 554. In spite of his able administration he was removed by Justinian's successor, Justin II, on the ground of his avarice which caused him to levy severe taxes on the people. Legend says that he was insulted by the Empress Sophia upon his dismissal, and that he thereupon went over to the Lombards. He was equally famous as general and statesman. Consult Hodgkin, 'Italy and Her Invaders' (1885–95, Vols. IV and V); Bury, 'Later Roman Empire' (Vol. I, 1889); Gibbon, E., 'Decline and Fall of the Roman Empire' (London 1898); 'Cambridge Mediæval History' (Vol. II, New York 1913).

NARTHEX (Greek, a reed, hence any oblong figure), the term used in ecclesiastical architecture to designate the westernmost division of an ancient Greek church, running like a cloister from the north to the south wall. It was a vestibule, separated from the nave proper by a screen or railing, beyond which catechumens and those under Church censure or penance were not permitted to advance. It had three door-ways, one on the west as well as one in the northern and southern walls. The western was the principal entrance and was known as «the beautiful» or «royal gate.» The doors leading through the screen into the nave were named according to the classes who used them, «the priests' gate,» «the men's gate,» etc. The narthex was also used for funerals and public meetings; baptism was celebrated there and the font, which had formerly been in a building adjoining the church, was also placed in the narthex. There was sometimes an inner and an outer narthex. Consult Bingham, 'Christian Antiquities'; Siegel, 'Christliche Alterthümer'; Walcott, 'Sacred Archæology.'

NARUSZEWICZ, nä-roo-shā'vĭch, **Adam Stanislaw,** Polish historian and poet: b. Pinsk, Lithuania, 20 Oct. 1733; d. Janow, Galicia, 8 July 1796. He became a Jesuit in 1748; taught in the Jesuit schools in Vilna and Warsaw; and after the suppression of the Order became bishop of Smolensk, and later of Lutsk. His poetry, consisting of translations, odes, fables, epigrams, satires and idylls, was first published in 1778. In prose, he translated Tacitus, wrote a biography of Chodkiewicz (1781), composed a history of Crimea (1787), and on the suggestion of his patron, King Stanislaus Augustus Poniatowski, wrote his greatest work, a history of Poland down to 1386 (1780–86, new ed. 1859–60), which, because of its style and its protest against the abuses of a monarchy or an aristocracy, won him the name of the Polish Tacitus.

NARVA, när'vą, Esthonia, an important manufacturing town on the river Naróva, 100 miles southwest of Petrograd. It contains several Greek and Lutheran churches, has a fine town-hall, a castle, two gymnasia, a theatre and technical schools in connection with the cotton and woolen mills nearby. Cotton and lumber are the principal items of trade. The town was founded by the Danes in the 13th century, and after being held briefly by the Russians passed to the Swedes in 1581. Peter the Great took it in 1704. Here, on 30 Nov. 1700, was fought a battle between 8,000 Swedes under Charles XII and 80,000 Russians under General Dolgorouki. The Russians were besieging Narva, and after driving in 10 large bodies who occupied advanced positions, Charles boldly attacked their entrenched camp. After a brief cannonade the Swedes stormed the Russian trenches, and although the Russian artillery stood to their guns, the defenders were driven out in disorder after three hours of hard fighting. The Russians lost 18,000 men in the trenches and many more in the open fight; the Swedes only lost 600. Pop. 27,000, Germans, Esths and Russians.

NARVACAN, när-vä-kän', a pueblo of the province of Ilocos Sur, Luzon, situated 13 miles southeast of Vigan, the provincial capital. It is on the main road and one of the most important towns of the province, being next the capital in population. Pop. about 22,000.

NARVAEZ, när-vä-ĕth', **Pánfilo de,** Spanish soldier in America: b. Valladolid, about 1470; d. near mouth of Mississippi River, November 1528. He came to America about 1498, settled first in Santo Domingo and then in Cuba, where from 1512 until his death he was under Velasquez in the command of an auxiliary force in the conquest of the island. The disobedience of Cortés in Mexico, whither he had been sent by Velasquez, led the latter to send Narvaez in 1520 to supersede and punish Cortés. This expedition was entirely unsuccessful. Narvaez landed at Vera Cruz in April; was defeated in May at Cempoala by the army of Cortés; lost one eye in the battle, and was deserted by the remnant of his army, which

joined Cortés. He was captured, but soon released; returned to Spain, where he was appointed governor of Florida in 1526, and sailing from Cuba in March of 1528, landed at Apalachee Bay, lost half his men on the march inland, retreated to the shore, where he found that his ships had been destroyed, and having built boats, sailed westward along the coast, only to be shipwrecked with all but four of his men. Consult Bourne, E. G., 'Spain in America' (New York 1907); Alvar Níeñez Cabeza de Vaca, 'Relación' (in J. F. Jameson's, ed., 'Original Narratives of Early American History' (Vol. II, ib. 1907).

NARVAEZ, Ramón María, Duke of Valencia, Spanish general, and statesman: b. Loja, Andalusia, 4 Aug. 1800; d. Madrid, 23 April 1868. He entered the army in 1815; fought against the French and in 1822 assisted in putting down the uprising in the Royal Guards; lived in retirement at Loja from 1823 until the death of Ferdinand VII in 1833; in 1836 defeated the Carlist leader, Gomez; and in 1838, after clearing La Mancha of brigands, was made captain-general of Old Castile. He led an insurrection against Espartero, in 1840, his old chief, but was beaten and fled to France, where he joined the party of Maria Christina. He returned to Madrid in July 1843; Espartero left the country; and from May 1844 to February 1846, and from October 1847 to January 1851 Narvaez was Prime Minister, in recognition of his services to Maria Christina. In 1845 he was made grandee of Spain of the first class and Duke of Valencia. He began by changing his policies to the more conservative form, revising the Liberal constitution of 1837. He held the same post in 1856–57 and 1864–65, being Minister to Paris and Vienna in the intervals. During the military rising of 22 June 1866 Narvaez commanded the loyal soldiery, and in July succeeded the defeated O'Donnel as Ministry President and Minister of War. A Liberal in early life he became more and more conservative and spent his last years in attempting to keep Isabella on the throne. Consult Mazade, 'Les révolutions d'Espagne' (Paris 1869); Pirala, A., 'Historia contemporánea' (Madrid 1871–79).

NARVIK, när'vĭk, Norway, small town on the Ofoten Fjord, with beautiful mountainous surroundings. It is also known as Victoriahavn, and is the terminus of the Ofoten Railway which transports an enormous tonnage of Swedish iron ore. It is used by the tourists visiting the lovely Lofoten Islands. It is a station for coastwise trading steamers. Pop. about 7,000.

NARWHAL, a large porpoise which inhabits the Arctic Ocean. It belongs to the family *Delphinidæ* and was named *Monodon monoceros* by Linnæus. Its most striking characteristic is the possession by the male of a very long, straight, spirally-grooved tusk, which projects forward from the left side of the upper jaw in line with the axis of the body. When full-grown the narwhal has a length of about 16 feet. The head is rounded, the back has a very low ridge instead of a fin and the pectoral fins are short and broad. The color of the body is gray above and white below, everywhere mottled and spotted with gray and black. The young are darker colored, while old individuals are often nearly white throughout. The vertebral formula is as follows: Cervicals, 7; dorsals, 11; lumbars, 6; caudals, 26; total, 50. The cervical vertebræ, unlike those of other true porpoises, except the beluga or white whale, are all free. The skull is depressed, with a broad rostrum.

The massive tusk or maxillary tooth of the narwhal is developed only in the male, and with rare exceptions, only on the left side of the jaw. Normally the corresponding tusk or tooth of the right side remains concealed in the maxillary bone during life. In females neither tusk is visible. All other teeth are wanting in adults of both sexes. Occasionally, both tusks are developed in males and in females as well. About 16 such heads have been preserved, including one from Prince Regent Inlet, in the National Museum, Washington. The largest narwhal tusks are about eight feet long, with a girth of about nine inches at the base. They are hollow for a considerable proportion of their length.

The tusk is a secondary sexual character like the antlers of the stag, the spurs and comb of the cock, etc. It has been suggested that the narwhal makes use of the tusk to break the ice, to transfix its prey, or in combat, but these ideas lack confirmation.

When first introduced into Europe, the true origin of the tusks not being known, they were supposed to be the horns of the mythical unicorn. For a considerable time they were highly prized on account of their reputed medicinal properties, and are still made use of in China as a drug.

Narwhals occur in large herds or schools among the ice of the Arctic Ocean, northward of lat. 65° N. They migrate to higher latitudes as the ice recedes and return in the fall. Very rarely individuals stray southward along the coast of Europe as far as Scotland.

The narwhal resembles the beluga or white whale in many important characters, not shared by other porpoises, and forms with it a separate sub-family, the *Delphinapterinæ*.

NASBY, năz'bĭ, **Petroleum V.** See Locke, David Ross.

NASCENT STATE, *in chemistry,* the state or the peculiar reactionary power possessed by an element at the instant of liberation from a compound or combination in which it has previously existed. At the moment an element is liberated from a compound of which it has been a constituent it acquires a higher power of chemical reaction than it displays some time after its liberation. One theory of the nascent state of an element is that the molecules at the instant of liberation are separate and independent; and that an appreciable length of time is required for their final arrangement; and that while they are in this free state they possess an extraordinary power of reaction, which power is otherwise exerted and expended in the act of molecular arrangement. For instance, it has been advanced by some chemists and physicists that hydrogen in a nascent state is made up of single atoms, while hydrogen in a gaseous state is composed of molecules, each molecule containing two atoms. Another theory is that nascent hydrogen is simply hydrogen under great pressure, for a mere increase in pressure will make ordinary hydrogen act

like nascent hydrogen. Thus many substances, such as aldehyde, will combine with nascent hydrogen which utterly refuses gaseous hydrogen.

NASCOPI, năs'kă-pē, or **NASCAPEE, INDIANS,** a Labrador tribe, the most northeasterly known branch of the Algonquian family. They formerly occupied the interior tableland extending from Lake Mistassini, in south central Quebec, Canada, to the Atlantic Ocean.

NASEBERRY, nāz'bĕr-ĭ, the fruit of *Sapota achras,* one of the finest West India fruits. The bark of the tree has astringent and febrifugal properties. See also SAPOTACEAE.

NASEBY, nāz'bĭ, parish, England, in Northamptonshire, 12 miles northwest of Northampton, on the north side of which, on June 14, 1645, Fairfax and Cromwell, commanding the Parliamentary troops, defeated Charles I and his army, taking 5,000 prisoners and capturing the royal cannon and baggage. An obelisk marks the site. Pop. (1939 est.) 399.

NASH, Abner, American politician: b. Amelia County, Va., Aug. 8, 1740?; d. Philadelphia, Pa., Dec. 2, 1786. He studied law and removed to New Bern, N. C., where he practiced successfully and in 1774 he was a member of the first provincial congress of North Carolina. He served as member of the council which framed the state constitution in 1776 and was speaker of the senate in 1779. He was governor of the state from 1779–1781 and in 1782–1786 sat in the Continental Congress.

NASH, Francis, American soldier: b. Amelia County, Va., May 10, 1720; d. Germantown, Pa., Oct. 7, 1777. He was a brother of Abner Nash (q.v.), and early removed to North Carolina, where he was clerk of the Superior Court of Orange County. He was a member of the assembly in 1771, 1773–1775. He served under the crown with a captain's commission, but resigned and was a member of the provincial congress which met in 1775 when he was appointed lieutenant colonel in the Continental Army. In 1777 he was commissioned brigadier general by the Continental Congress and at once joined Washington, under whom he commanded a brigade and was mortally wounded at the Battle of Germantown.

NASH, John, English architect: b. London, 1752; d. East Cowes Castle, Isle of Wight, May 13, 1835. He studied and practiced architecture under Sir Robert Taylor; then retired from business until 1793; and upon his re-entry into the profession gained much royal and noble patronage. He laid out Regent's Park and the street leading up to the park, now called Regent Street; remodeled Buckingham Palace and altered the Brighton Pavilion. He was particularly fond of single façades, of projecting colonnades and of a plentiful use of plaster and stucco. The use of cast iron girders was principally introduced by Nash, who patented several varieties. Personally he was an estimable man, but unpopular because of George IV's display of favoritism toward him.

NASH, Richard (called BEAU NASH), English leader of fashion: b. Swansea, Wales, Oct. 18, 1674; d. Feb. 3, 1762. He studied at Jesus College, Oxford, was for a time in the army, but finding military discipline not to his liking, entered at the Inner Temple. In 1705 his skill in gaming took him to Bath, which in 1703 had become a much frequented watering-place. He determined to improve the provincial character of the spa, and soon became a self-appointed but arbitrary master of ceremonies. He was known as the "King of Bath" and his rule was celebrated in prose and verse. His code included the prohibition of swords within his realm, a restriction which tended toward that consideration for the public peace which was then growing in England. His vanity grew with his power; he appeared in a monstrous cream-colored beaver and invariably journeyed by post-chariot with three span of grays, footmen and outriders. Gambling was prohibited by law in 1740, and Nash, by 1745, had lost his trade. The town granted him an annuity of £10 a month. Goldsmith wrote his life (1762).

NASH, or **NASHE, Thomas,** English satirist and dramatist: b. Lowestoft, Suffolk, 1567; d. 1601. He studied at Cambridge in 1586, spent some time on the Continent, and before 1588 came to London. In 1589 he published his *Anatomie of Absurdities.* In the literary warfare carried on between the Puritans and bishops Nash took an active part in behalf of the latter. Under the pseudonym PASQUIL he published the tracts *A Countercuffe Given to Martin Junior* (1589) and *Pasquil's Apologie* (1590). In 1592 he issued his powerful satire on contemporary society, *Pierce Pennilesse, His Supplication to the Divell.* His *Christes Teares over Jerusalem* (1593) followed in repentant mood, and he affected to dismiss satire, in which, he said, he had "prodigally conspired against good houres." His notable work of picaresque fiction, *The Unfortunate Traveller, or the Life of Jack Wilton* (1594), to a certain extent anticipated Defoe. Involved in a paper war with Gabriel Harvey, who had boasted of having put him to silence, he thereupon published *Have with You to Saffron-Walden, or Gabriel Harvays Hunt Is Up* (1596), brimming with scorn. Nash also wrote plays, in whole or in part. He completed, unsatisfactorily (1594), Marlowe's *Dido.* His *Summers Last Will and Testament* (1593), comedy, was first published in 1600. A play, *The Isle of Dogs,* led to his imprisonment for attacks contained in it. He died having, as one epitaph put it, "never in his life paid shoemaker or tailor." Nash's personality was somewhat unique in Elizabethan literature. His prose was vigorous and his verses were at times those of a poet. His works were edited by Grosart (1883–1885).

NASHUA, năsh'ū-ȧ, city, New Hampshire, one of Hillsborough County's seats; altitude 152 feet; on the Nashua and Merrimack rivers; 34 miles southeast of Concord; on the Boston and Maine Railroad; has a municipal airport. Nashua is the second largest city in the state, with well diversified industries. In 1823 the Nashua Manufacturing Company, the oldest industry in the city, was formed; it is known chiefly for its woolen blankets, although it manufactures other textile products. Machine tools and lathes were developed here in 1838–1852. Elias Howe (q.v.)

perfected the sewing machine in 1844–1846. The first watches were made by machinery about 1860. The first waxed wrappers for bread were made here in 1908. Major factory products now are: textiles including blankets, paper box machinery, shoes, gummed and coated paper, asbestos products, shears and refrigerators. A United States fish hatchery here has huge rearing ponds. Various other points of interest in the city include Greeley Park (125 acres), a gift to the city for recreation purposes; Holman Stadium, seating 5,300; Colonial House, built in 1803, an architectural gem; and Marsh Tavern, a well known stagecoach hostelry, dating from 1804. Originally a fur-trading post known as Watanic, the site was settled in 1656, became Dunstable town in 1673 and Nashua in 1803. It was incorporated as a city in 1853. Pop. (1940) 32,927; (1950) 34,666.

NASHVILLE, city, Tennessee, state capital, seat of Davidson County, and a port of entry, is situated on both banks of the Cumberland River (connected by bridges), and covers an area of more than 22 square miles. The city's average altitude is 500 feet. Nashville lies in the north central part of the state, 138 miles northwest of Chattanooga and 184 miles southwest of Louisville (highway mileage), in the Tennessee Basin, and is surrounded by a fertile agricultural area in which are raised cotton, tobacco, grains, livestock, fruits, and other products. The city is served by the Nashville, Chattanooga and St. Louis, the Louisville and Nashville, and the Tennessee Central railroads. On each side of the river is a municipal airport (the Berry and the Cumberland), which together provide Nashville with passenger transport, charter, and private airplane facilities. About 14 miles southeast of the city is the Sewart Air Force Base. A network of federal and state highways converges on Nashville for motorbus and truck transportation. There is river transport service also, the Cumberland at this point having a 9-foot channel. Although Nashville is a modern city, it has "a serene, Athenian quality," as Hodding Carter puts it.

Commerce and Industry.—Nashville is an important commercial center, with a thriving wholesale and retail trade; and six banking institutions, including a branch of the Atlanta Federal Reserve Bank. The city is also an important printing and publishing center, having two daily newspapers and more than 50 periodicals, most of them issued by religious or professional groups. It has railroad shops, limestone quarries, foundries, meat packing plants, and establishments which produce butter, spices, coffee, and other foods, rayon and cellophane, woven and knit clothing, shoes and boots, tobacco products, boats and barges, bridges, stoves, brick, and other products.

Educational and Cultural Institutions.—Nashville is one of the South's most important educational centers. Besides its public school system, it has private and parochial academic schools, business schools, a junior college for girls, and eight coeducational institutions of higher learning. Of these last there are, for white students, George Peabody College for Teachers—the largest teacher training center in the South—and Vanderbilt University (both institutions are private and nonsectarian); Trevecca Nazarene College (Nazarene); David Lipscomb College (Church of Christ); and Scarritt College for Christian Workers (Methodist). For Negro students, there are Fisk University (which dates from 1865) and the Meharry Medical College (both of which are private and nonsectarian), and the Tennessee Agricultural and Industrial State College, one of the largest educational institutions for Negroes in the world. Each of Nashville's colleges and universities has its own library facilities, and the city's public library has a collection of about 436,000 volumes, in addition to files of Nashville's newspapers dating from 1818. In the War Memorial Building are housed the State Archives and two state historical museums containing relics of wars in which Tennesseeans have fought. Vanderbilt University owns the Thurston Collection of Antiquities and Minerals which includes numerous artifacts of the Moundbuilders. In the Nashville Art Museum are rare collections of European ceramics and the works of American painters. Fisk University has an art gallery with unusually fine examples of modern art, including paintings by Paul Cezanne, Pablo Picasso, Diego Rivera, and Georgia O'Keeffe. Housed in the Parthenon in the city's Centennial Park is the Gowan Collection of paintings by American artists, dating from the colonial period. The Hermitage Hotel displays a score of Civil War scenes by the American artist William Gaul. Nashville has its own symphony orchestra and other musical organizations, among which are the world-renowned Jubilee Singers of Fisk University.

Notable Buildings and Other Points of Interest.—Near the heart of Nashville, on an eminence once known as Cedar Knob, is the State Capitol. Completed in 1855, it was patterned after an Ionic temple and built of fossilized Tennessee limestone blocks. Near its east portico is a bronze, equestrian statue of Andrew Jackson, 7th president of the United States, who as a young man, had his law office in Nashville; and whose beautiful old home, The Hermitage (1835), just a few miles northeast of the city, is maintained as a memorial to him. On the grounds of the capitol is the tomb of his friend, James K. Polk, one of Tennessee's governors and 11th United States president. Nearby is another building of classic design, the War Memorial, containing the historical museums already mentioned, and an auditorium with a seating capacity of 2,200. Perhaps Nashville's most beautiful public building is the replica of the Athenian Parthenon, with its 46 magnificent columns and its classical statuary. This modern structure of steel and concrete replaces an earlier replica in plaster, opened to the public in 1897.

Reminders of Nashville before the Civil War are the spacious private dwellings, built of bricks that were made by slaves, which can still be seen in the older parts of the city. A number of the city's churches also antedate the Civil War. Among these are First Lutheran Church (1838), St. Mary's Roman Catholic Church (1847), First Presbyterian Church (third on the site since 1816, and the cornerstone of which was laid in 1849), Holy Trinity Protestant Episcopal Church (built in the 1850's and given to its Negro parishioners in 1908), and First Christian Science Church (built 1856–1881 for an Episcopal congregation). Noted for the beauty of their architecture among the newer places of worship is the Roman Catholic Cathedral of the Incarnation, patterned after the church of San Martino ai

Monti in Rome; the Vine Street Temple (Jewish Reformed), designed in Byzantine style; and Christ Episcopal Church, in Victorian Gothic.

The city has a number of public parks containing playgrounds, swimming pools, lakes, tennis courts, municipal golf courses, driveways, bridle paths, and other recreational facilities. An unusually large variety of trees grows on its public and private grounds. Gardening is a popular hobby among Nashville denizens, and the city is famous for its iris which attracts visitors during the April Iris Festival when the flower blooms in parks and gardens.

Government.—The city's government is of the mayor-councilmanic type. Nashville's welfare program includes slum clearance and housing projects. As the capital of Tennessee, state government operations occupy a large place in the life of the city, and determine many aspects of its character. The federal government maintains in Nashville a customhouse and offices of several of its other agencies.

History.—Moundbuilders were the earliest human beings known to have inhabited the site of Nashville, but Shawnee Indians were the first ever seen by white explorers. In 1780 a white man's settlement was made at what was then called French Lick or Big Salt Lick, on the Cumberland River. As agent for the Transylvania Company, James Robertson had already explored the area and, late in 1779, led the first band of migrants overland from their homes in the Wautauga Settlement. They arrived at their destination on New Year's Day of 1780. In the spring they were joined by a second group, led by Col. John Donelson who came by flatboat, arriving after a harrowing thousand-mile river journey during which 33 of the group perished. (Among the survivors was Colonel Donelson's daughter Rachael, who later married Andrew Jackson.) The same year (1780), the Cumberland Compact was drawn up under which the little community of about 300 made provisions for its government and security. Seven crude forts were erected along the river, the most important of which was named Fort Nashborough in honor of Gen. Francis Nash, Revolutionary hero who had died at the Battle of Germantown. In 1784 Nashville became the official name of the settlement and was incorporated as a town. It grew rapidly, particularly after the admission of Tennessee into the Union in 1796. In 1806 it was chartered as a city and had a mayor-aldermanic government. Nashville was already a trading center with flour and cotton mills, foundries and smithies. With the inauguration of steamboat service about 1819, and the completion of the first bridge over the Cumberland, Nashville became an important river port for the shipment of cotton down the Ohio and Mississippi. By this time, the city was also a fashionable center for the schooling of the daughters of wealthy Tennesseans. Except for 10 years, the state legislature met there during all the period between 1812 and 1843, when Nashville was officially designated the state's capital. Two years later, the Nashville and Chattanooga Railroad (now the Nashville, Chattanooga and St. Louis) was chartered, the first railroad in the state to be completed (1854). This not only contributed to the development of Nashville as a railroad center but also gave the city better commercial connections with the Middle West.

On the question of slavery the city was divided, but after the state seceded from the Union in 1861, Nashville became one of the Confederacy's military headquarters, and home guards for the city were organized. In 1862, under threat of attack, the capital was temporarily moved to Memphis. A few days later Nashville surrendered to Union forces, and martial law was soon proclaimed. In 1864, in an attempt by a Confederate force to capture the city, a battle was fought in its environs. (See NASHVILLE, CAMPAIGN AND BATTLE OF.) The attempt proved disastrous, and Nashville remained in Union hands. Its suffering following the war was severe until, in 1868, a move for investigation instituted by its citizens released it from carpetbag rule. Recovery was slow until the middle of the 1870's, but the period 1870–1880 saw the population increase from 25,865 to 43,350, and reach 76,168 by 1890. The modern commercial, industrial, and educational center of today was beginning to emerge. When Tennessee celebrated its 100th year as a state, more than 6,000,000 visitors saw its Centennial Exposition at Nashville, opened officially by President McKinley. The growth of industries in the 1900's continued but at a slower pace until World War II, when extensive expansion took place.

Population.—Nashville is the second most populous city in the state, being exceeded only by Memphis. Its foreign-born population is small; its Negro population represents about 28 per cent of the total. The following figures indicate the population growth during the 20th century: (1900) 80,865; (1910) 110,364; (1920) 118,342; (1930) 153,866; (1940) 167,402; (1950) 174,307.

NASHVILLE, the name of a Confederate privateer that left Charleston in 1861 on a cruise to England and captured booty to the amount of $3,000,000. In March 1863 she was sunk by a Federal ironclad in the Savannah River.

NASHVILLE, Campaign and Battle of. When General Sherman's picked army of 62,000 left Atlanta Nov. 15, 1864 for the March to the Sea, the Confederate Army under Gen. John Bell Hood, strengthened by Gen. Nathan B. Forrest's cavalry, was on the Tennessee River in the vicinity of Tuscumbia and Decatur, with Stephen Dile Lee's corps across the river and in advance of Florence. Active preparations were making for a move on Nashville with the Ohio as a possible objective. Gen. George Henry Thomas had been sent to Nashville six weeks before to organize a force to resist Hood. Toward the last of October the Twenty-third Corps (Gen. John McAllister Schofield's) and the Fourth Corps (D. S. Stanley's) were ordered to General Thomas, who sent them under General Schofield to Pulaski, with orders to delay Hood as long as possible to allow of the needed concentration and organization at Nashville.

General Thomas was working most energetically at Nashville to organize an army to meet Hood, while General Schofield, with his inferior force, was holding against him with the utmost stubbornness to gain time for Thomas.

Hood was baffled in his attempt to intercept General Schofield at Pulaski and Columbia, Schofield reaching the latter place, forming solidly before Hood, who arrived November 27, and holding him there to the limits of possibility. Again, by skillful work, Schofield reached

Franklin in advance of Hood, marching his troops at night within rifle-shot of the enemy's lines at Spring Hill. Here Hood threw his army *en masse* upon Schofield, who had taken position around the town. The attack was delivered at 4 P.M., and lasted into the night. It was one of the most desperate assaults of the Confederates on any field, and most depressing for them in its results, five general officers being killed, six wounded and one captured. (See FRANKLIN, BATTLE OF.) The night of the 30th Schofield withdrew to Nashville, and the morning of December 1 Thomas' army was united.

A part of Andrew Jackson Smith's veteran division arrived at Nashville during the battle of Franklin, but not in time to be sent to General Schofield. The rest of his division, and General James Blair Steedman's division from Chattanooga also arrived December 1.

Hood advanced the day after the battle of Franklin and established his lines in front of Nashville December 2. Not until Hood appeared before Columbia with the entire army that had confronted the three armies under Sherman, re-enforced with Forrest's 10,000 cavalry, and the fact appeared that Schofield was fighting a gallant, almost desperate game to hold him back while Thomas was working energetically to organize his forces, did the authorities at Washington and City Point realize that Thomas had been left with inadequate means.

This created a feeling at Washington and City Point approaching a panic. It was feared that Hood might avoid Thomas, cross the Cumberland and carry out President Davis' plan to have him push on to the Ohio. This fear was redoubled when the necessity appeared for Schofield to retire from Franklin. It was not so clearly seen that his stubborn holding against Hood had saved the situation which Sherman created. Instead of leaving Thomas, who up to that time had never lost a movement or a battle, to deal with Hood as his full knowledge of the situation might suggest, it was insisted that he should at once attack. The straits of the situation were recognized at City Point, and the day after Schofield's arrival Grant telegraphed: "Arm and put in your trenches your quartermaster's employees, citizens, etc." The fourth day Thomas was peremptorily ordered to attack. He calmly went on with his energetic preparations to deal a final blow to Hood. His despatches, clearly showing his situation and his active work, were ridiculed by Edwin M. Stanton and Henry W. Halleck, and Grant repeated his orders to attack, and next directed Halleck to relieve him, first with Schofield, and next with Logan, and Grant himself started to take general direction, although Thomas had explained that while he had the troops ready to attack, a sleet-storm had covered the country with a sheet of ice upon which neither men nor horses could move, but that the moment it melted he would attack. When John Alexander Logan reached Louisville he was met with the news of an overwhelming victory. The two-days' battle, December 15 and 16, was remarkable for its perfection of plan, and for the fact that in its progress to the end this plan was closely followed.

The Confederate main and advanced lines were intrenched on bold hills about two miles from the city. Their advanced salient was established within three eighths of a mile of the Union center. The Union lines extended from the river above the city to the river below it. The Confederate lines were compact between the Murfreesboro Railroad at their right and the Hillsborough Turnpike, which ran south from the center of the city, across the Union center. Thus the Confederate lines covered less than half of the Union position. Benjamin Franklin Cheatham's corps was on the right, Lee's corps formed the center, and Alexander Peter Stewart's corps the left.

More than half the inner line was held by quartermasters' employees under Quartermaster-General Donaldson, and the rest of that line by new troops under Gen. J. F. Miller. Gen. A. J. Smith's corps held the right of the advanced Union line, Gen. T. J. Wood's line the center and General Schofield the left. General Steedman's division was in echelon to the front on the left. The night before the battle General Schofield's corps was moved to the left and front of Wood's line, and prepared to take prominent part in turning the Confederate left. The morning of the 15th fog veiled the rapid formation of Union forces in front of their works.

The battle began at 8 o'clock by a successful attack by General Steedman's division upon the earthworks commanding the extreme left. This attracted the enemy's attention to that quarter. About 10 o'clock Smith's corps moved against Hood's left, and James Harrison Wilson's cavalry corps of 9,000 horsemen and 3,500 dismounted men swung off in its wide circuit against the left and rear of the Confederate works, one division extending to the river below the city, and forcing back Hood's cavalry reserve under Gen. James Ronald Chalmers. Forrest's main body had been sent to attack Murfreesboro. Smith's corps moved obliquely against the Confederate left flank and took it in reverse. Schofield by a wide detour penetrated still further to the rear. At the same time Wood assaulted in front. Wilson's troopers carried earthworks, captured 27 guns and swept squarely into the rear of the Confederate left. These movements compelled its withdrawal for two miles. The next afternoon the same tactics were continued by Smith, Schofield and Wilson, while Wood on the Union center, and Steedman on the left, pushed forward to Hood's new line. This had been reformed with Benjamin Franklin Cheatham on the left, Stewart in the center and Lee on the right. The Union lines began the attack upon Hood's position at 3 o'clock with an unsuccessful assault by two brigades from Wood and one from Steedman upon the Confederate right. Soon after 4 o'clock Smith and Wood's corps on the front, with Schofield operating on their right and against the Confederate left flank, attacked in force, soon carrying the entire line. This attack and its results General Hood thus described in his official report: "The position gained by the enemy being such as to enfilade our line caused in a few moments our entire line to give way, and our troops to retreat down the pike in the direction of Franklin, most of them, I regret to say, in great confusion, all efforts to reform them being fruitless." Here 54 guns in position were captured. There was immediate and hot pursuit for nine days, led by Wilson's cavalry, when the remnant of Hood's forces crossed the Tennessee, having suffered a loss during his campaign of over 13,500 prisoners and 72 guns, and here the Union pursuit ended. Over 2,000 deserters came into the Union lines.

The result vindicated Thomas' insisting upon waiting for the remounting of his cavalry, since Wilson with his troopers formed an essential and controlling element in the battle and in a pursuit which were designed to disintegrate an army.

The records do not show the number of men with which Hood reached Tupelo. He claims that there were 18,500 left there after 3,000 were furloughed. He further says that of 14,000 that left Tupelo to join Gen. J. E. Johnston in North Carolina, 9,000 deserted. General Johnston's reports show that when Hood's forces reached him they numbered 3,953 officers and men. Thus, after Nashville, Hood's splendid force of Confederate fighters did not again appear as an army on the theater of war.

Even this complete victory, defeating the contemplated advance of the Confederate Army to the Ohio, did not fully allay the panic at Washington lest Sherman's movement to the sea should prove to have left the central West without sufficient protection, and while every possible effort in pursuit was being put forth in horrible weather, General Halleck thus telegraphed Thomas:

> Permit me, General, to urge the vast importance of a hot pursuit of Hood's army. Every possible sacrifice should be made, and your men for a few days will submit to any hardships and privations to accomplish the great result. If you can capture or destroy Hood's army General Sherman can entirely crush out the rebel military force in all the Southern States. He begins a new campaign about the first of January, which will have the most important results if Hood's army can now be used up. A most vigorous pursuit on your part is, therefore, of vital importance to General Sherman's plans. No sacrifice must be spared to obtain so important a result.

General Thomas, nagged beyond endurance, put an end to this style of despatches by the following reply:

> Your despatch of 12 M., this day, is received. General Hood's army is being pursued as rapidly and as vigorously as it is possible for one army to pursue another. We can not control the elements, and you must remember that, to resist Hood's advance into Tennessee, I had to reorganize and almost thoroughly equip the force now under my command. I fought the battle of the 15th and 16th instant with the troops but partially equipped; and, notwithstanding the inclemency of the weather and the partial equipment, have been enabled to drive the enemy beyond Duck River, crossing two streams with my troops, and driving the enemy from position to position without the aid of pontoons, and with but little transportation to bring up supplies of provisions and ammunition. I am doing all in my power to crush Hood's army, and, if it be possible, will destroy it. But pursuing an enemy through an exhausted country, over mud roads completely sogged with heavy rains, is no child's play, and can not be accomplished as quickly as thought of. I hope, in urging me to push the enemy, the department remembers that General Sherman took with him the complete organization of the Military Division of the Mississippi, well equipped in every respect, as regards ammunition, supplies, and transportation, leaving me only two corps, partially stripped of their transportation to accommodate the force taken with him, to oppose the advance into Tennessee of that army which had resisted the advance of the army of the Military Division of the Mississippi on Atlanta, from the commencement of the campaign till its close, and which is now, in addition, aided by Forrest's cavalry. Although my progress may appear slow, I feel assured that Hood's army can be driven from Tennessee, and eventually driven to the wall by the force under my command. But too much must not be expected of troops which have to be reorganized, especially when they have the task of destroying a force, in a winter's campaign, which was able to make an obstinate resistance to twice its numbers in spring and summer. In conclusion, I can safely state that this army is willing to submit to any sacrifice to crush Hood's army, or to strike any other blow which may contribute to the destruction of the rebellion.

This changed the tone of despatches from Washington and City Point. Grant and Stanton sent congratulations, and Grant, in his official report, after setting forth his impatience and apprehensions that Hood would go north, said of Thomas: "But his final defeat of Hood was so complete, that it will be accepted as a vindication of that distinguished officer's judgment."

H. V. Boynton.

NASHVILLE, CHATTANOOGA AND SAINT LOUIS RAILWAY, The. The first railroad completed in the State of Tennessee. It was first advocated by Dr. James Overton who, in 1843, offered himself as a candidate for the legislature. He based his canvass on his railroad project which he believed would permit control of the large cotton trade of Georgia and Alabama. He was defeated, and his plan was deemed impracticable by the people who dubbed him "Old Chattanooga." Two years after his defeat, however, the necessity for other outlets from Nashville besides the Cumberland River brought the subject of railroads under agitation again. Through the pressure of many influential citizens the legislature passed an act on Dec. 11, 1845, incorporating a railroad from Nashville to Chattanooga. This act was amended in 1847 to permit the town of Nashville to subscribe $500,000 for the benefit of the road, and "to raise money on loans by pledging the faith of the corporation; by pledging a portion of its taxes; by mortgage or otherwise to an amount not exceeding what might be demanded for the calls on the stock." Other major subscriptions were: from Murfreesboro, Tenn., $30,000; Charleston, S. C., $500,000; the Georgia Railroad and Banking Company of Augusta, Ga., $250,000. The shares of stock then had a par value of $25. In many instances the subscriber paid for his stock by actual work on the line, or in materials furnished. The state also gave material assistance by lending its endorsement to the bonds of the company issued from time to time on completed miles of railroad. The first train ran from Nashville to Antioch, 11 miles, on April 13, 1851, and when, on July 4, of the same year, a train arrived at Murfreesboro, the event was the occasion of a great celebration. People from all the surrounding country were on hand to celebrate this mark of progress. By May 1853, the road had reached Bridgeport, Ala., on the Tennessee River whence communication was established with Chattanooga by steamboat; but the entire line, 151 miles in length, was not completed until Feb. 1854. The iron track rail used was purchased in England, and delivered at Nashville for about $45 per ton. In November 1871, the company purchased from the State of Tennessee the railroad properties of the Nashville and Northwestern Railroad Company, a line extending from Nashville, Tenn., to Hickman, Ky. In 1873 the name of the corporation was changed to its present name. The Western and Atlantic Railroad, extending from Chattanooga, Tenn., to Atlanta, Ga., was leased from Dec. 27, 1890, to Dec. 27, 1919, and later extended for an additional 50 years to Dec. 27, 1969. The Paducah and Memphis division is leased from the Louisville and Nashville Railroad Company for 99 years from Dec. 14, 1895. The several branches of the present system were built under separate charters, some of them by independent corporations. The parent company operates its present mileage under the charters granted originally to the various corporations which have been merged from time to time into its line. The main line extends from Memphis, Tenn., through Nashville and Chattanooga to

Atlanta, Ga. Its various branches extend to Union City, Tenn., and Paducah, Ky.; Sparta, Pikeville, Hohenwald and Lewisburg, Tenn.; and Gadsden, Ala. From most of these terminals the road has connections with other railroads to all parts of the country. During the Civil War the line was in charge of the Federal military authorities from March 1862 to Sept. 1865. The railway suffered many losses in equipment and through distruction during the Civil War and did not emerge from its difficulties until the early 1890's. But it has never passed through any form of reorganization, nor has it compromised or failed to pay any obligation.

NASHVILLE CONVENTION, in American history, a convention of delegates from the Southern states held at Nashville, Tenn., June 10, 1850, called to consider the slavery question and the encroachments of Northern abolitionists. The Wilmot Proviso and the Missouri Compromise were disapproved, but resolutions of open resistance advanced by Texas, South Carolina and Mississippi were voted down. The convention, which was never generally popular, met again in November and again moderate resolutions were adopted. For text of the resolutions adopted at both meetings consult Harper's *Encyclopedia of United States History,* vol. 8 (New York 1915).

NASIK, nä'sĭk, or **NASSICK,** India, headquarters of a district of the same name in the State of Bombay; on the Godavari River, 30 miles from its source, and 107 miles northeast of Bombay. Nasik town is situated 5 miles northwest of Nasik Road, a station on the Great Indian Peninsula Railway. Due to the sanctity of the river Godavari, and to the belief that Rama, hero of the Ramayana, lived here for some time with his wife Sita, and his brother Lakshman, Hindus consider Nasik to be of special interest and holiness. On both sides of the river, but chiefly on its southeastern bank, lies the town of Nasik. Its buildings, covering an area of about 2 square miles, are divided into two parts—the new town to the north and the old town to the south. Though a place of great antiquity, the old town of Nasik has no ruins or buildings of any age, except the mosque on the site of the old fort. Nasik is the Nasica of Ptolemy, and was anciently a Mahratta capital. It is noted for its manufactures of brass and copper products, paper, and cotton. Interesting relics of the ancient religion were excavated in the 2d or 3d century A.D. Pop. (1941) 55,924.

NASMITH, nā'smĭth, Sir **Martin Eric Dunbar,** English naval officer: b. 1883. As commander of submarine E 11, during World War I, he destroyed 96 Turkish vessels in the Sea of Marmora, an effort for which he was awarded the Victoria Cross. In 1928 he was promoted rear admiral; in 1932, vice admiral; and 1932–1934 he was commander in chief of the East Indies station. While serving as lord commissioner of the admiralty and chief of naval personnel (1935–1938) he was promoted admiral (1936). Vice admiral of the United Kingdom and lieutenant of the Admiralty in 1945, since 1948 he has been vice chairman of the Imperial War Graves Commission.

NASMYTH, nāz'mĭth, **Alexander,** Scottish painter: b. Edinburgh, Scotland, Sept. 9, 1758; d. there, April 10, 1840. Portrait painting was his specialty. He became pupil, and subsequently assistant, to Allan Ramsay, Jr., and accompanied that artist to London. He returned to Edinburgh (1779); and traveled in Italy (1782), where he devoted himself to landscape and historical painting. He was intimate with Robert Burns, and painted his portrait which is in the London National Gallery. Other of his notable works are: the large *River Scene* owned by the Society of Arts; *The Port of Leith* (1824); and *The Lawn Market* (1824). In 1822 he published 16 scenes described by Sir Walter Scott. Simple in style, his landscapes are finely composed and very impressive although as a painter he is considered inferior to his son Patrick (q.v.). Somewhat weak in coloring, his execution is neat and detailed rather than vigorous in character. The Nasmyths were an artistic family of whom, between 1829 and 1866, no less than six women painters exhibited in London.

NASMYTH, James, Scottish engineer: b. Edinburgh, Scotland, Aug. 19, 1808; d. South Kensington, England, May 7, 1890. He was the son of Alexander Nasmyth (q.v.). After study at Edinburgh University, he went to London in 1829, offered his services to Henry Maudslay, founder of a well-known engineering firm, and was appointed assistant in his private workshop. There he remained until 1831, when he returned to Edinburgh and constructed a set of machine tools with which he began business in 1834 at Manchester. Here he was so successful that he had soon to erect a large new workshop at Patricroft near Manchester, where he became famous as a machine constructor and inventor. Chief among his inventions was the steam hammer, designed in 1839, and in 1842 patented in an improved form. The first hammer was constructed from a view of Nasmyth's sketches by Joseph Schneider at Creusot, in France, about 1841; but the first British one was erected by Nasmyth at Patricroft in 1843. Among Nasmyth's further inventions are a nut-shaping machine, a hydraulic punching-machine and a flexible shaft for driving small drills. In 1856 he retired from the firm of Nasmyth, Gaskell and Company, which he had founded, and devoted himself to the study of astronomy. He was the first to observe the mottled appearance of the sun's surface known as "willow-leaves" or "rice grains" (1860). He is author of *Remarks on Tools and Machinery* in Sir Benjamin Baker's *Elements of Mechanism* (1858); *The Moon Considered as a Planet, a World and Satellite* (1874), with James Carpenter, and an autobiography edited by Dr. S. Smiles (1883, new ed. 1895).

NASMYTH, Patrick Milner, Scottish painter: b. Edinburgh, Scotland, Jan. 7, 1787; d. Lambeth, London, England, Aug. 17, 1831. He studied under his father, Alexander, and developed great talent for landscape in spite of ill health and a crippled right hand which necessitated the use of the left in painting. He went to London in his 20th year and established his reputation in 1809 by his first picture *A View of Loch Katrine* which was exhibited at the Royal Academy. He invariably painted *en plein air;* in his last sickness he was raised on his bed to watch through the window a violent thunder-storm that was raging, during which he expired. His pictures

are highly valued; his *View in Surrey* sold in 1892 for $13,125.

NASO, nā'sō. See OVID.

NASR-ED-DIN, nä'sĕr-ĕd-dēn, shah of Persia (1848–1896): b. April 24, 1831; d. May 1, 1896. Although not the heir apparent, the ability and influence of his mother induced his father, Mohammed Mirza, to proclaim him his heir. His accession to the throne was disputed by the reformer El Bab, proponent of a pantheistical sect whose doctrine forbade concubinage and polygamy (q.v.). He crushed the opposition mercilessly and became the ablest ruler that Persia had had in many years. Assisted by his vizier, Mirza Taki Khan, he began his reign with reform measures. He also studied European methods of warfare, and proved himself to be a master of finance. He effectively crushed various insurrections, and by his occupation of Herat in 1856 provoked a war with Great Britain which was concluded in 1857. In 1873–1878, and in 1889, he visited western Europe and endeavored to establish more friendly relations with England, soon, however, to return to his friendship with Russia. He favored progress and Western civilization in so far as it did not conflict with his despotism. Under his reign the telegraph through Persia connecting Europe and India was established. He was assassinated in 1896, and succeeded by his son, Muzaffar-ed-Din.

NASSAU, Robert Hamill, American missionary in West Africa; b. near Norristown, Pa., Oct. 11, 1835; d. May 6, 1921. After teaching in Lawrenceville, N. J., he studied three years in the Princeton Theological Seminary (1856–1859). Later, he studied medicine at the University of Pennsylvania. His linguistic ability, intimate knowledge of African native thought, customs and languages, and his skill in managing African tribesmen, made him an effective missionary. In the last eleven years of his life in Ambler, Pa., he wrote several books, the most notable of which was *Fetichism in West Africa.*

NASSAU, năs'ô, city and capital of New Providence, chief of the Bahama Islands, a British Colony, in the North Atlantic Ocean off the coast of Florida. The town is built on rising coral ground at the northeast end of the island. Its excellent harbor permits large steamships to enter and turn. Nassau has fine government and other buildings, including a public library with a museum. The western entrance to the harbor is dominated by the historic Fort Charlotte, named after Queen Charlotte, consort of King George III. The fort has many dungeons, corridors, and underground stairways. The Sea Gardens, at the eastern end of the harbor, attract many visitors who, through a glass-bottomed boat, may view a submarine coral garden with fish of many colors, sizes and shapes. Nassau has a mild and healthful climate, and is a popular winter resort for Americans and West Indians. The United States has here a consular agent. Nassau was founded by the English in the 17th century, destroyed by the French and Spanish in 1703, and rebuilt in 1718. It was fortified 20 years later, and opened to free trade. Pop. (1943) 29,391.

NASSAU, năs'ô, Prussia, formerly an independent duchy, later the Wiesbaden government district of Hesse-Nassau province. Its chief city is Wiesbaden. Situated north and east of the Rhine it is a hilly and thickly forested area intersected by the Taunus Mountains and the Lahn River. The low-lying areas produce wine in abundance, also grain, flax, hemp and fruit. The territory abounds with mineral springs, the most popular being Wiesbaden and Ems. Nassau has considerable mineral wealth but is not an important industrial center.

NASSAU, House of, a princely family whose duchy was located on the east bank of the Rhine. The title was taken by Walram I, count of Nassau (d. 1198), a descendant of one Drutwin (d. 1076), generally regarded as the founder of the house of Nassau. Walram placed his lands under the suzerainty of the king of Germany. The duchy increased considerably in size. About the year 1255 their patrimony was divided into two branches of the house of Nassau by Walram's grandsons, Walram II and Otto I. The estates of the elder German line, founded by Walram II, were in the southern part on the left bank of the Lahn River where Wiesbaden became the ducal residence. Adolf of Nassau, son of Walram II, became king of Germany (1292–1298). The German line was later partitioned into several branches most of which failed to perpetuate themselves; but Walram's share of Nassau was united with NASSAU-WEILBURG (1816). When Duke Adolf (1817–1905) took sides with Austria (1866), Nassau was absorbed into the kingdom of Prussia.

The younger Dutch line, founded by Otto I (d. about 1292), occupied the northern part of the region on the right bank of the river, and was closely identified with the history of the Netherlands. Its capital was Siegen. It was later divided among Otto's three sons. From this division arose: (1) The Engelbert I, of NASSAU-DILLENBURG branch, which acquired lands in the Low Countries (1404). A descendant, Henry III, later inherited both German and Dutch possessions. His son, René, inherited from his father the principality of Orange. At his death in the trenches of St. Dizier (1544), his titles and estates passed to his cousin, William I, count of Nassau, later surnamed William the Silent (d. 1584), the famous stadholder of the Netherlands, whose descendants were known as princes of ORANGE-NASSAU. One of them was William III who became William III of England, that line becoming extinct in 1702.

(2) John VI, count of Nassau, a younger brother of Henry III, ruled Nassau-Dillenburg until 1606, when his four sons founded new branches, two of which were extinct by 1739. The NASSAU-SIEGEN branch, founded by the eldest son, Count Joan Mauritz (1604–1679) became extinct in 1743; but the NASSAU-DIETZ line, founded by the third son, Ernest Casimir, has survived to the present. One of Ernest Casimir's descendants, John William Friso, inherited the Orange possessions in the Netherlands, and the latter's son, William IV, after reuniting all the Orange estates (1743), became hereditary stadholder of the Netherlands in 1747. The title was lost by his son William V in 1795 when he was expelled by the French republicans. Upon his death in 1806, the latter's son William VI succeeded to the duchy of Nassau. The new duke, refusing to adhere to the Confederation of

the Rhine (q.v., the league of German states formed by Napoleon), joined the Prussian Army, was captured at Jena (Oct. 14, 1806), and all his possessions confiscated However, when the Congress of Vienna constituted the kingdom of the Netherlands, to include Belgium and Holland, he was chosen the first sovereign and was proclaimed King William I on Mar. 16, 1815. In recompense for his hereditary estates, given to Prussia and Nassau, he received the grand duchy of Luxembourg. The now royal house of ORANGE (sometimes still called Orange-Nassau) continues to rule over the Netherlands.

NASSER, nä'sĕr, **Gamal Abd el-**, Egyptian soldier and public official: b. Beni Mor, Asyût Province, Egypt, Jan. 15, 1918. Founder of Egypt's "Revolutionary Movement," Lieutenant Colonel Nasser directed an army revolt against the government (July 1952), forced King Farouk's abdication, organized a republic, and placed in the premiership and presidency the popular Gen. Mohammed Naguib (q.v.). Intense rivalry developed between them and early in 1954 Colonel Nasser, who had contented himself with the office of deputy premier, twice assumed the premiership. In November 1954 he caused Naguib's removal from both offices. Thereafter Premier Nasser dominated the government.

NAST, Condé. American publisher: b. March 26, 1874; d. Sept. 19, 1942. Born in New York of a French mother and German father, he grew up in St. Louis. At Georgetown University he became manager of the baseball team. Engaged first to write advertising for *Collier's* magazine, he later rose to business manager having greatly increased the circulation of the magazine. Later, for a nominal sum, he acquired *Vogue,* then a 24-page fashion magazine which, under his direction, became an outstanding success. To this he added *Vanity Fair* and *House and Garden,* also recognized as leaders in their field. After financial reverses around 1929, he applied himself with characteristic energy and integrity to the rehabilitation of his fortune. In this endeavor he succeeded largely because of his perspicacity in the selection of executives. His printing plant at Greenwich, Conn., became one of the largest in that state.

NAST, Thomas, American cartoonist: b. Landau, Bavaria, Sept. 27, 1840; d. Guayaquil, Ecuador, Dec. 7, 1902. His mother brought him to the United States in 1846 where he attended the public schools. He was employed as doorkeeper in Bryant's Art Gallery in New York, where his spare time was spent copying the paintings. He studied at the National Academy of Design, New York. At the age of fifteen he showed some of his sketches to Frank Leslie, and was engaged by *Frank Leslie's Illustrated Newspaper* at four dollars a week. In 1860 he was sent to England to draw the Heenan-Sayers prize fight. Later, he extended his tour to Italy and sent to New York periodicals pictures of the fighting in Garibaldi's revolt. He returned penniless to America (1861) and in that year married Sarah Edwards. In 1862 he joined the staff of *Harper's Weekly.* His clever cartoons soon became famous. His political and personal caricatures (1871–1873) directed at the Tweed Ring in New York City brought him further fame and power. He bitterly opposed Greeley in 1872, Tilden in 1876, and Hancock in 1880, urging against each of these nominees his inevitable connection with Tammany Hall. He left *Harper's Weekly* in 1887 and in 1894 joined the staff of the *Pall Mall Gazette.* For several years he published *Nast's Almanac* which he illustrated. He also illustrated *Pickwick Papers* and *Pictures from Italy.* His cartoon *Peace* in 1862 attacking opponents of the continuance of the Civil War and the reconstruction period attracted great attention. It is said that President Lincoln designated him "our best recruiting sergeant." To Nast belongs the fame of being the first to typify the Republican Party by the elephant; the Democratic Party by the donkey; and Tammany Hall by the Tiger. Nast also painted in oils, particularly scenes in the Civil War. His work was both realistic and dignified. In May 1903 he was appointed United States consul at Guayaquil, where he died of yellow fever.

Consult Paine, A. B., *Thomas Nast; his Period and His Pictures* (New York 1904), and *Life and Letters of Thomas Nast* (New York 1910).

NAST, William, Methodist Episcopal clergyman and editor; founder of the first German Methodist church in the United States: b. Stuttgart, Germany, June 15, 1807; d. Cincinnati, Ohio, May 16, 1899. After his confirmation (1821) he attended the theological seminary at Blaubeuren. At the age of 18 he entered the University of Tübingen, but became a rationalist and took up literary work till 1828 when he emigrated to the United States. He became tutor at Duncan's Island, Pa., and in 1830 was librarian and instructor of German at West Point Military Academy. Resigning (1832), he became instructor in German, Greek, and Hebrew at Kenyon College, Gambier, Ohio. He joined the Methodist Episcopal Church (1836) and was appointed missionary evangelist for Cincinnati. One of his converts, John Swahlen, became cofounder with Nast of German Methodism. In 1838 he organized the first German Methodist Church in Cincinnati, and became editor of a German church-paper, *Der Christliche Apologete,* which position he held for 53 years. Many German publications of the church were edited by him. Among the most important were *Das Leben und Wirken des Johannes Wesley und Seiner Haupt-mitarbeiter* (1852); *Die Aufgabe der Christlichen Kirche im neunzehnten Jahrhundert* (1857); a commentary in German on the New Testament (1864); *Das Christentum und seine Gegensätze* (1883). He visited Europe several times in connection with his calling, and was one of the founders of German Wallace College at Berea, Ohio, later merged with Baldwin as Baldwin-Wallace College.

NASTURTIUM, the Indian cress (*Tropaeolum majus*) a perennial climbing plant, native of Peru, with pungent fruits and showy spurred flowers in varying shades of red and yellow. There is a smaller species (*T. minus*). See also TROPAEOLUM.

NASUA. See COATI.

NAT TURNER'S REBELLION, in American history, a term applied to a Negro insurrection at Southampton, Va., in 1831. The rebellion was led by Nat Turner, a Negro slave, who believed himself chosen by God to free the

colored race. In August 1831, Turner and a band of followers went from house to house with the intention of killing all white people, and before they were dispersed 55 persons had been murdered. The lives of many whites were saved by the faithfulness of their slaves. As outcome of the rebellion, more stringent laws governing slaves were enacted, free Negroes lost their privileges, and the manumission movement received a great setback. See TURNER, NAT.

NATA, nä'tä, in Mexican mythology, the name of a former legendary prophet, who in the "Age of Water" (Atonatiuh) escaped with his wife, Nena or Xochiquetzal, from the general destruction of mankind by the deluge, in a boat made from the trunk of an ahuehuete, or Mexican cyprus tree, or according to another version, either in the hollow of the tree or on the trunk of the tree itself. The proper name of this legendary Nahuatl Noah is Coxcox, the term Nata being apparently corelative with Tata, the "old father," or uncle or simply the "old one." The legend of Coxcox was common not only to all the Nahuatl tribes, but it was recounted by the Zapotecas, the Mixtecas and other cultured races of Mexico. According to this flood legend, Coxcox and his wife landed at Mount Colhuacan (Place of the Colhuas); and their children increased very rapidly; but they were all born dumb. Finally a dove took pity on them and gave them the power of speech. But they all spoke different languages. Of the descendants of Coxcox or Nata, 15 chiefs spoke the same tongue or nearly so; and from these were descended the different tribes of the Nahua race. According to a Michoacán version of the same myth, their deluge hero who was called Tezpi escaped in a large boat with his wife, his children and numerous animals and various kinds of grain for seed. According to still another version of this story, the people drowned in the deluge did not die but were turned into fishes; for the earth-ocean and the ski-ocean drew near to one another and they were overwhelmed in the downpour of the sky-waters into the earth-waters, which swallowed up even the highest mountains for an Aztec century (52 years).

NATAL, nȧ-tăl', Union of South Africa, one of the four original provinces. Bordering on the Indian Ocean, it is bounded on the north, west, and south by Mozambique, Swaziland, Transvaal and Orange Free State provinces, Basutoland, and Cape of Good Hope Province. The area is 35,284 square miles, and the population numbered 1,946,468 at the census of 1936; the whites numbered 218,139 in 1941. Pietermaritzburg (pop. 1936, 49,539) is the provincial capital; and Durban (pop. 1944, 285,800) is the largest city of Natal and the Union's second seaport in size.

Topography.—The chief natural boundary on the land side of the province is formed by the Drakensberg Mountains, separating it from the Orange Free State and Basutoland. Natal proper is separated from Zululand (q.v.), administratively part of the province, by the Tugela River; and on the southwest, the rivers Umtamyuma and Umtamvuna form much of the boundary between Natal and Cape Province. The 400 miles of coast line contains the mouths of numerous other streams but, with the exception of the landlocked circular bay on which Durban stands, is destitute of creeks and bays. The surface of the province is finely diversified, rising rapidly from the seaboard in a confused succession of hills and ridges toward the lofty mountains on the western frontiers; much tropical cultivation is carried on in the numerous beautiful valleys. From the main mountain chain numerous transverse branches proceed nearly at right angles and form a series of minor watersheds, separating the various streams. Most of the latter, flowing through precipitous ravines and rocky gorges, are too shallow to be navigable.

Climate.—The coast lands of Natal are decidedly warmer than the eastern seaboard of Cape Province, but in the north, as the height above sea level increases, the climate approximates to that of the Transvaal. On the coast the range of temperature is from 47° to 88°, giving an average in summer of 76° and in winter of about 55°. Inland, in the region of Pietermaritzburg, the mean temperature of July, the coldest month, is 55°; of February, the hottest, 80.5°; and of the whole year, 67°. During the rainy season (October–March) thunder showers are of almost daily occurrence. Long droughts are almost unknown.

Flora and Fauna.—Under such climatic conditions, and with a soil of considerable fertility, vegetation is obviously vigorous. Despite heavy cutting in the past, the forest lands of Natal, particularly in the west, still have much virgin timber; most common species is *Podocarpus thunbergii* (yellow wood), much used for building purposes. Most of the fauna common to other parts of the Union of South Africa (q.v.) are to be found in Natal. Lion and leopard are scarce, but antelopes and gazelles are plentiful, as are, too, the hyena, tiger cat, jackal, ant bear, and porcupine. The hippopotamus has still his haunts, particularly in Zululand in streams near the sea, where also are numerous small crocodiles. Snakes, some of them venomous, are plentiful. Birds found in Natal include cranes, vultures, several varieties of eagle, and the secretary bird.

Population.—Three quarters of the inhabitants of Natal are native Africans (1,553,629 at the 1936 census), predominantly of Zulu and other Bantu stock. The Indian population (183,661 in 1936) is larger than that found in the other three provinces combined. First brought into the country in 1860 to work on the sugar plantations, the Indian community has grown steadily until its numbers almost equal those of the white population. While the bulk of the latter are of British extraction, Dutch predominate in some of the northern districts; other racial groups, though in small numbers, include Germans and Scandinavians. Compared with the other provinces, Natal has a limited number of colored people (of mixed blood).

Education.—With the exception of higher education, which is under the control of the Union government, the educational system is supervised by the provincial administration. There are separate schools for white, native, Asiatic, and colored children, some supported entirely by public funds and others in receipt of state grants. Out of 385 schools for white children in 1943, 44 of them provided an education beyond the primary standard; there were also 881 schools for natives, 130 for Indians, and 35 for colored children. A total of 179,718 children were attending school in 1943, of these 34,973 being white pupils; the government spent £1,528,230 on educa-

tion in 1943–1944, of this sum £936,814 being allotted for the schooling of white children. Natal University College, which was founded in 1909 at Pietermaritzburg and has a branch at Durban, is an affiliate of the University of South Africa. Besides its responsibility for higher education, the Union government also provides vocational and agricultural instruction in Natal and the other provinces.

Government.—The powers of the unicameral legislature of the province are quite limited, being restricted to enactments (ordinances) pertaining to such subjects as elementary and secondary education, and the maintenance of hospitals and roads (other than "national" roads and those within municipalities). In addition to this legislature (Provincial Council) of 25 members, the voters of Natal also elect 16 members to the Union House of Assembly and 8 to the Union Senate. Executive power in the province is exercised by an administrator nominated by, and responsible to, the Union government; the administrator is assisted by an executive committee of four members elected by the Provincial Council. Since the provincial legislature has only limited powers of taxation, the Union government provides annual subsidies and grants in order to balance the local budget. In 1941–1942, out of total revenue of £2,567,703, provincial taxation in Natal yielded only £1,585,600.

Agriculture.—Much the most important of agricultural crops is sugarcane. The first sugar mill was erected in 1849, at Compensation, and cane was first cut on a commercial scale in Zululand in 1908. By the year 1940 a total of 340,396 acres of the province were under cane on plantations under white management, 85,672 acres being planted with Uba cane and 254,724 acres under other varieties. While the bulk of the labor force on the sugar plantations was originally Indian, native Africans subsequently were employed in large numbers. Despite the damage wrought by bollworm, cotton is grown on a moderate scale in Zululand and in northern and eastern Natal proper. The province produces only about 15 per cent of the Union's total corn (maize) crop (the country's largest), and other grains also grown on a limited scale include barley and oats. Among other crops are peanuts, potatoes, sorghums, and tobacco. Teff, a staple cereal food crop of Ethiopia, is grown in the uplands of Natal as feed for cattle. Over half a million acres in Natal are devoted to plantations of wattle, *Acacia molissima,* the bark and extract of which (used for tanning) constitute one of the province's most important exports; production from 1940 to 1944 had a value of approximately £6,000,000. Tropical and semitropical fruit trees in wide variety do well, both fresh and canned fruits being exported in increasing quantities.

Mineral Resources.—Coal is the principal mineral mined in Natal. Discovered in 1840 and first produced some 40 years later, coalfields have been developed on the Klip River and in the Vryheid and Utrecht districts; reserves of coal have been estimated at 8,400,000,000 tons. Underlying many of the coal measures are seams of iron ore from one to six feet thick; the main deposit is at Prestwick, where the ore is of excellent quality. The province lacks the great deposits of diamonds and gold found in other parts of the Union; a few occurrences of gold have been located in Zululand and in the neighborhood of Vryheid, but little development has been effected. Asbestos and nickel have been located in Zululand, and natural gas occurs in several places in Alfred County, Natal; the province also possesses small deposits of manganese, titanium, wolframite, tin, corundum, vanadium, fluorspar, gypsum, and molybdenum. Considerable quantities of zircons were found in Zululand in 1926, the Umhlatuzi River and its tributaries, 15 miles north of Eshowe, yielding crystals of high quality. The only city of Natal with manufacturing industries of importance is Durban, where matches, paints and varnishes, soaps, and surgical instruments are made.

History.—Natal owes its name to having been discovered on Christmas Day, 1497, by Vasco da Gama (q.v.). The Dutch government at Capetown acquired, in 1689, the bay in which subsequently the seaport of Durban was founded, but it was not until 1824 that a settlement was established there (at what was then called Port Natal) by Francis George Farewell, a former British naval officer. Dutchmen who later reached Natal overland during the Great Trek became involved in fighting with the Zulus, and in 1838 scored a notable victory over the great chief Dingaan. A Dutch republic named "Natalia" was proclaimed in 1840, but the British annexed the country in 1843. Natal was administered as part of Cape Colony until 1856, when it was constituted a separate colony and given its own elective assembly. The colonists of Natal served as volunteers in considerable numbers through the war with the Zulus in 1878–1879, but the conflict seriously checked the country's progress. In return for services rendered to a Zulu chieftain in 1883, a party of Transvaal Dutchmen obtained cession of a large section of Zululand and there constituted the "New Republic." Reduced in area to comprise the Vryheid and neighboring districts, the nascent state was annexed to the South African (Transvaal) Republic in 1888; and meanwhile, in 1887, all the remainder of Zululand was annexed by Great Britain. In 1897, Zululand was incorporated into the colony of Natal; and, in 1903, following the South African War (q.v.), the Vryheid area was detached from the Transvaal (by this time a British colony) and joined to Natal proper. From the commencement of its history as a colony Natal had had a white population of predominantly British origin, and in the recurring disputes with the South African Dutch the colonists consistently supported the British government. Nevertheless, by a referendum taken in 1909 the electors of Natal expressed a desire to link their fortunes with the Dutch in the proposed new dominion; and accordingly, the next year, Natal relinquished the status of colony to become a province of the Union of South Africa (q.v.). Consult Hattersley, Alan Frederick, *Portrait of a Colony* (London 1940).

NATAL, Brazil, the principal seaport and capital of the state of Rio Grande do Norte, on the right shore of the Potengy River near the Atlantic, 150 miles north of Pernambuco. Notwithstanding the sand bars at the entrance to the harbor, considerable export trade is carried on chiefly of cotton, sugar, rubber, hides, and lumber, about $1,000,000 annually. The United States is represented by a consular agent. Natal was originally called Didade dos Reis. Pop. (1940) 55,242.

NATALIE, năt'a-lē, a queen of Serbia: b. May 14, 1859. She is a daughter of Pierre Ivanovitch Keschko, a Russian officer, and married Prince Milan, afterward king of Serbia, in 1875. The marriage turned out unhappily and the union was broken in 1888, when Milan obtained a divorce. The king abdicated in the following year, and Natalie, returning to Belgrade, the Serbian capital, resided there for a time with her son, King Alexander, enjoying the favor of the people; but in 1891, at the request of the National Assembly, left the country on account of political interests. Becoming reconciled to Milan in 1893, she resumed her former relations with the royal family; and returning to Belgrade in 1895 she was greeted by the people with every token of popularity. Her residence has since been chiefly in Biarritz, France; and after the assassination of King Alexander (1903) the political authorities at Belgrade decreed that she should not again enter the Serbian kingdom. She became a Roman Catholic in 1902.

NATATORES, an obsolete group of birds, the swimmers, artificially allied by Illiger on their likeness in pursuing an aquatic life, but structurally having relationships with several natural orders. Similar illogical groupings in the same by-gone but once popular classification were *Clamatores,* the screamers; *Scansores,* the climbers; *Cursores,* the runners, etc.

NATCHEZ, năch'ĕz, Miss., city, county seat of Adams County, on the Mississippi River; also on the Yazoo and Missisippi Valley; the Mississippi Central; and the Missouri Pacific railroads, 90 miles southwest of Jackson. A new Mississippi River bridge, costing $4,000,000 was opened in 1940. Natchez has a ferry to Vidalia, La., and steamer connection with Mississippi River ports. The main part of the city is on high bluffs; along the river front is Natchez-under-the-Hill. The country surrounding Natchez is chiefly devoted to livestock and cotton growing. There was a cottonseed oil mill here in 1834. The principal factory products now are lumber, veneer, boxes, hardwood products, automobile tires and tubes, shirts, candy, and fruit cake. Since 1932 the Pilgrimage Garden Club for two weeks in March each year displays the city's wonderful gardens with azaleas and camellia japonica, and the many fine mansions dating back before the Civil War. Two taverns are famous—King's, the oldest house in the state, and Connelly's (1795; restored by the Garden Club). The ante-bellum mansions include: The Elms, Hope Farm, Linden, and Airlie (all built before 1790); Auburn (1816), in a city park of 210 acres; The Briers (1812), where Varina Howell married Jefferson Davis; Gloucester (about 1800), home of the first governor of Mississippi Territory; Rosalie (1820); D'Evereux (1840); Stanton Hall (1851); Lansdowne (1853); Monteigne (1855). In the center of the city is a Confederate Memorial Park, and other parks overlook the river. On a bluff just outside the city limits is a national cemetery. Six miles out of the city is a famous preparatory school, Jefferson Military College (1802). In the city are Natchez College (colored), the Fisk Library and the Agnes Z. Carpenter Public Library. The government (charter of 1877) is by a mayor, who holds office two years, and a council of eight.

La Salle and Tonti were here in 1662, and in 1716 Bienville built on the bluffs Fort Rosalie, named for the Duchess of Pontchartrain. The place was destroyed in 1729, by the Natchez Indians. The fort came into possession of the English in 1763, when the name was changed to Fort Panmure. In 1779 the Spaniards took possession, and in 1798 the United States took possession of Natchez and much of the adjacent territory. From 1798 to 1802, and from 1817 to 1821 Natchez was the capital of Mississippi; in 1803 it was incorporated as a city. A tornado destroyed much of the city in 1840. In 1862 Commodore Porter shelled the city, and in 1863 Federal troops took possession. Pop. (1930) 13,422; (1940) 15,296; (1950) 22,740.

NATCHEZ, nä-chāz, **Les,** a romance by Chateaubriand, published in 1825–26, many years after the author first planned it. The work was written during his exile in England, long after his journeyings in America, of which country it contains his views as well as setting forth his psychological speculations and philosophy of life.

NATCHEZ INDIANS. See CREEKS.

NATCHITOCHES, năch-ĭ-tŏch'ĕz, an American Indian tribe formerly living along the banks of the Red River, in Louisana. They were driven from their homes by the Natchez and united with the Caddoes in 1731. They made homes in rough dwellings covered with sod. Certain phases of their religious practices demanded human sacrifice.

NATCHITOCHES, năk'ĭ-tŏsh, town, Louisiana, parish seat of Natchitoches Parish, on Cane River (near the Red River), and on the Texas and Pacific Railroad, about 150 miles in direct line northwest of Baton Rouge. The town is on the site of what was once a French trading post established in 1714. It is situated in an agricultural region in which the chief products are cotton, beef cattle, poultry, milk, corn, hay, oats, potatoes, sugarcane, sweet potatoes, peas, soybeans, and truck vegetables. The principal industries of the town are connected with the preparation and shipment of the agricultural products, livestock, and gas. It also manufactures lumber, cottonseed oil, bricks, and beverages. It is the seat of a Northwestern State College. Pop. (1950) 9,914.

NATHAN, Hebrew prophet in the time of David and Solomon. He was in his day the latest direct descendant and representative of the school of the prophets under Samuel. Saint Jerome mentions a Jewish tradition which identifies him with the eighth son of Jesse, but there is no ground for this supposition. His earliest appearance in the history of David is as the king's counsellor, first advising the building of the temple and then after a vision announcing that the time had not yet come (about 1010 B.C.). His power, eloquence and tact as a prophet are shown by his exquisite apologue of the ewe lamb which brought David to a sense of his guilt in the case of Bathsheba (1000 B.C.). On the birth of Solomon the prophet named the child Jedidiah, "friend of the Lord," and was entrusted with his education. When the end of David's reign approached Nathan advocated the succession to Solomon, counseled Bathsheba to secure it, and rebuking the indifference of the king obtained his presence

and assistance at the inauguration of his successor (977 B.C.). Nathan's sons occupied high posts in the new court, Nabud being "the king's friend" and principal officer or chamberlain, while Azariah was over the "twelve officers which provided victuals for the king and his household." It was in accordance with the counsels and suggestions of this prophet that David, the year after his son's accession, crowned the work of his life, as poet, musician and promoter of a rich temple ritual, by introducing into public worship an orchestra of Levites. Eccles. ix, 14–16, a passage attributed to Solomon, is evidently an imitation of 2 Sam. xii, 1–4, which shows how the influence of Nathan was perpetuated in the literature of succeeding ages. In I Chron. xxix, 29, and II Chron. ix, 29, he is mentioned as historian of the reigns of David and Jonathan He died about 935 B.C., and his grave is still pointed out at Halhul, five miles north of the ancient Hebron. An echo of his parable of the rich man with many flocks is found in the Koran Sura xxxviii, 20–25.

NATHAN, George Jean, American dramatic critic and magazine editor: b. Fort Wayne, Ind., 15 Feb. 1882. He was educated at Cornell University and entered journalism in 1904. In 1906 he became dramatic critic to the *Bohemian Magazine,* in 1908 to *Harper's Weekly,* and in the same year to *The Smart Set.* Since 1906 he has contributed articles on the current drama to many other magazines, and has also written for a newspaper syndicate. In 1914 he became part owner of *The Smart Set* and joint editor with H. L. Mencken (q.v.). In 1924 with Mr. Mencken, he founded the *American Mercury,* and was an editor for one year, after which he was contributing editor. His publications include 'Europe After 8.15,' with H. L., Mencken and W. H. Wright (1914); 'Another Book on the Theatre' (1916); 'Bottoms Up' (1917); 'Mr. George Jean Nathan Presents' (1917); 'A Book Without a Title' (1918); 'Comedians All' (1919); 'The American Credo,' with H. L. Mencken (1920); 'The House of Satan' (1926); 'Heliogabalus,' a play, with H. L. Mencken (1920); 'The Eternal Mystery' (1913); 'Art of the Night' (1928); 'Monks are Monks' (1929). See also Kozlenko, 'Quintessence of Nathanism' (1930). Nathan's criticism is marked by independence of academic standards, and extensive knowledge of dramatic literature.

NATHAN, Maud, American reformer: b. New York, 1862. She was educated at private school and Green Bay, Wis., High School. In 1880 she married Frederick Nathan; was speaker before the International Congress of Women, in London (1899), at Berlin (1904) and International Peace Congress, New York (1907), and International Conference of Consumers' Leagues, Geneva (1908). In 1908 she was also a delegate at the International Congress for Labor Legislation, Lucerne (1908), since which she has preached and lectured in the principal cities of the country. She was a delegate to the International Woman Suffrage Convention at Stockholm (1911) and at Budapest (1913) and numerous other conferences abroad. She has been president of the Consumers' League of New York (1897–1917) and vice-president of the National Consumers' League.

NATHAN THE WISE. Lessing's immediate occasion for writing 'Nathan der Weise' ("Nathan the Wise," 1799) was the necessity of finding a form, to which the censor could take no exception, for final utterance of some sentiments on the subject of personal religion which he had very much at heart. During a controversy with the Pastor Goeze in Hamburg he had had abundant experience of the pharisaical intolerance of the Lutheran orthodoxy of his day; and, on the other hand, his dear friend Moses Mendelssohn gave him an example of one of the gentlest, most enlightened of spirits in a member of a despised and persecuted sect. The idea of a dramatic poem on the subject of 'Nathan' goes back, however, some 25 years before this time.

The central *motif* Lessing adapted to his purposes from one of the stories of Boccaccio ('Decameron,' first day, third novel): Saladin, desiring to extort money from the Jew Melchizedek, invites him to declare which is the true religion. The Jew begs leave to tell a story: a father, possessed of a precious ring and having three sons equally dear to him, causes two rings to be made so nearly like the true one that he himself can hardly tell which is which, gives each son one ring, and nobody can decide who is heir of the original. So it is with the three principal religious faiths. Lessing's version attributes to the true ring the special virtue of making its wearer acceptable in the sight of God and man, provided he wears is confident of that effect. Proof, then, for each son that his ring is genuine will appear in the use that he makes of it. The moral is obvious: faith is the working out of salvation, not the possession of the truth. And from this follows a sufficient principle of conduct: act so as to deserve, and the right that you earn is right indeed, so far at least as any human being can judge. Translated by Ellen Frothingham (New York 1892), and by E. K. Corbett (London 1883). Edited by G. O. Curme (New York 1898) and by J. C. Robertson (Cambridge, England 1912).

WILLIAM G. HOWARD.

NATHANAEL, one of the earliest believers in and follower of Christ. He was a native of Cana in Galilee and attached himself to Jesus on becoming convinced of the Messiahship of the son of Mary by his miraculous insight and power of reading the heart (John i, 46–49). On the hypothesis that he was one of the 12 he has been identified with Bartholomew, but on insufficient grounds. There is a tradition that Nathanael was the bridegroom at the marriage at Cana, and Epiphanius implies that he was one of the two disciples whom Jesus overtook on the way to Emmaus.

NATHORST, nät'hôrst, **Alfred Gabriel,** Swedish scientist: b. Wäderbrunn, near Nyköping, 7 Nov. 1850. He studied at Lund and Upsala, served (1874) as privat docent in geology at Lund and (1873–84) as geologist on the royal Swedish geological research, becoming (1885) intendant of the palæontological plant collection of the Stockholm Riks Museum. In 1870 and 1882 he was exploring in Spitzenbergen and (1873–84), in south and central Sweden. In 1883 he accompanied the Nordenskiöld expedition to Greenland and (1898) led an Antarctic

expedition. His researches in glacial flora fossils were fruitful. He died in 1921.

NATICA, a genus of sea-snails, forming the type of the family Naticidae. The shell is globose in form, the spiral portion being minute and indistinctly marked, smooth and porcelain-like and its aperture of large size and semicircular form. The animal appears large in proportion to the shell, the foot especially being extensive. The mantle-lobes partly conceal the shell, and an operculum is always present. Most of the genera of this family are marine.

NATICK, nā'tĭk, town, Massachusetts, in Middlesex County; altitude 158 feet; on the Charles River; 18 miles southwest of Boston; on the Boston and Albany Railroad. The chief manufactures are boots, shoes, saws and edge tools, paper boxes, and baseballs. The town was founded in 1651 by John Eliot (q.v.), as the first of his thirty Praying Towns, which he hoped to make centers of Christian education among the Indians. A monument in honor of John Eliot is in South Natick. A boulder memorial on the Natick Common marks the Henry Wilson tree, planted by "the Natick cobbler" who became vice president of the United States (1873–1875). Natick was incorporated as a town in 1781. Pop. (1940) 13,851; (1950) 19,838.

NATION, Carry Amelia Moore, American temperance agitator: b. Garrard County, Ky., Nov. 25, 1846; d. Leavenworth, Kan., June 9, 1911. After brief and sporadic schooling, Carry Moore attended Missouri's State Normal School and received a teaching certificate. In 1867 she married a young physician and Union Army veteran, Dr. Charles Gloyd, an alcoholic. Unable to reform him, they separated, and six months later Gloyd died of alcoholism leaving her with an infant daughter Charlien, who lived to a weak and insane maturity. For the next four years she taught in a primary school at Holden, Mo., and in 1877 married David Nation, a lawyer, minister and editor, nineteen years her senior. In 1901, while they were living at Medicine Lodge, Kan., Nation divorced her on grounds of desertion. Meanwhile she had organized a local branch of the Woman's Christian Temperance Union and begun her campaign against the "joints," illicit saloons flourishing in the "dry" state of Kansas. Her first use of a hatchet to destroy property occurred in 1900 when she invaded Wichita and wrecked several saloons. She then descended upon Enterprise, Danville, Winfield, Leavenworth, and the state capital Topeka. Later she continued her hatchet crusade in San Francisco and eastern seaboard cities. Arrested some 30 times on charges of disturbing the peace, she paid her fines from her earnings in the sale of souvenir hatchets, lecture tours and stage appearances. Though sometimes earning as much as $300 per week, she never became wealthy. She gave large sums to the poor and to temperance projects and built a home for drunkards' wives in Kansas City, Kan. Afflicted with hereditary paranoia (her mother and maternal grandmother were insane), her violent tactics, which made her a choice subject for the cartoonists, embarrassed the majority of temperance reformers and she never received the unqualified endorsement of any of the national bodies. Consult her autobiography, *The Use and Need of the Life of Carry A. Nation* (1904).

NATION. See NATIONALITY; NATIONALISM.

NATIONAL ACADEMY OF DESIGN. An American association devoted to the fine arts, membership in which is limited to 125 painters, 25 sculptors and 25 architects and engravers. In 1906, joined by the Society of American Artists (q.v.), the National Academy became affiliated with Columbia University and the Metropolitan Museum of Art. The school of design, conducted since 1825 in connection with the academy, is located at Amsterdam Avenue and 109th Street and is open for instruction from October to May; the home and exhibition building of the society is at 1083 Fifth Avenue. The instructors in the school are selected from the governing council of the academy, which consists of its officers and six members. First known as the New York Drawing Association, a secession in 1825 of young artists from the first academy of arts in New York founded in 1802, the present name was adopted in 1828.

NATIONAL ACADEMY OF MUSIC (ACADEMIE NATIONALE DE MUSIQUE; also called the THEATRE NATIONAL DE L'OPERA), French institution founded by Louis XIV in 1669, the official title of the Paris Opera. The first composer of eminence connected with the institute was the Italian Lully, who became a naturalized French subject and gained control of the institute in 1672. The present building of the institute was opened in 1875 and is one of the finest of its kind in the world.

NATIONAL ACADEMY OF SCIENCES. Established by an Act of Congress approved by President Lincoln March 3, 1863, the charter of the National Academy of Sciences directs that it "shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art, the actual expense of such investigations, examinations, experiments, and reports to be paid from appropriations which may be made for the purpose, but the academy shall receive no compensation whatever for any services to the Government of the United States." Membership is by election, in recognition of outstanding achievements in scientific research, and is limited to 350 active members and 50 foreign associates. Members must be citizens of the United States. New members are elected by the academy on nominations from its 11 sections: Mathematics, Astronomy, Physics, Engineering, Chemistry, Geology and Paleontology, Botany, Zoology and Anatomy, Physiology and Biochemistry, Pathology and Bacteriology, and Anthropology and Psychology.

Publications of the academy include its *Annual Report* to the Congress of the United States; *Biographical Memoirs* of its deceased members; occasional scientific *Memoirs;* and *Proceedings,* issued monthly, and devoted to condensed reports of the most recent achievements in scientific research by members of the academy and the National Research Council, or by persons introduced by members.

The academy building is at 2101 Constitution Avenue, Washington, D.C.

NATIONAL ARCHIVES AND RECORDS SERVICE (NARS). The National Archives and Records Service is a part of the General Services Administration. It superseded the National Archives Establishment, an independent agency created by Congress in 1934, which was transferred to the General Services Administration effective July 1, 1949. NARS is headed by the archivist of the United States. It consists of the Records Management Division, the National Archives, the Federal Register Division, the Franklin D. Roosevelt Library at Hyde Park, N. Y., and the National Historical Publications Commission.

NARS prescribes standards and methods for the efficient management of the government's current records; supervises the administration of records centers, where noncurrent records being processed for disposal are stored inexpensively; selects, preserves, and administers in the National Archives those federal records that have enduring value; publishes the *Territorial Papers of the United States,* the daily *Federal Register,* the *Code of Federal Regulations,* the *Statutes at Large,* the *U.S. Government Organization Manual,* and the *Handbook of Emergency Agencies;* and administers the papers and collections of Franklin D. Roosevelt and related materials in the Library at Hyde Park. The National Historical Publications Commission serves as the staff agency of the federal government in planning national programs for collecting, preserving, and, on a selective basis, publishing archival and other manuscript materials important for an understanding of the history of the United States, and in cooperating with and assisting federal, state, and nongovernmental institutions in carrying out those programs.

More than 1,000 reference services a day are performed on the 872,000 cubic feet of permanently valuable records in the National Archives, which include maps, motion pictures, sound recordings, and still pictures. There is a general *Guide to the Records in the National Archives* (1948); and the *National Archives Accessions* lists current acquisitions. Records relating to World War II are described in a 2-volume handbook, *Records of World War II* (1950–1951). Other materials descriptive of records on deposit in the National Archives are issued from time to time in the form of inventories, reference information papers, and special lists of documents. To make entire bodies of research materials available to scholars and institutions, the National Archives reproduces them on microfilm and sells positive prints at cost. Individual documents of historic significance are also reproduced in exact facsimile for sale as teaching aids.

WAYNE C. GROVER,
Archivist of the United States.

NATIONAL ASSEMBLY (also known as the CONSTITUENT ASSEMBLY), a body established in France in 1789. Upon the convocation of the States-General by Louis XVI, the privileged nobles and clergy refused to deliberate in the same chamber with the commons, or *tiers-état* (third estate). The latter, therefore, on the proposition of the Abbé Siéyès, constituted themselves an *Assemblée Nationale,* with legislative powers, June 17, 1789. They bound themselves by oath not to separate until they had furnished France with a constitution, and the court was compelled to give its assent. In the 3,250 decrees passed by the assembly were laid the foundations of a new epoch, and having accomplished this task, it dissolved itself Sept. 30, 1791. The term is also applied to a joint meeting of the Senate and Corps Legislatif, for the purpose of electing a chief magistrate or the transaction of other extraordinary business. See also FRANCE—*Revolution and Consulate: 1789–1804.* (The National Assembly).

NATIONAL ASSOCIATION OF MANUFACTURERS, The. A convention, consisting of several hundred representative American manufacturers, met in Cincinnati, Ohio, Jan. 22, 1895, and provided for the organization of a national association of manufacturers. At the first annual convention of the association held in Chicago Jan. 21, 1896, the name "The National Association of Manufacturers of the United States of America" was adopted, a preamble setting forth the objects of the association was published, and a constitution was adopted. The constitution has been revised, elaborated and amended several times to cover the constantly expanding activities of the association.

The general objects for which the association works are: (1) the promotion of the industrial interests of the United States; (2) the fostering of the domestic and foreign commerce of the United States; (3) the betterment of the relations between employers and their employees; (4) the protection of the individual liberty and rights of employer and employee; (5) the dissemination of information among the public with respect to the principles of individual liberty and ownership of property; (6) the support of legislation in furtherance of those principles and opposition to legislation in derogation thereof.

The association has standing committees on the following subjects: agricultural cooperation; economic policy; economic security; educational cooperation; employment relations; government finance; healthful working conditions; industrial economics; industrial financing; industrial practices; national defense and industrial mobilization; patents and trade-marks; public relations; relations of government to industry; scientific research study of depressions; tariff and transportation.

To advise the standing committees in their deliberations, the association has a number of advisory groups. In addition, the association has been sponsoring the most widespread and complete program ever undertaken by organized industry to tell its story to the public through the National Industrial Information Committee.

The membership of the association consists of individuals, firms and corporations engaged in manufacturing. The annual dues are based on capitalization, and the entire income of the association is expended in the interests of its members. Branch offices are maintained at Washington, D.C., and San Francisco, Calif.

NOEL SARGENT,
Secretary.

NATIONAL AUDUBON SOCIETY. See AUDUBON SOCIETIES.

NATIONAL CATHOLIC WELFARE CONFERENCE. Founded in 1919, its aims are to organize Roman Catholic activities in such fields as education, social welfare, immigrant aid, and youth guidance. The membership

includes all Roman Catholic bishops and archbishops in the United States. It publishes a monthly, *Catholic Action,* and supplies a news service to affiliated weeklies. Headquarters are in Washington, D.C. See also CATHOLIC CHURCH, ROMAN—*Catholic Press of the United States.*

NATIONAL CEMETERIES are burial grounds instituted by act of Congress for the interment of any member of the United States armed forces who dies in action, while on active duty, or a veteran whose last service has terminated honorably. The veteran's wife or husband may be buried in a national cemetery, according to certain regulations; and unmarried children under 21 years of age and unmarried daughters of any age may be buried in a national cemetery in a grave site in which the remains of a parent have been buried. There is no cost for the grave site in a national cemetery.

National cemeteries had their inception shortly after the American Civil War. Of the total interments, about 10,700 are those of Confederates, being mainly in the national cemeteries of Arlington, Camp Butler, City Point, Cypress Hills, Finn's Point, Fort Smith, Hampton, Jefferson Barracks, Little Rock, Philadelphia, Springfield, and Woodlawn. Today more than 500,000 honorably discharged veterans and members of their families rest in 91 national cemeteries. Of these cemeteries, 79 are under the Department of the Army and supervised by the Quartermaster General. The other 12 cemeteries are under the Department of the Interior. The following is a list of national cemeteries:

Alexandria, Pineville, La.
Alexandria, Va.
Andersonville, Ga.
*Andrew Johnson, Greenville, Tenn.
Annapolis, Md.
*†Antietam, Sharpsburg, Md.
Arlington, Ft. Myer, Va.
Balls Bluff, Leesburg, Va.
Baltimore, Md.
Barrancas, Warrington, Fla.
Baton Rouge, La.
*†Battleground, Washington, D.C.
Beaufort, S. C.
Beverly, N. J.
Camp Butler, Springfield, Ill.
Camp Nelson, Nicholasville, Ky.
Cave Hill, Louisville, Ky.
Chattanooga, Tenn.
City Point, Hopewell, Va.
Cold Harbor, Richmond, Va.
Corinth, Miss.
Crown Hill, Indianapolis, Ind.
Culpeper, Va.
*Custer Battlefield, Crow Agency, Mont.
Cypress Hills, Brooklyn, N. Y.
Danville, Ky.
Danville, Va.
Fayetteville, Ark.
Finn's Point, Salem, N.J.
Florence, S. C.
Fort Bliss, Tex.
*†Fort Donelson, Dover, Tenn.
Fort Gibson, Okla.
Fort Harrison, Richmond, Va.
Fort Leavenworth, Kan.
Fort McPherson, Maxwell, Nebr.
Fort Rosecrans, Point Loma, Calif.
Fort Sam Houston, Tex.
Fort Scott, Kan.
Fort Smith, Ark.
Fort Snelling, Minneapolis, Minn.
*†Fredericksburg, Va.
*†Gettysburg, Pa.
Glendale, Va.
Golden Gate, San Bruno, Calif.
Grafton, W. Va.
Hampton, Va.
Jefferson Barracks, St. Louis, Mo.
Jefferson City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Lebanon, Ky.
Lexington, Ky.
Little Rock, Ark.
Long Island, Farmingdale, L. I., N. Y.
Loudon Park, Baltimore, Md.
Marietta, Ga.
Memphis, Tenn.
Mills Springs, West Somerset, Ky.
Mobile, Ala.
Mound City, Ill.
Nashville, Madison, Tenn.
Natchez, Miss.
New Albany, Ind.
New Bern, N. C.
Perryville, Ky.
Philadelphia, Pa.
*†Poplar Grove, Petersburg, Va.
Port Hudson, Zachary, La.
Quincy, Ill.
Raleigh, N. C.
Richmond, Va.
Rock Island, Ill.
Saint Augustine, Fla.
Salisbury, N. C.
San Antonio, Tex.
San Francisco, Calif.
Santa Fe, N. Mex.
Seven Pines, Richmond, Va.
*†Shiloh, Pittsburg Landing, Tenn.
Sitka, Alaska
Soldiers' Home, Washington, D.C.
Springfield, Mo.
Staunton, Va.
*†Stones River, Murfreesboro, Tenn.
*†Vicksburg, Miss.
Wilmington, N. C.
Winchester, Va.
Woodlawn, Elmira, N. Y.
*†Yorktown, Va.
Zachary Taylor, Louisville, Ky.

* Under the Department of the Interior.
† Administered by the National Park Service; it also administers the military cemetery which is part of the Chalmette National Historical Park, La.

AMERICAN CEMETERIES OF WORLD WAR I IN EUROPE
(under the American Battle Monuments Commission)

Name	Location	Number of acres	Number of interments
Aisne-Marne	Belleau	34	2,179
Brookwood	England	4½	434
Flanders Field	Belgium	5	360
Meuse-Argonne	Romagne	130	13,969
Oise-Aisne	Seringes-et-Nesles	32	6,038
Somme	Bony	13	1,825
Saint Mihiel	Thiaucourt	30	4,139
Suresnes	Paris	7½	1,503
Total		256	30,447

Since World War II the Department of the Army has announced plans for establishment of national cemeteries at Honolulu, T. H., and San Juan, Puerto Rico. Fourteen permanent military cemeteries are to be established overseas to care for deceased of World War II whose next of kin have requested that final interment be made outside the continental limits of the United States. These will be located at Cambridge, England, Neuville-en-Condroz, and Henri Chapelle, Belgium; St. Laurent, Epinal, St. Avold, St. James, and Draguignan, France; Florence and Nettuno, Italy; Carthage, Tunisia; Margraten, Netherlands; Hamm, Luxembourg; and Fort McKinley, Philippine Islands.

NATIONAL CITY, city, California, in San Diego County, five miles from San Diego on San Diego Bay, and 10 miles from the Mexican border; altitude 200 feet. It is served by the Atchison, Topeka and Santa Fe Railway by bus from San Diego. Vegetables and citrus fruits are grown in the area, and the industries include commercial flower growing, light manufacturing, and vegetable packing.

Settled in 1868, the city, which is largely residential, was incorporated in 1887. Its government is by city manager and five councilmen. Pop. (1950) 21,132.

NATIONAL CITY BANK OF NEW YORK, The, chartered June 16, 1812, under "An Act to incorporate the stockholders of the City Bank of New York," may be said to be a direct offspring of Alexander Hamilton's First Bank of the United States. The circumstance which led to the establishment of the new bank was the refusal of Congress to renew the charter of the First Bank of the United States, which, since its establishment in 1791, had been the most important financial institution in the country. The closing of this bank created a need for additional banking facilities in New York City, and the new institution was designed to fill this need.

Three days after the New York State legislature granted the charter to the City Bank of

New York, the directors met and elected officers. They arranged that holders of stock in the First Bank of the United States, which was then liquidating, might exchange that stock upon equitable terms for stock in the City Bank. This offer was availed of to the extent of 10,000 shares, which comprised more than a majority of the original capital. The authorized capital of the bank was $2,000,000 in shares of $50 each, but it commenced business with $800,000 of capital paid up. The City Bank then opened for business in the offices which formerly had been occupied by the New York branch of the First Bank of the United States, 52 Wall Street, and remained in that location until it moved in 1908 into its present home at 55 Wall Street.

Upon the establishment of the national banking system in 1864 the bank surrendered its state charter and, in 1865, entered the new system as The National City Bank of New York. The efforts of its management have always been energetically directed toward broadening and perfecting the service of the institution for the accommodation of the rapidly expanding interests of business and individuals throughout the United States and abroad. The Farmers' Loan and Trust Company was affiliated in June 1929, at which time there was a reorganization of the National City organization under which the trust company became the City Bank Farmers Trust Company. In November 1931, the Bank of America was absorbed, thereby increasing its resources and further developing the National City system of branches serving various communities throughout greater New York City.

The bank has been active in developing American foreign trade, and was the first American national bank to establish foreign branches. The National City Bank now has branches, affiliates and correspondents in every important financial and commercial city of the world.

In June 1921, following its absorption of the Commercial Exchange National Bank, the National City Bank began to open branches in New York City. On Dec. 31, 1949, it operated 67 such branches. During the previous 109 years, its sole place of business in New York City had been at its head office, located in Wall Street.

NATIONAL CONFERENCE OF SOCIAL WORK, The, was organized in 1873 for discussion of the problems and methods of practical human improvement; it was formerly known as the NATIONAL CONFERENCE OF CHARITIES AND CORRECTIONS. Membership exceeds 5,500 persons and agencies concerned with problems of social welfare. A quarterly *Bulletin* and an annual volume of *Proceedings* are published. Its office is in Columbus, Ohio.

NATIONAL CONSUMERS' LEAGUE, The, was organized in 1899 by Florence Kelley, who believed that consumers who sought cheap markets regardless of how cheapness was brought about were responsible for some of the worst evils from which workers suffered. The league began to inform the public in an effort to promote better working conditions. It investigated the conditions under which goods were made, so that the purchaser might be able to identify the product of those factories which maintained good standards. It chose the stitched cotton underwear industry for women and children for its first investigation, and as a result products of factories complying with league standards were labeled so that purchasers could be guided in their buying. The league label, having served its purpose while the needle trades were still unorganized, gave way to the union label in 1918.

In 1904 the league published the first handbook of child labor laws to be issued in the United States, and it continued thereafter to work vigorously for establishment of the Federal Children's Bureau. When congressional measures to limit child labor by federal control were declared unconstitutional, the league campaigned for ratification of the Child Labor Amendment. For a quarter of a century it fought to free women from overwork, publishing facts concerning effects of long hours and industrial strains on women which proved to the public the need for regulation by law.

Earlier state legislation for a minimum wage having been found unconstitutional, in 1933 the league drafted a new minimum wage bill which was quickly passed by seven state legislatures. In 1937 the Supreme Court of the United States upheld the constitutionality of the minimum wage. The league has defended labor laws, and it helped secure passage of the Federal Fair Labor Standards Act of 1938. After World War II the league campaigned for improvement of the act, and endorsed expanded social security and national health insurance. Headquarters are in Cleveland, Ohio.

ELIZABETH S. MAGEE,
General Secretary, National Consumers' League.

NATIONAL CONVENTION, a French revolutionary assembly (Sept. 21, 1792–Oct. 26, 1795), elected by universal suffrage as a constitutional and legislative body. The third assembly of the deputies elected by the French people after 1789 decreed the suspension of the king on Aug. 10, 1792, and voted the election of the National Convention which was constituted in the hall of the Tuileries on Sept. 19, 1792. The first session was held the following day, and the Convention was installed on the 21st. The history of this body is divided into three periods.

In the first period (Sept. 21, 1792–June 2, 1793), its first act was to make France a republic, which it did on Sept. 22, 1792, by abolishing the throne. This was followed by the trial of Louis XVI (q.v.) on Jan. 15, 1793,[1] his sentence to death the following day, and his execution on Jan. 21, 1793. Internal dissension arose between the leftist party, the Mountain, whose members were known as Montagnards, and the Girondists, resulting in the overthrow of the latter on June 2, 1793.

During the second period (June 2, 1793–July 27, 1794), the Convention, under the dictatorship of Robespierre who in turn was influenced by the Jacobins, created the Revolutionary Tribunal in October 1793 which sent thousands of its political opponents to the guillotine in what was known as the Reign of Terror (q.v.). However, the Montagnards were divided into three factions, one with Robespierre as the leader, and rival groups which were led by Jacques René Hébert and Georges Jacques Danton, both of whom were executed in the spring of 1794.

In the last period, the moderate party, which

[1] The 14th according to some authorities.

was known as the Thermidoreans, ultimately triumphed with the execution of Robespierre on July 28, 1794. A regime of reaction was initiated against the excesses of the Terror, and the Thermidoreans defended themselves against attacks by the Montagnards and the Royalists. After governing France for three years, the Convention dissolved on Oct. 26, 1795. It had drawn up the republican document called the Constitution of the Year III which was implemented by the succeeding government of the Directory. The Convention witnessed France's victory over a European coalition and the annexation of the Austrian Netherlands. It saw the establishment of the metric system and the inauguration of many scientific and cultural institutions. See also FRENCH REVOLUTION.

NATIONAL CONVENTIONS. See CONVENTION, POLITICAL.

NATIONAL COUNCIL OF THE CHURCHES OF CHRIST IN THE UNITED STATES OF AMERICA.—The National Council is a fellowship of 30 nationwide communions (25 Protestant and 5 Eastern Orthodox), with more than 35,000,000 members that desire to cooperate in all their common tasks. It is a practical expression of the unity of spirit and purpose which Christian people have because of their common loyalty to Christ.

The Council was established at Cleveland, Ohio, on Nov. 29, 1950. This was made possible by the decision of eight interdenominational agencies, to combine their forces; said decision having been authorized by their constituent communions and boards. These eight agencies, which by their official action transferred their functions and responsibilities to the National Council, were:

Federal Council of the Churches of Christ in America
Foreign Missions Conference of North America
Home Missions Council of North America
International Council of Religious Education
Missionary Education Movement of the United States and Canada
National Protestant Council on Higher Education
United Council of Church Women
United Stewardship Council

Five additional agencies later decided to merge their interests in the National Council:

Church World Service
Inter-seminary Committee
Protestant Film Commission
Protestant Radio Commission
Student Volunteer Movement

The National Council is the direct creation of the churches themselves. Its constitution was officially ratified by the highest authority of each of the thirty member denominations. The council is directly responsible to the denominations as officially represented at the General Assembly which meets biennially and the General Board which meets bimonthly.

The National Council encourages Christian churches to cooperate with each other and maintains close working relationships with more than 900 state and local Councils of Churches and a still larger number of state and local Councils of United Church Women and Interdenominational Ministerial Associations throughout the nation.

Non-member communions which share the basic faith in Jesus Christ as Divine Lord and Saviour may become members of the National Council under the provisions outlined in the constitution.

The National Council of Churches is an incorporated body, pursuant to the Membership Corporation Law of the State of New York, with its principal offices located at New York, N. Y.

J. QUINTER MILLER,
Assistant General Secretary.

NATIONAL COVENANT, in Scottish history, a league formed by the Presbyterians in 1638. See COVENANT.

NATIONAL DEFENSE. See CONSCRIPTION.

NATIONAL EDUCATION, Systems of. See EDUCATION, NATIONAL SYSTEMS OF.

NATIONAL EDUCATION ASSOCIATION OF THE UNITED STATES (NEA), The. A professional organization of teachers, school officials, and others engaged and interested in educational work, incorporated by act of the United States Congress "to elevate the character and advance the interest of the profession of teaching and to promote the cause of education in the United States." Headquarters offices of the organization since 1918 have been located in its own seven-story building, 1201 Sixteenth Street, N. W., Washington, D.C.

History.—The first teachers' association in the United States was the Society of Associated Teachers organized in New York City in 1794. Other early significant educational organizations leading to a recognition of the need for a national association were: the American Institute of Instruction established in Boston 1830; the Western Literary Institute and College of Professional Teachers organized in Cincinnati 1831; and the American Association for the Advancement of Education held its first meeting in Philadelphia in 1849 with Horace Mann as presiding officer. By 1857 more than 20 state teachers' associations had been formed beginning with Rhode Island, New York, and Massachusetts. In August 26, 1857, 43 representatives of 10 of the state teachers' associations met in Philadelphia and organized the National Teachers' Association. That name was used until the organization united with the American Normal School Association and the National Association of School Superintendents in 1870 to form the National Education Association.

First incorporated, Feb. 24, 1886, under the laws of the District of Columbia, the organization was reincorporated by a special act of Congress with its present name, National Education Association of the United States, June 30, 1906.

By 1920 the increasing membership of the organization brought about an urgent need for some type of representative government. An amendment to the charter approved July 9, 1920, provided for the present representative assembly by which only elected and accredited delegates participate in the parliamentary sessions of the organization. Delegates to the representative assembly are elected by affiliated state and local associations, each organization being entitled to a number of delegates proportional to its members who belong to the NEA.

Membership.—The NEA is the largest professional organization in the world, reaching a record membership in 1948 of 441,127.

Beginning with the 10 state associations which created the national organization in 1857, the

state associations have continued in close cooperation and coordination with the NEA. All of the state teachers' associations of the 48 states, the District of Columbia, and three Territories, Hawaii, Alaska, and Puerto Rico, are affiliated with the National Education Association. The combined membership of these state and territorial associations is in excess of 800,000.

Finances.—The NEA is supported almost entirely by membership dues supplemented by income from advertising, sales of publications, and convention exhibits. Life membership dues, raised from $100 to $150 in 1948, have been used to purchase the headquarters office building and create a fund for further plant expansion.

Departments.—With increasing specialization in education, the number of the departments of NEA grew until in 1948 there were 29 as follows: Adult Education; American Association for Health, Physical Education, and Recreation; American Association of Colleges for Teacher Education; American Association of School Administrators; American Educational Research Association; American Industrial Arts Association; Association for Supervision and Curriculum Development; Audio-Visual Instruction; Classroom Teachers; Elementary School Principals; Higher Education; Home Economics; International Council for Exceptional Children; Kindergarten-Primary Education; Lip Reading; Music Educators National Conference; National Art Education Association; National Association of Deans of Women; National Association of Journalism Directors of Secondary Schools; National Association of School Secretaries; National Association of Secondary-School Principals; National Council for the Social Studies; National Council of Administrative Women in Education; National Science Teachers Association; Rural Education; Secondary Teachers; Speech Association of America; United Business Education Association; and Vocational Education.

Publications.—The association publishes annually about 500 million impression pages, including magazines, bulletins, books, and leaflets. The publication of widest distribution is the *NEA Journal.*

BELMONT FARLEY,
Director, Press and Radio Relations.

NATIONAL FORESTS. See NATIONAL PARKS AND MONUMENTS.

NATIONAL GALLERY, The, the British national art gallery; a collection of paintings, in Trafalgar Square, London. It originated in a collection formed by J. J. Angerstein, consisting of 38 pictures, 29 by old masters and nine by British painters, and purchased with public funds in 1824 for $280,000 as the nucleus of a national gallery. Since that time the collection has been greatly enlarged by purchases out of funds provided by Parliament, as well as by bequests and gifts.

The National Gallery now comprises over 4,500 pictures and though specially strong in examples of the British school of painting, foreign masters are fully represented. The various early and late Italian schools are extensively illustrated; there are good examples of the chief representatives of Italian art, as Raphael, Correggio, and Paul Veronese. There are also good examples of Murillo and Velásquez and the Spanish school, and among the great Dutch and Flemish painters, Rembrandt, Rubens, Van Dyck, are well represented. The original building of the National Gallery dates from 1838 but has since had additions to accommodate the increasing collection. See also NATIONAL PORTRAIT GALLERY.

NATIONAL GALLERY OF ART. See SMITHSONIAN INSTITUTION.

NATIONAL GEOGRAPHIC SOCIETY, The. Founded in Washington, D.C., in 1888 for the "increase and diffusion of geographic knowledge," the society publishes the *National Geographic Magazine,* containing articles of wide geographic interest. Circulation to society members and to schools and other institutions exceeds 1,965,000.

Through the years, the society has sponsored —often in cooperation with other institutions— expeditions and research projects that have reached to the earth's poles, plumbed the ocean depths, soared to stratosphere heights, and peered into the darkness of interstellar space.

In addition to reproducing more than 1,000 natural-color photographs a year in its magazine pages, the society distributes every year as magazine supplements four large 10-color wall maps prepared in its own cartographic department.

Geographic news bulletins giving background information on places of current news interest are supplied to press and radio offices to the number of about 300 subjects a year. Weekly *Geographic School Bulletins* go to some 35,000 classrooms.

Gilbert Grosvenor has been editor of the *National Geographic Magazine* continuously since 1899, when the circulation was less than 1,000, and president of the society since 1920. Headquarters of the society are in Washington, D.C.

NATIONAL GUARD. Under MILITIA—*American Militia* there was traced the rise and fall of the militia system in the United States; and in the same article was indicated the genesis of the present National Guard. Not originating in any conception of universal military obligation but stemming entirely from a volunteer basis, the National Guard is made up of those citizens who choose to look upon soldiering as an avocation and carry on their military work in peacetime alongside of their normal occupations, trades, or professions. The units so formed are all controlled by the separate state governments. Unfortunately, as the National Guard grew, it became an ungainly thing. There was no uniformity within states, there was no integration among states. In the Spanish-American War the Cuban campaign showed conclusively that there was much to learn about mobilization. Secretary of War Elihu Root resolved to do something about the matter and, accordingly, instituted a study and rearrangement of American military organizations. Out of this came the passage of the Dick Bill in 1903. This divided the militia into (1) organized militia to be known as National Guard of the state and (2) a remainder known as reserve militia. Regular Army armament and discipline were prescribed as was instruction by Regular Army personnel. At the outset, the president was authorized to call this force for constitutional purpose for a period not to exceed nine months. In 1908 this time ban was lifted, as was the restriction on service outside the continental

limits of the United States. Upton's book on military policy, published in 1907, brought to light facts which, by their sharp sting of criticism, spurred the National Guard to renewed efforts to establish and maintain higher standards. In 1912, Attorney General Wickersham, passing on the Dick Bill amendment of 1908, ruled that it was his opinion that to move National Guard units outside the continental limits of the United States would be unconstitutional. In 1916, National Guard units were called into United States service "to protect against invasion, rebellion—." They spent six months on the Mexican Border, having enrolled nearly 100,000 men. When the United States declared war against Germany in 1917, these troops served as a rallying force around which to build the National Guard units necessary to supplement the Regular Army. The Selective Service Act of May 18, 1917 drafted the National Guard into federal service, and by subsequent War Department orders (General Orders 95 and 101, July 18 and Aug. 3, 1917, respectively) the Guard was distributed and formed into 16 National Guard combat divisions, each mobilized and trained in a separate camp. These organizations served with honor and distinction abroad for the period of the World War. When peace came, there was a rush to return to civilian pursuits and it became necessary to build the defense force anew.

Out of the welter of plans and suggestions advanced, came the adoption of the plan fostered by Gen. John J. Pershing and enthusiastically seconded by Maj. Gen. John F. O'Ryan, New York's noted World War commander of the 27th Division, A.E.F. This plan set up an "Army of the United States" to consist of three components: Regular Army, Organized Reserves, and National Guard, the latter to remain a state force under state control except for those periods when actually in federal service. The act of June 4, 1920 accomplished this set-up. Nothing was done to destroy local pride in any unit. Instead, there was increased federal aid of all kinds, broadened to preserve local tradition and honors won in outstanding military operations. The governor of each state is the commander in chief for his state, except when the Guard is in federal service. Arms, equipment, motor vehicles, and supplies come from Uncle Sam, who also pays wages for armory drills and for 15 days' field training per year (lengthened in emergency in 1940 by an extension of one week). The army's schools are open to the National Guard and its members receive full pay when in attendance there.

Amendments to the 1916 and 1920 acts created "The National Guard of the United States," distinct from "The National Guard" of the several states. They differ only in character, and the purpose accomplished by the latest amendment was that of making it possible, when Congress declares a national emergency, to order the National Guard into active service as federal troops, obviating the old, clumsy procedure of getting them by "calls" through the state governors.

In 1920, National Guard strength was 56,090; in 1940, it was 251,000. The National Guard participates annually in Regular Army field maneuvers. Its present organization is comprehended in 18 infantry and four cavalry divisions with a pro rata proportion of corps, army, and GHQ reserve troops. It stands as a state force, available to quell disorders within state boundaries, and it is a definite part of the federal military force.

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R. S. THOMAS,
Associate Military Historian, Army War College.

NATIONAL HYMNS AND ANTHEMS.

Patriotic songs or airs played or sung on ceremonial occasions, fêtes, and other public gatherings as a mark of respect to the country are generally known as national anthems or hymns. There is no very marked difference between a national hymn and an anthem, and many countries possess both. Where this is the case, the anthem has been made the official music of the nation by a legislative act or royal decree. It takes precedence over all other national hymns regardless of the affection and esteem in which they may be held. It may be an air without words or a march played by bands or orchestras to symbolize patriotism and loyalty. Love of fatherland and pride in one's country are the keynotes of most national anthems, and in many, religious feeling is blended with patriotic sentiment. National hymns and anthems are frequently closely related to the folk songs of a country or grow out of wars and revolutions. In most cases, both words and music are by a native composer.

Argentina.—*Oíd, mortales, el grito sagrado* (*Hear, O Mortals, the Sacred Call*) was written in 1813 by Vicente Lopez y Planes and set to music by José Blas Parera.

Australia.—*God Save the King* is the official national anthem of the Dominion, but it shares honors with a more local melody. On state and formal ocasions when *God Save the King* is played, it is followed by the playing and singing of *Advance Australia Fair.* This Australian anthem was written about 1875 by P. D. McCormick.

Austria.—Before World War I, the national anthem of the empire was *Gott erhalte unsern Kaiser,* composed in 1797 by Franz Joseph Haydn. After the formation of the first republic, a new song was adopted, *Österreichische Bundeshymne,* with words by Karl Renner and music by Wilhelm Kienzl. It was officially proclaimed the national anthem on Dec. 13, 1929. During the time of chancellors Engelbert Dollfuss and Kurt von Schuschnigg, it was compulsory to follow the national anthem with the party song *Lied der Jugend.*

Belgium.—*La Brabançonne,* with music by François Van Campenhout (1779–1848) has had three sets of words since it was first sung at the Théâtre de la Monnaie in Brussels on Sept. 12, 1830. At that time Belgium was still part of the Kingdom of the Netherlands, under the House of Orange. The original version pledged loyalty to the orange provided that it should ripen on the tree of liberty. The second version, written during the street fighting in which Bel-

gium won its independence, was strongly anti-Dutch. Words of the early versions were by "Jenneval," stage name of the French comedian Hippolyte Louis Alexandre Dechet (1801–1830), who was killed fighting for Belgian freedom. The third and last version was written in 1860 by Charles Rogier so that the anthem should be in keeping with the friendly relations between Belgium and Holland.

Bolivia.—*Bolivianes, el hado propicio,* with words by J. Ignacio de Sanjinés and music by Benedetto Vincenti, was played for the first time in 1842 and adopted the same year.

Brazil.—*Hymno da Proclamacão da Republica* (*Hymn of the Proclamation of the Republic*) was composed by Leopoldo Miguez. The words are by Medeiros e Albuquerque.

Bulgaria.—*Shoumi Maritsa* (*The Bubbling Maritsa*), a river which flows through Bulgaria and Turkey. It was written by (?) Mareček and set to music by Gabriel Sebek.

Canada.—The Dominion of Canada probably comes as close as any other country to having two official national anthems. By law, *God Save the King* is the only official one, but by custom and usage, most Canadians look upon *O, Canada* as their national anthem. The words were originally written in French by Sir A. B. Routhier in 1880; the music is by Calixa Lavallée. The English adaptation was made in 1908 by R. S. Weir. On all state and formal occasions when the playing of the national anthem is in order, *God Save the King* is immediately followed by *O, Canada.* Still another highly popular national song is *The Maple Leaf Forever* with words and music written by Alexander Muir in 1867.

Chile.—*Dulce Patria,* the Chilean national anthem, was originally written as a poem in 1819 by the Argentine poet Bernardo de Vera y Pintado. Chile had just obtained its independence, and the poem was a harsh outcry against Spain. It was set to music in December 1828 by Don Ramon Carnicer. In 1847, the Chilean poet, Eusebio Lillo, wrote new verses for *Dulce Patria,* leaving the chorus as it was originally written.

China.—In 1924, Dr. Sun Yat-sen gave an address to the Whampoa Military Academy in which he discussed his three principles of democracy. Part of his text was taken for the national anthem, *San-Min-Chu-I* (*Three Principles of the People*) and set to music in 1928 by Ch'eng Mao-yun. Another of China's national songs and her most popular war song is *March of the Volunteers,* known also in the United States as *Chee-lai.* The words were by T'ien Han, and the music was composed by Nieh Erh.

Colombia.—*Himno Nacional* was officially adopted as the national anthem in 1921, although it had been written years earlier. The words were by Rafael Nuñez, written before he became president, and the music was composed by Oreste Sindice, originally an Italian and later a naturalized Colombian citizen.

Costa Rica.—*De la Patria,* the national anthem, was written by José M. Zeledón. Manuel M. Gutiérrez composed the music in 1821.

Cuba.—In about 1868, Pedro Figueredo wrote the words and music to Cuba's national anthem, *Himno Bayamés.*

Czechoslovakia.—The national anthem is divided in two parts: the first is Czech and the second Slovak. They are always played together as a single anthem. The Czech part, *Kde Domov můj* (*Where is my Native Land*), was originally a song in the musical comedy *Fidlovačka* by the Czech dramatist Josef Kajetán Tyl with music by František Skroup. It was first performed in Prague on Dec. 31, 1834. *Nad Tatrou sa blýska* (*It Storms Over the Tatra*) is the Slovak part of the Czechoslovak anthem. It was written in 1844 by the Slovak poet, Janko Matúška, to the tune of an old folk song.

Denmark.—The national anthem is *Kong Christian stod ved højen Mast* (*King Christian Stood by the Lofty Mast*). The words are by the Danish poet Johannes Ewald (1743–1781), and it was included as an aria in a musical piece by Ewald, *Fiskerne* (*The Fisherman*), written in 1779. There is some uncertainty as to who was the composer of the music. It was either Johann Ernst Hartmann (1727–1793), who composed the music to *Fiskerne,* or Ewald's friend, Ditlev Ludvig Rogert (1742–1813).

Dominican Republic.—*Himno National,* with words by Emilio Prud'homme and music by José Reyes, is the official national anthem of the Dominican Republic. It was first played and sung in 1900.

Ecuador.—The official title of the Ecuadorian national anthem is *Himno Nacional del Ecuador,* but it is known sometimes by the opening words of the first stanza: *Salve, O Patria* (*Hail, O Fatherland*). The composer was Antonio Neumane, and the words were written by Juan León Mera. It was officially recognized in 1866.

Egypt.—*My Country, My Country, I Live for You* is the Egyptian royal hymn sung at patriotic gatherings. *A Royal Salute,* formerly known as the *Salaam, Effendi* (*March of the Khedive*) is played at the conclusion of popular gatherings and patriotic assemblies. The music is by Giuseppe Verdi, but it has, or had, no words.

Estonia.—Since its incorporation into the Soviet Union in 1940, Estonia has adopted the national anthem of the USSR. *Mu Isamaa,* the old anthem, is still played on formal occasions, but it no longer holds its former honored position. The music was the same as the Finnish national anthem composed in 1848 by Frederik Pacius. The words were written by J. Jannsen in 1865.

Ethiopia.—The music of the national anthem *Etiopia hoy,* was composed by M. K. Nalbandian, the Albanian band leader of the Imperial Guard in Addis Ababa, in 1925. The words were written in 1930 by a group of Ethiopian scholars.

Finland.—The Finnish national anthem was composed by Frederik Pacius, and the words were originally written in Swedish by a Finnish poet, Johan Ludvig Runeberg. The Finnish title is *Maamme* (*Our Land*), and the Swedish, *Vårt Land.* It was first sung May 13, 1848.

France.—*La Marseillaise,* perhaps the most famous national anthem and stirring martial music ever played, was written April 25, 1792, by Rouget de Lisle, a young engineer officer in the French army at Strasbourg. See also MARSEILLAISE, LA.

Germany.—During the Franco-Prussian War (1870–1871) and through World War I *Die Wacht am Rhein,* with words by Max Schneckenburger (1840) and music by Carl

Wilhelm (1854), was considered the national anthem. On Aug. 11, 1922, *Lied der Deutschen* was officially adopted. Also known as *Deutschland, Deutschland über Alles,* the music is the same as that of the old Austrian national anthem composed by Franz Joseph Haydn in 1797. The words were written by August Hoffman von Fallersleben in 1841. After the Nazi party took control of the German government in 1933, the *Horst Wessel Lied* by Ernst Hanfstaengl became an essential part of the national anthem, and by law it followed the playing of *Lied der Deutschen.*

Great Britain.—The authorship of words and music to *God Save the King,* national anthem of Great Britain, is doubtful. It is usually credited to Henry Carey (1740). The music to this anthem has been used for more national hymns than perhaps any other. It has been used at different times by the United States, Germany, Denmark, and Switzerland. See also GOD SAVE THE KING.

Greece.—The words to the Greek national anthem, *Hymn to Liberty,* were written in 1823 by Dionyssios Solomos on one of the Ionian Islands. Five years later it was set to music by Nicholas Manzaros, and when the islands were ceded to Greece by Great Britain in 1864, the *Hymn to Liberty* became the national anthem and was dedicated to King Othon of Greece.

Guatemala.—*Himno Nacional de Guatemala,* the national anthem, was composed by Professor Rafael Alvarez. The words were written by Dr. J. J. Palma.

Haiti.—In 1903, *La Dessalinienne,* Haitian national anthem was composed for the centenary celebration of the country's independence. The words are by Justin Lhérisson, and the music is by Nicolas Geffard.

Hawaii.—As a territorial possession of the United States, Hawaii's official national anthem is *The Star-Spangled Banner. Hawii ponoi,* however, has long been a favorite song among the native population. Words and music are believed to have been composed by King Kalakaua (1874–1891).

Honduras.—Augusto C. Coello, minister of foreign affairs of Honduras in 1927, wrote the words to the Honduran national anthem, *Himno Nacional de Honduras.* Carlos Hartling was the composer of the music. The anthem was selected as the result of a public competition sponsored by the Honduran government.

Hungary.—*Hymnusz,* the Hungarian national anthem, was written in 1823 by Ferencz Kolcsey and put to music by Francis Erkel in 1845. The playing of *Hymnusz* is frequently followed immediately by *Szózat,* another national song with words by Michael Vörösmarty (1836) and music by Benjamin Egressy.

Iceland.—*O Gud vors Land,* the national anthem of Iceland, was written by Matthías Jochumsson in 1874. The music was composed by Sven Sveinbjørnsson.

Iran.—The Iranian national anthem is *Shāhanshāh-i mā Zandah bādā* with words by S. Afsar and music by Lieut. Najmi Moghaddam. It was officially adopted in 1934.

Iraq.—The *Iraq Salute,* the country's national anthem, was composed by Major A. R. Murray.

Ireland, Republic of.—The national anthem of Eire, formerly the Irish Free State, is *The Soldiers' Song,* officially adopted in July 1926. The words are by Peadar Kearney, and the music was composed by Kearney and Patrick Heaney. It was first published in *Irish Freedom* in 1912.

Italy.—Until June 1946, *La Marcia Reale,* an instrumental march by Giuseppe Gabetti (1831), was the national anthem. While the Fascists controlled the government and until the defeat of Italy in World War II, the national anthem was always followed by the party song, *La Giovinezza* with words by Marcello Manni and music by G. Castaldo.

On June 2, 1946, date of the proclamation of the Italian Republic, the *Hymn of Mameli* was adopted as the national anthem. The words are from a poem, *Fratelli d'Italia,* by Goffredo Mameli, Italian poet and patriot who died July 6, 1872, from a bullet wound received in the battle of Villa Corsini. It was first put to music by Novaro and later by Giuseppe Verdi.

Japan.—*Kimi ga yo wa* (*Let Mikado's Empire Stand*) by Hayashi Hirokami is an old 9th century oriental air.

Latvia.—*Dievs, svētī Latviju* (*God, Bless Latvia*), the old Latvian national anthem, was written by Karlis Baumanis (1835–1905) for the National Singing Festival in 1873. Since Latvia became a republic of the Soviet Union in 1940 it shares honors with the national anthem of the USSR.

Lebanon.—The national anthem of Lebanon was adopted by presidential decree on July 12, 1927. The three verses were written in Arabic by Rachid Nakhle, and the music was composed by Wadia Sabra.

Liberia.—The words and music to *Salve, Liberia, Salve!* (*All Hail, Liberia*) were written by Olmstead Luca in 1860.

Lichtenstein.—The words of Kaplan H. H. Jauch (1850) were set to the music of *God Save the King* to form the Lichtenstein national anthem, *Oben am deutschen Rhein* (*Above the German Rhine*).

Lithuania.—In 1918, the Lithuanian government officially adopted *Lietuva, Tévyné Mūsu* as the national anthem. Words and music were written by Vincas Kudirka. Since 1940, when Lithuania was made part of the Soviet Union, the country has had two anthems: *Lietuva, Tévyné Mūsu* and the new national anthem of all the Soviet Republics.

Luxembourg.—The official national anthem of the grand duchy of Luxembourg is *Ons Hemecht* with words by Michel Lentz in 1859 and music by J. A. Zinnen.

Mexico.—The Mexican national anthem, *Mexicanos, al grito de guerra,* with words by Francisco G. Bocanegra and music by Jaime Nunó dates from Sept. 16, 1854.

Monaco.—The Monégasgue national anthem was conceived by Théopile Bellando de Castro, an official of the principality. He jotted it down on the corner of a table as the melody occurred to him one evening. The simple, stirring air was altered to some extent and refined by a distinguished musician, Castil Blaze, who was visiting in the principality. The result, known as the *Marche de Théopile Bellando, ecrite et variée par Castil Blaze,* became the national anthem of Monaco.

Montenegro.—John Soundechitch wrote the words to *In Our Beautiful Montenegro.* The composer of the music is unknown.

Netherlands.—The national anthem is *Het*

Wilhelmus, also known as *Wilhelmus van Nassouwen.* The composer is unknown.

New Zealand.—The official national anthem for all public occasions in New Zealand is *God Save the King,* but the national song is *God Defend New Zealand,* which has never been officially adopted. The words of the song are by Thomas Bracken and the music by John J. Woods.

Nicaragua.—The music of the national anthem, *Patria Amada* (*Beloved Fatherland*), has been used since early colonial days. The identity of its composer is obscure. In 1939, the words were officially changed, and verses of Salomon Ibarra were adapted to the old music. The opening line of the new anthem is as follows: *Salve a Tí, Nicaragua.*

Northern Ireland.—The national anthem of all of Great Britain is *God Save the King.*

Norway.—The Norwegian composer, Rikard Nordraak (1842–1866) wrote the music of the national anthem, *Sang for Norge* (*Song of Norway*), to the words of his cousin, the author and poet Björnstjerne Björnson. It is sometimes known by the words of its opening line: *Ja, Vi Elsker Dette Landet* (*Yes, We Love This Country*).

Panama.—The music of *Himno Nacional de Panamá,* the republic's national anthem, was composed by Santos Jorge, a Spanish musician who settled in Panama in 1889. The words were written by Jerónimo de la Ossa, Panamanian poet and engineer. It was written and composed in 1904, provisionally adopted by the National Assembly in 1906, and later, in 1925, was definitely proclaimed the official anthem of the republic by the same legislative body.

Paraguay.—*Paraguayos, Republica ó muerte!* with words by Francisco de Figueroa and music by Francés Dupuy is the national anthem of Paraguay.

Peru.—In 1821, General Jose de San Martin selected *Himno National* (*Somos libres, seámoslo siempre, We are Free, Let Us Be So Forever*) as the official national anthem from six entrants in a contest for that purpose. The music was composed by Jose Bernardo Alcedo; words were by Jose de la Torre Ugarte. The anthem was officially played for the first time on Sept. 24, 1821.

Philippines.—On June 4, 1898, Julian Felipe, a Filipino music teacher and composer, began work on a national anthem. A week and a day later, on June 12, the Act of Proclamation of the Philippine Independence took place, and Felipe's composition was played for the first time. It was called *Marcha Nacional.* A year later the words were written by Jose Palma, a young poet and private soldier. His poem was called *Filipinas,* and the name was given also to the music. Until the Philippines received their independence on July 4, 1946, a playing of *Filipinas* was always followed by *The Star-Spangled Banner.*

Poland.—The words to Poland's national anthem, *Song of the Legions,* were written by Joseph Wybicki, a volunteer in Napoleon's Polish Legion under the command of Gen. Henryk Dabrowski. The music is the composition of Michael Ogiński. Wybicki wrote only one stanza and chorus, and the song was originally only a stirring marching song for the legion. After the restoration of independent Poland, *Song of the Legions* was designated as the national anthem of the Polish Republic.

Portugal.—*A Portuguesa* with words by Lopez de Mendonça and music by Alfredo Keil was written in 1890 and officially adopted as the national anthem in 1910.

Rumania.—A contest held in 1861 resulted in the selection of *Trăiasča Regele* (*Long Live the King*) as the Rumanian national anthem. The words were by V. Alexandri, and the music was composed by Edward Hübsch (1833–1894), who was at the time general inspector of military bands in Rumania and leader of the National Theatre orchestra.

Salvador, El.—*Saludemos la Patria* (*Let Us Salute the Fatherland*) was written by Juan J. Canas. The music was composed by J. Aberle.

Saudi Arabia.—As of the end of 1947, Saudi Arabia's anthem had not been officially adopted. The composers were Sheikh Ahmed A. Jabbar, first secretary of the royal legation in Washington, D.C., and Sheikh Ali Alireza, a delegate to the United Nations from Saudi Arabia. It was first played on Jan. 12, 1947, on the occasion of the visit to the United States of H.R.H. Crown Prince Saud.

Scotland.—As in the case of all parts of Great Britain, *God Save the King* is the official national anthem. *Scots Wha Ha'e wi' Wallace Bled,* an ancient Scottish melody with words by Robert Burns (1793) calls forth a large degree of national sentiment but holds no official position.

*** Siam.**—*Sanrasoen Barami,* the national anthem, was composed in 1871 by an English bandmaster in Singapore named Hudson. It was done at the request of King Chulalongkon (1868–1910) who then ordered a Siamese writer to apply Siamese words to the melody. Several alterations have been made in the wording since the original composition.

Spain.—Before 1937, Spain had no official national anthem although *Marcha Granadera,* popularized during the War of Independence against Napoleon, had attained general acceptance. In 1937, General Franco declared *Marcha Granadera* to be the national anthem, but no specific arrangement was decided upon, and it has no official words. It is generally played as a march rather than a hymn, and verses by M. Tomás are popular.

Sweden.—The official anthem is *Du gamla, du fria* (*Thou Old, Thou Free*), written by Richard Dybeck (1811–1877) to an old folk melody which he had discovered in the central province of Västmanland. Dybeck was a noted Swedish author, composer, and folklorist, who made a careful study of the inscriptions on the Swedish rune stones from Viking days. In later years another song has become almost as beloved and popular although it is not designated as the official anthem. It is *Sverige* (*Sweden*), with words by the Nobel Prize winning poet Verner von Heidenstam (1859–1940) and music by Wilhelm Stenhammer (1871–1927).

Switzerland.—The Swiss national anthem, *Rufst du, Mein Vaterland?* (*Call'st Thou, My Fatherland?*), with words by Johann R. Wyss (1811), is set to the music of *God Save the King.*

Syria.—The Syrian National Anthem, which has no other title, was written by the composer, Flayfel Bros, and adopted by the government in 1936.

* Now Thailand (1949).

Turkey.—*March of Independence,* the Turkish national anthem, was written as a poem in 1921 by Mehmet Akif Ersoy. On March 1 of the same year, the minister of public instruction read the poem to the Grand National Assembly. Eleven days later on March 12, 1921, *March of Independence* was officially declared the country's national anthem. Several different musical compositions have been written for Mehmet Akif's poem, but the final selection was that of the Turkish violinist, Zeki.

Union of South Africa.—*God Save the King* is the official national anthem, but *Die Stem van Suid-Afrika* is popular as an exclusively South African song. The author of the words is unknown, but the music was composed by M. L. de Villiers.

Union of Soviet Socialist Republics.—Before the Russian Revolution, the national anthem had been *Bozhe Zaria Chrany* (*God Preserve the Czar*) with words by V. Joukovsky and music by A. F. Lvov. It was replaced by the *Internationale,* words by Eugène Pottier (1871) and music by Pierre Degeyter. During World War II, the *Internationale* was in turn replaced by a new song, known simply in English as the National Anthem of the Soviet Union. The music was composed by A. V. Alexandrov, and the words were written by Sergei Mikhalkov in collaboration with El Resistan.

United States.—On March 3, 1931, Congress established *The Star-Spangled Banner* as the official national anthem. The words were written by Francis Scott Key on Sept. 14, 1814, to an old English melody, *To Anacreon in Heaven,* by John Stafford Smith (1750–1836). See also STAR-SPANGLED BANNER.

Uruguay.—*Orientales, la patria ó la tumba!* (*Uruguayans, fatherland or death!*) was composed and written by Juan Coppetti.

Venezuela.—The national anthem was written by two patriots who died in 1814 in the first revolutionary movement against Spain. Vicente Salias, who wrote the words, called his poem *Gloria al Bravo Pueblo* (*Honor to a Brave Nation*). He was executed as a rebel by Spanish forces in Puerto Cabello. It is traditionally said that he was shot with a copy of the anthem pinned on his chest as a target. Juan José Landaeta, the composer of the music, is believed to have been killed in Cumaná at about the same time.

Wales.—*God Save the King* is the official anthem, but as one of the most musical people in the world, the Welsh have many national songs and airs. One of the best is known is *March of the Men of Harlech* and commemorates the part played by the town of Harlech in the Wars of the Roses. Another favorite is *Mae hen wlad fy nhadan* with words by Evan James and music by J. James.

Yugoslavia.—On Nov. 17, 1946, the Presidium adopted a composition by Cedomir Minderović as the new national anthem. One year later it still had not been put to music, and the old anthem, *Hej Sloveni,* was being sung.

NATIONAL INCOME. The net income of an economy consists of the consumption of economic goods during the income period plus the net change in the stock of economic goods. Consumption, as used in this definition, means the use of economic goods by individuals, as individuals or members of family units, for the direct satisfaction of their wants. The use of bread as food by a family or individual is a pertinent illustration; the use of wheat by a business firm to make flour, or flour to make bread, is not. When direct consumption is measured it includes all of the prior or auxiliary uses of intermediate commodities or services. This view assumes that the end purpose of an economy is considered to be the satisfying of the wants for economic goods of the individual members of society.

Economic goods include all scarce sources of satisfaction and may be material or nonmaterial. A source of satisfaction is said to be scarce if the quantity of it, relative to the wants for it, is not sufficient to meet completely the sum total of all such wants, and cannot be made to meet all such desires without the giving up of some other satisfactions. Thus, economic goods command prices which tend to restrict the demand for them to the quantities available or producible in competition with other economic goods.

The net change in the stock of economic goods over the income period is the difference between the quantity of such goods on hand at the end and the beginning of the income period. This difference may be positive or negative. If positive, it indicates that, in addition to the consumption of commodities and services produced during the period, the economic goods on hand at the end of the period exceed those at the beginning and, therefore, that any goods used up in the process of production have not only been replaced but added to. When the net change in stock is negative, consumption must have come partly from the stock of economic goods on hand at the beginning of the period as well as from production within the period. In the former case the economy was saving (investing), and building up its capital; in the latter it was dis-saving (disinvesting), and living off its capital. The net change in stock is added to consumption to obtain the economy's income or end product because all stocks of economic goods are essentially partly finished, final, consumption goods. Every factory building, machine, or item of materials inventory is gradually used up—that is, turned into final products.

As described above, the net income or net product of an economy is *net* in the sense that all resources used up in the income-creating process are deducted before arriving at the end product of the period. Allowances are made for the wearing out of durable productive equipment as well as the using up of less durable inventories. It is customary, however, not to deduct for the destruction of resources brought about by factors not usually associated with the income producing process, such as war or other catastrophes not generally included in the risks of business activity. Some income estimators make no deduction for depletion of natural resources, since such resources were not originally brought about by prior production. Furthermore, the net income, as described, is net not only because it allows for the using up of beginning stocks but because it also eliminates any double counting which would result from including, at successive stages, the products produced and used up during the income period, such as the wheat, the flour, and the bread.

The adjective "National" before income, refers to the income of an economy in some way bounded by the authority of a Nation. The economic area of a nation is ordinarily not restricted to its geographical boundaries so that its national

income need not be confined to what was produced within such boundaries. Usually national income refers to the income received by, or accruing to, individuals and family units domiciled within a nation. This definition excludes that portion of income produced within the geographic area of one nation but received by, or accruing to, individuals residing in other countries. It includes income received by, or accruing to, its inhabitants but produced within the boundaries of other nations. In terms of consumption and net savings, a nation's income may be defined as including (1) the consumption, by those domiciled within the nation, of economic goods produced both within and outside the nation, and (2) the net change in ownership by those domiciled within the nation of the worldwide stock of economic goods on hand at the end of the income period.

Measurement.—The above definitions have been in terms of the commodities and services themselves. To secure any meaningful quantitative total it is necessary to summarize the heterogeneous content of real income by the use of a money value. National income thus becomes the money value of the goods and services consumed plus the money value of the net change in resources. This leads to several difficulties when comparisons over a period of time or among nations are desired.

Since the value of money is itself subject to change, the measurements in successive periods of the market value of goods and services consumed do not give an indication of the change in consumption in real terms. This purpose can be realized reasonably well by correcting such money values for changes in the value of money. This can be done by the use of a price index which gives the changes in the weighted prices of representative commodities and services comprising the consumption-aggregate. It can never be done perfectly, since the consumption-aggregate changes its composition over a period of time and the qualities of individual goods also change. For periods of time not too far removed the price correction gives the money value in terms of constant prices. This provides an indication of the changes in physical volume if the composition and quality of the income content have not changed significantly.

Similar problems, but somewhat more difficult ones, must be solved in estimating the value in constant prices of the net change in resources. Here also we seek a measure of the real change in quantity. Capital gains resulting from either changes in the value of money or shifts in the conditions of scarcity and demand must not be included. Their exclusion is accomplished by taking the current income period market costs of gross additions to stock, and subtracting the current reproduction cost of the asset used up during the income period. The remainder thus obtained gives the value, in current prices, of the net change, and excludes capital gains. Such current price totals for different periods can then be corrected by an index of prices of capital goods, to give an indication of the real change in capital.

In the actual measurement of national income totals the general concepts set forth above are slightly modified. Want-satisfying services or commodities produced and consumed within the family are generally excluded. These exclusions are made because the members of the economy—individuals and family units—do not think of their own family activities as belonging to economic activity proper. It is the social process of producing for each other by way of the market—the process of buying and selling for prices—that constitutes economic activity proper. Thus the services we perform for ourselves—dressing, washing, home gardening, home repair, and housewife services—are not included in the usual measurements of national income. Such exclusions must, however, be taken into consideration in any uses of national income totals for comparisons over time or among nations. Even within the same economy there may be significant shifts of activities from the market to the family. This may cause us to understate national income in depression as compared with prosperity. Between economies with different combinations of market and family activities of an economic character the error may be substantial.

One element of what might be called family-produced income is commonly included in the national income total, namely, the net rental value of owner-occupied homes. Also included are such items as farm produce consumed on the farm, since the output was primarily for the market. Similarly, payments received in kind by domestic servants and other workers for whom such payments are substantial, and which are important considerations in securing their services, are also included.

Because the family unit or individual is conceived of largely as a consuming unit rather than a producing unit, all consumption goods purchased by such units are considered to be consumed. It is consumers' outlay rather than consumption which is measured. Except for residential real estate, no capital accounts are kept for consuming units. The purchase of consumption goods is considered to be consumption even though the goods are not actually consumed during the income period in which they are acquired.

The measured totals of national income commonly include, therefore: (1) all outlays by consumers through the business markets for consumers' commodities and services; (2) government-provided commodities and services, and (3) net savings. The inclusion of government among the institutions participating in income creation presents a major problem not yet satisfactorily resolved. Government activities are not paid for in accordance with the usual voluntary market-price practices, but by taxes. They may be valued either in terms of the collective tax payments made or the costs incurred. The major problem, however, is to find a basis for allocating the value of such services, however determined, between direct and indirect services. This is easily done within the private business framework since purchases by one firm from another may be considered indirect goods. A corresponding interpretation of tax payments is highly arbitrary but provides one basis which has been used (Kuznets). Under this method, all taxes paid by business—direct or indirect—are considered payments for services to business, i.e., indirect goods. Taxes paid by individuals are then the measure of consumer services.

Thus far we have defined national income at the stage where it is acquired by, or accrues to, the consumers. This is probably the clearest way of presenting the meaning of national income. The total may, however, be measured at various stages in the productive process, and thus be presented from different viewpoints even though each gives identical totals.

Table 1—NATIONAL INCOME IN THE UNITED STATES, AVERAGES PER YEAR

By Decades, 1869–1938

Decade	In prices of each year [1]			In prices of 1949 [2]				
	National income (3) + (4)	Consumers' outlay	Net savings	National income (6) + (7)	Consumers' outlay	Net savings	National income [3]	
	(billions dollars)			(billions dollars)			Per capita (dollars)	Per gainfully occupied (dollars)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1869–78	6.5	5.7	.8	13.0	11.2	1.8	299	899
1874–83	8.3	7.2	1.1	18.9	16.2	2.7	386	1,128
1879–88	9.9	8.6	1.3	24.8	21.2	3.6	453	1,271
1884–93	11.0	9.4	1.5	29.2	24.5	4.7	478	1,286
1889–98	11.7	10.0	1.7	33.6	28.1	5.4	496	1,312
1894–1903	14.3	12.4	2.0	41.3	35.2	6.1	557	1,460
1899–1908	19.7	17.3	2.5	51.8	44.8	7.0	636	1,631
1904–13	26.3	23.1	3.2	62.5	54.3	8.2	697	1,737
1909–18	36.3	31.8	4.5	70.2	61.1	9.2	718	1,786
1914–23	55.3	48.5	6.8	79.5	70.4	9.1	758	1,897
1919–28 [4]	72.2	64.3	7.9	95.9	86.2	9.7	850	2,136
1924–33 [4]	70.1	65.4	4.7	101.8	95.7	6.1	843	2,122
1929–38 [4]	61.3	60.0	1.2	101.1	98.6	1.4	794	1,989

[1] Source: Simon Kuznets, National Product Since 1869; National Bureau of Economic Research, New York, 1946. Adapted from Tables II 16 and II 17. Columns 3 and 4 may not add to column 2 exactly because of rounding.

[2] Same source and tables with data in 1929 prices adjusted to 1949 prices by the relationship shown by the Consumers' Price Index in 1929 and 1949. Columns 6 and 7 may not add to column 5 exactly because of rounding.

[3] Computed by the author.

[4] Data by years in current and 1929 prices may be found in the source cited in note 1 in Tables I 18, columns 1, 2 and 3 and in Table I 19, columns 1, 2 and 3.

First, at the stage of production, national income may be assessed as the net value of all commodities and services produced within the boundaries of a nation plus net income from foreign investment. Measurement may be made so as to give the amount of domestically produced income originating in each industry. That is, from the gross value of the product of each industry adjusted for depreciation and inventory changes we subtract the purchases from other industries, to obtain the net value added by the particular industry. The sum of such net values for all industries gives the national income when adjusted for net income from foreign investment.

Second, the net values produced by each industry must be paid out, or accrued to, individuals as wages, interest, rent, and profits. The national income, viewed in terms of income payments, is, therefore, nothing but the sum of factor payments.

Data on national income for the United States have been extensively developed during the inter-war years (1919–1938) and are presented in Table 1 by overlapping decades from 1869 to 1938. The national income of the United States in constant dollars showed nearly an eight-fold increase in total and almost a tripling in amount per capita over the 69-year period. Year-to-year changes and cyclical movements are not apparent because of the decade averaging but the severity of the recession of 1929 is indicated by the decade averages for 1924–1933 and 1929–1938.

The period since 1938 experienced World War II and strict comparisons with the earlier period are problematical. Annual estimates of national income for the United States since 1938 are presented in Table 2. In the 14 years covered to 1953 the total national income in constant prices has more than doubled while the income per capita and per member of the labor force has increased by more than three-fourths. Although long comparisons have a less certain interpretation it is reasonably clear that the income of the United States, after correcting for price changes, has shown a phenomenal growth, approximating a 20-fold increase in total and nearly a six-fold increase per capita since the Civil War.

International comparisons are subject to the same difficulties as encountered in long-period national income comparisons and in addition must face the problem of converting all measures

Table 2—NATIONAL INCOME ESTIMATES FOR THE UNITED STATES, 1939–1953

Year	Total in prices of each year[1]	Total in 1949 prices[2]	Per capita in 1949 prices[3]	Per member of the labor force in 1949 prices[4]
	(billions dollars)		(dollars)	(dollars)
(1)	(2)	(3)	(4)	(5)
1939	72.5	124.4	950	2,237
1940	81.3	138.3	1,047	2,461
1941	103.8	168.0	1,260	2,920
1942	137.1	200.1	1,484	3,314
1943	169.7	233.4	1,707	3,615
1944	183.8	248.7	1,797	3,765
1945	182.7	242.0	1,729	3,706
1946	180.3	220.1	1,557	3,609
1947	198.7	211.8	1,470	3,429
1948	223.5	221.3	1,509	3,518
1949	216.3	216.3	1,450	3,394
1950	240.6	238.2	1,570	3,678
1951	278.4	255.4	1,655	3,870
1952	291.6	261.5	1,665	3,928
1953	307.7	273.8	1,715	4,088

[1] This series through 1952 is from line 1 of Table I, page 11 of the Survey of Current Business, July, 1953, United States Department of Commerce, Washington, D. C. The figure for 1953 in this column is from the April, 1954 issue of the Federal Reserve *Bulletin*, p. 406. Figures for consumers' outlay and capital formation are not shown since they would not be comparable with figures in Table 1 unless adjusted. Further details concerning national income and gross national product are available in the July issue for each year of the Survey of Current Business.

[2] Corrected for price change by the use of the *Consumers' Price Index* after adjusting it to a 1949 base.

[3] Based on population figures including military forces overseas.

[4] Based on labor force data (including military forces) for the period 1940–53 as reported by the Bureau of the Census, Department of Commerce. The figure for 1939 is based on the report of gainfully occupied persons reported by the census.

Table 3—INTERNATIONAL COMPARISONS OF PER CAPITA INCOME IN 1949 FOR 70 COUNTRIES [1]

Country (arranged by size of per capita income) (1)	Per capita incomes in U.S. dollars (2)
United States	1,453
Canada	870
New Zealand	856
Switzerland	849
Sweden	780
Great Britain	773
Denmark	689
Australia	679
Norway	587
Belgium	582
Luxembourg	553
Netherlands	502
France	482
Iceland	476
Israel	389
Czechoslovakia	371
Finland	348
Argentina	346
Ireland	342
Uruguay	331
Venezuela	322
Germany (western)	320
U.S.S.R.	308
Poland	300
Cuba	296
Hungary	269
South Africa	264
Portugal	250
Italy	235
Austria	216
Chile	188
Panama	183
Yugoslavia	146
Colombia	132
Greece	128
Costa Rica	125
Turkey	125
Lebanon	125
Mexico	121
Brazil	112
Southern Rhodesia	100
Egypt	100
Japan	100
Syria	100
Peru	100
El Salvador	92
Nicaragua	89
Iran	85
Iraq	85
Paraguay	84
Honduras	83
Guatemala	77
Dominican Republic	75
Ceylon	67
India	57
Bolivia	55
Pakistan	51
Afghanistan	50
Philippines	44
Ecuador	40
Saudi Arabia	40
Yemen	40
Haiti	40
Ethiopia	38
Liberia	38
Burma	36
Thailand	36
Korea (southern)	35
China	27
Indonesia	25

[1] Source: United Nations Statistical Office, *National and Per Capita Incomes in Seventy Countries,* 1949, New York, October, 1950. It must be emphasized, as the United Nations Statistical Office does, that these estimates are only very rough approximations. In the opinion of the author they significantly underestimate the incomes of the less industrialized countries.

into a single currency. The United Nations Statistical Office is trying to overcome these difficulties and the information in Table 3 provides a rough indication of the tremendous disparities which exist in income levels throughout the world. Irrespective of inaccuracies the differences are so wide as to leave little doubt that the nations of the world secure the material requisites of well-being for their inhabitants in very unequal amounts and that at least 80 per cent of the people of the world are below the poverty level.

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NATIONAL INDUSTRIAL CONFERENCE BOARD, INC., an independent and nonprofit institution for scientific economic research whose purpose is "to study and encourage wider understanding of current economic problems."

The board's research, conference, publication and education programs are supported by several thousand subscribing associates, which include business organizations, labor unions, trade associations, libraries, government bureaus, individuals, colleges and universities.

The board, which is nonpolitical in character, conducts objective research in economics, business policies, and industrial relations. The results of these inquiries are issued through published reports, periodicals, press releases, and at meetings.

The board brings together business and labor executives in monthly conferences. In smaller technical sessions, experts appraise and discuss various timely subjects in the field of economics and personnel relations.

The board was founded in Boston in 1916 by Magnus W. Alexander and then included representatives of eleven major trade associations. Later, individual companies and other organizations were admitted. In 1936, the first labor union, Amalgamated Clothing Workers of America, was admitted and many large labor groups have since been associated with the board.

During World War I, the board was invited by the Council of National Defense to recommend policy on industrial relations. In the same year, the first cost of living study was issued by the board, and this series, the only nongovernment survey on a national scale, has since been maintained.

Upon Mr. Alexander's death in 1932, Dr. Virgil Jordan became the board's second president. He became chancellor of the board in 1949 and was succeeded by John S. Sinclair as president.

NATIONAL LABOR RELATIONS BOARD. On June 23, 1947, the 80th Congress, over presidential veto, passed into law the Labor Management Relations Act, popularly known as the Taft-Hartley law. The new statute greatly amended the National Labor Relations Act of 1935 (Wagner Act) and enlarged its scope of activities.

The new law reaffirms the right of employees to self-organization and to bargain collectively through representatives of their own choosing. Likewise, it retains the Wagner Act's unfair

labor practices provisions proscribing employer interference with and domination of employees' organizations, discrimination against employees because of union membership or other collective bargaining activities, and refusal to bargain collectively.

To these provisions Congress added a section in the new act embodying new unfair labor practices clauses which regulate union policies and activities. This section forbids unions to engage in the following types of conduct which it declares to be unfair labor practices:

(1) To restrain or coerce employees in the exercise of their self-organizational rights;
(2) To restrain or coerce an employer in the selection of his representatives for the purposes of collective bargaining or the adjustment of grievances;
(3) To cause or attempt to cause an employer to discriminate against an employee on account of his membership or nonmembership in a labor organization, with the one exception of the authorized union shop;
(4) To refuse to bargain collectively with an employer, provided the union is the majority-designated representative of the employees;
(5) To encourage or engage in a strike in order to force an employer to assign work to members of a particular union or craft rather than to members of another union or craft;
(6) To charge excessive or discriminatory initiation fees where an authorized union shop is in effect;
(7) To cause or attempt to cause an employer to pay for work which is not to be performed; and
(8) To encourage or engage in a strike or refusal to handle goods where an object of such activity is to: (a) require any employer or self-employed person to join a labor or employer organization; (b) require any employer to cease using, selling or transporting the products of any other employer, or to cease doing business with any other person; (c) require some other employer to bargain with a labor organization which has not been certified by the Board as the representative of that other employer's employees; and (d) require any employer to bargain with a labor organization where another labor organization has already been certified by the Board as the representative of his employees.

In addition, the new law separates the prosecuting from the judicial functions by vesting final authority for investigation and prosecution of all unfair labor practices cases in the General Counsel; enlarges the former board from three to five members; provides the board with injunctive powers; and adds four new type elections to be conducted by the board in addition to the Wagner Act collective bargaining polls:

(1) The decertification election, to determine whether a certified or currently recognized labor organization still represents a majority of the employees;
(2) The union-shop election, to determine whether the employees wish to authorize a union-shop agreement;
(3) The de-authorization election, to determine whether the employees wish to remove the labor organization's authority to enter into a union-shop agreement; and
(4) The national emergency election, to determine whether employees wish to accept the final offer of settlement made by their employer. (This election must be conducted between the sixtieth and seventy-fifth days after a Federal District Court has issued an injunction against acts which imperil or threaten to imperil the national safety.)

In order to use the services of the board a labor organization is now required by the act to file annually a financial report and affidavits by each of its officers swearing that they are not Communists nor supporters of subversive movements. A labor organization which has failed to comply with the filing requirements may participate in only one type of election—an election to determine whether the employees wish to revoke the union's authority to represent them. A noncomplying union is not entitled to any type of certification by the board.

The board has its headquarters in Washington, D.C., and maintains 24 regional offices and 8 subregional offices. The five board members and the General Counsel are all appointed by the president.

NATIONAL MUSEUM. See UNITED STATES NATIONAL MUSEUM.

NATIONAL OLD TRAILS ROAD is a highway extending 3,096 miles, from Washington, D.C., to Los Angeles, Calif. Portions of its route follow that of the Cumberland Road and the Santa Fe Trail.

NATIONAL PARKS AND MONUMENTS. By act of Congress dated Aug. 25, 1916, The National Park Service was established as a bureau of the United States Department of the Interior to "promote and regulate the use of the federal areas known as national parks, monuments, and reservations . . . by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

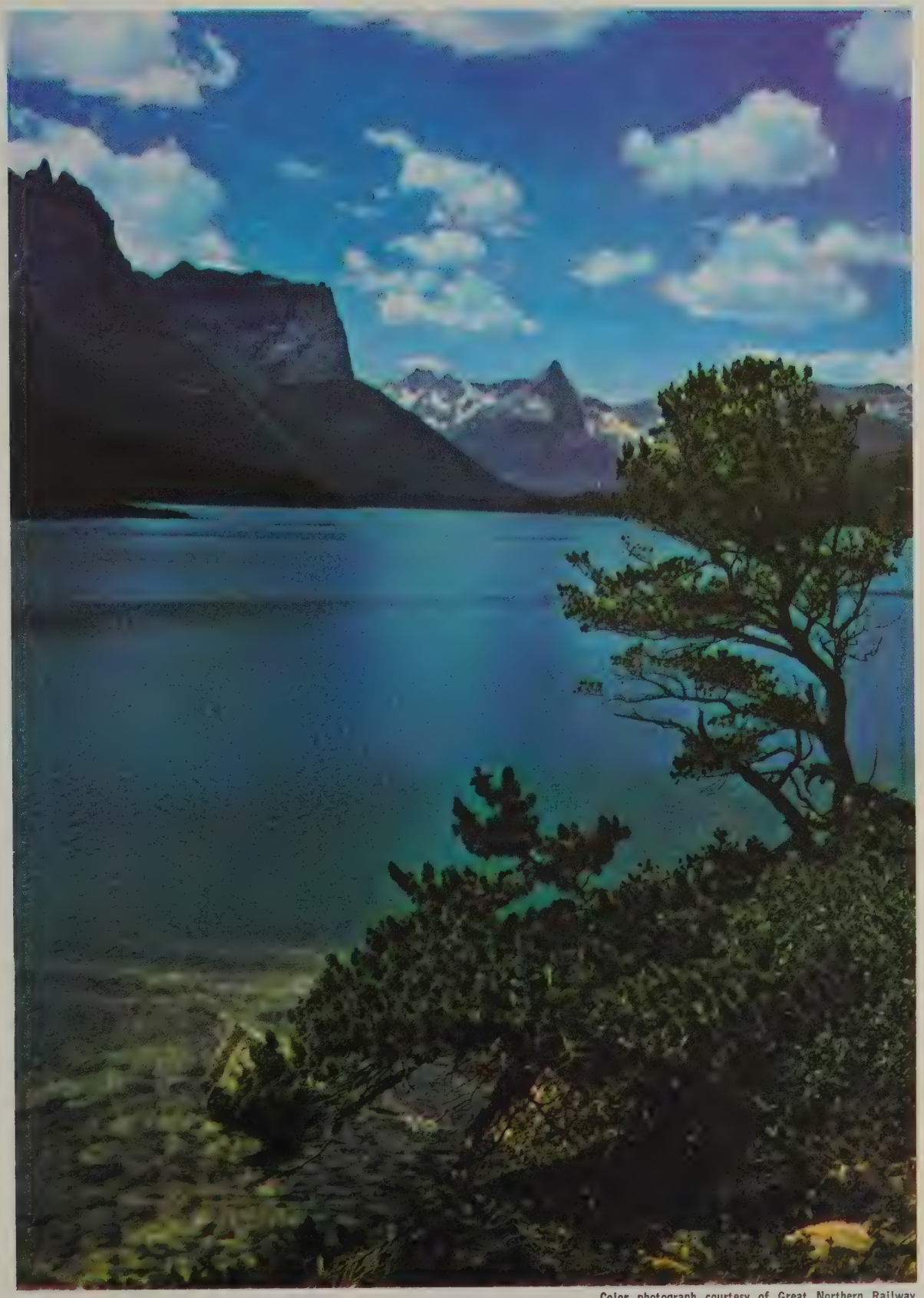
On June 30, 1954, there were 28 national parks, six national historical parks, 84 national monuments, 11 national military parks, three national battlefield parks, one national memorial park, five national battlefield sites, 10 national historic sites, 11 national memorials, 10 national cemeteries, four national parkways, and the system of National Capital Parks in, and adjacent to, the District of Columbia. Together they constitute a far-flung National Park System approximately 21,866,000 acres (federal land) in extent. In addition to administering these units of the National Park System, the National Park Service administers four recreation areas and one historic site (under cooperative agreements with other federal agencies). These five areas have a combined area of about 2,000,000 acres.

The National Park Service is host to millions of persons annually. During the 1953 calendar year alone the areas it administered attracted approximately 46,000,000 visitors who enjoyed drives over scenic roads; hiked or rode horseback over trails to points of interest and to sections otherwise inaccessible; fished in well-stocked streams and lakes; and "hunted" the native wildlife with a camera. Actual hunting in national parks and national monuments is prohibited, for these areas are maintained as game sanctuaries. Many persons inspected the areas and buildings of historical significance administered by the service, the majority of which are located in the East.

In most of the areas administered by the National Park Service, park ranger naturalists or historians guide interested persons on hikes or drives to points of special interest and conduct evening campfire programs, all designed to acquaint travelers with the rich scientific or historic backgrounds of the area they are visiting. Museums are also maintained for this purpose.

Overnight accommodations to fit every purse are available in most of the national parks and monuments, ranging from housekeeping cabins to luxurious hotels. Camping facilities are also available

All of the areas administered by the National



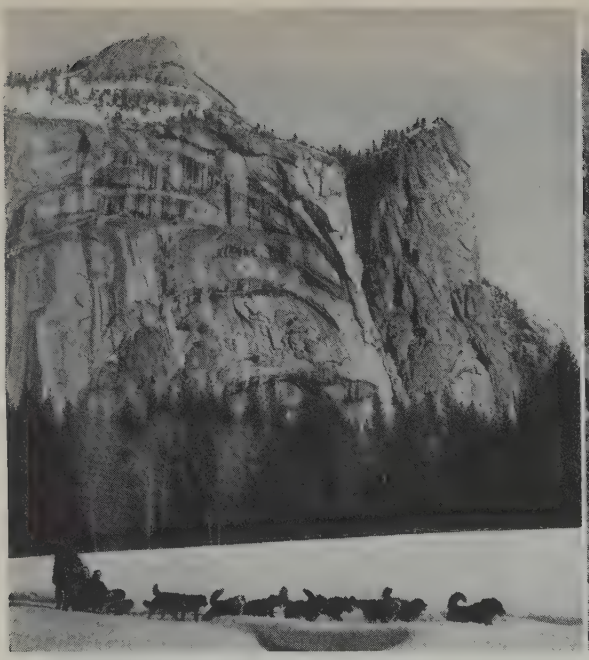
Color photograph courtesy of Great Northern Railway

Upper St. Mary Lake, one of the numerous crystal-clear lakes (notice the rocky lake bed, lower left) in Glacier National Park, Montana. The lake, originally believed by the Indians to be unfathomable, is at its deepest 200 feet. On the left, overshadowing the lake are Red Eagle (8,800 feet) and Little Chief (9,542 feet) mountains. The single pinnacle in the center is Mount Jackson (10,023 feet).

Photograph courtesy of United States Air Force

Above: An aerial view of the Grand Canyon, 217 miles long, of which 105 miles are within the Grand Canyon National Park, Arizona. At this point, from the rim to the Colorado River, the canyon is a mile deep.
Below: The Temple of Osiris, Bryce Canyon National Park, Utah, a collection of wind- and water-eroded rock formations.

Photograph courtesy of the United States Department of Interior



Dog team in the Yosemite National Park.

Cape Breton Highlands National Park, Nova Scotia.

NATIONAL PARKS

Courtesy United States Department of the Interior

View of the Rio Grande in Big Bend National Park, Texas.

Courtesy United States Department of the Interior

Beautiful Crater Lake in Crater Lake National Park, southwestern Oregon

Park Service, with the exception of a few areas located at high elevations and two national monuments (Yucca House, Colo., and Fossil Cycad, S. Dak., which are not open to the public at any time) are open throughout the year. During the winter months some national parks, particularly those in California, Oregon and Washington, are meccas for winter-sport enthusiasts.

Stephen T. Mather was the first director of the National Park Service and guided its activities until 1929. His successors in office have been Horace M. Albright, Arno B. Cammerer, Newton B. Drury, Arthur E. Demaray, and Conrad L. Wirth, the present incumbent.

In addition to a headquarters staff in Washington, D.C., the service has regional offices in Richmond, Va., Omaha, Nebr., Santa Fe, N. Mex., and San Francisco, Calif. It also has Eastern and Western Design and Construction Offices in Philadelphia, Pa., and San Francisco, Calif. The majority of the units in the national park system have resident superintendents.

Following is a list of the national parks, national historical parks, and national monuments administered by the National Park Service.

National Parks.—There are 28 areas in the United States and its territories which have been designated as National Parks. The list, with the date of establishment of each in parentheses, is as follows:

Acadia, Me. (1919), 30,363 acres. Rugged coastal area on Mount Desert Island, also picturesque Schoodic Peninsula on mainland, and half of Isle au Haut, exhibiting spectacular cliffs.

Big Bend, Texas (1944), 692,305 acres. Spectacular mountain and desert scenery; variety of unusual geological structures; enclosed in the great bend of the Rio Grande.

Bryce Canyon, Utah (1928), 36,010 acres. Amphitheaters filled with a countless array of fantastically eroded pinnacles of vivid coloring.

Carlsbad Caverns, N. Mex. (1930), 45,847 acres. Beautifully decorated limestone caverns, largest underground chambers yet discovered.

Crater Lake, Oreg. (1902), 160,290 acres. Vividly blue lake of exceptional depth and clearness in crater of extinct volcano.

Everglades, Fla. (1947), 1,258,591 acres. Portion of the only subtropical area in the United States; extensive watercourses, vast mangrove forests, and saw-grass prairies; abundant bird life.

Glacier, Mont. (1910), 999,262 acres. A region of picturesque peaks, gigantic precipices, and numerous lakes and glaciers. Forms part of the Waterton-Glacier International Peace Park established in 1932.

Grand Canyon, Ariz. (1919), 645,296 acres. Most spectacular part of the Colorado River's greatest canyon, which is 217 miles long.

Grand Teton, Wyo. (1929), 299,580 acres. Series of peaks comprising the most impressive part of the Teton Range; also portion of Jackson Hole.

Great Smoky Mountains, N. C.-Tenn. (1930), 507,168 acres. Includes portion of the Great Smokies, loftiest range east of the Black Hills, S. Dak.; luxuriant vegetation at lower elevations.

Hawaii, Territory of Hawaii (1916), 176,951 acres. Interesting volcanic areas on the islands of Hawaii and Maui.

Hot Springs, Ark. (1921), 1,019 acres. Contains 47 hot mineral springs used in treatment of certain ailments.

Isle Royale, Mich. (1940), 133,839 acres. Forested island, the largest in Lake Superior, distinguished for its wilderness character; great moose herd; pre-Columbian copper mines.

Kings Canyon, Calif. (1940), 453,655 acres. Mountain wilderness dominated by the two enormous canyons of the Kings River and by the summit peaks of the High Sierra. The former General Grant National Park, with its giant sequoias, is a detached section of the park.

Lassen Volcanic, Calif. (1916), 104,121 acres. Contains Lassen Peak, only recently active volcano in United States proper.

Mammoth Cave, Ky. (1936), 50,696 acres. Interesting caverns, including spectacular onyx cave formations and river 360 feet below surface.

Mesa Verde, Colo. (1906), 51,018 acres. Most notable and best preserved prehistoric cliff dwellings in the United States.

Mount McKinley, Alaska (1917), 1,939,319 acres. Main attraction is Mount McKinley, highest mountain in North America; large glaciers of the Alaska Range, abundant wildlife.

Mount Rainier, Wash. (1899), 241,571 acres. Includes Mount Rainier (14,408 feet), which bears a greater number of glaciers than any other peak in the United States proper.

Olympic, Wash. (1938), 888,182 acres. A true wilderness, with snow-capped peaks, mountain lakes, forests of unusual density, and bands of the rare Roosevelt elk.

Platt, Okla. (1906), 912 acres. Contains springs with distinctive mineral properties.

Rocky Mountain, Colo. (1915), 254,995 acres. Includes heart of the Rockies; 65 named peaks 10,000 to 14,255 feet high. Many glacial lakes.

Sequoia, Calif. (1890), 385,178 acres. Contains great groves of giant sequoias, world's largest and probably oldest living things; also Mount Whitney (14,495 feet), loftiest point in United States proper.

Shenandoah, Va. (1935), 193,473 acres. Includes outstanding portions of the Blue Ridge Mountains.

Wind Cave, S. Dak. (1903), 27,886 acres. Beautiful limestone caverns with peculiar boxwork formations.

Yellowstone, Wyoming, Montana, and Idaho (1872), 2,213,207 acres. Contains more geysers than in all the rest of the world together; hot springs, mud volcanoes, petrified forests, beautifully colored canyon, abundant wildlife.

Yosemite, Calif. (1890), 757,617 acres. Includes beautiful Yosemite Valley, spectacular waterfalls, High Sierra country, three groves of giant sequoias.

Zion, Utah (1919), 94,241 acres. Contains colorful Zion Canyon, an outstanding example of a deep, narrow, vertically walled chasm.

National Historical Parks.—There are seven such parks: Abraham Lincoln, Ky. (117 acres); Appomattox Court House, Va. (968); Chalmette, La. (70); Colonial, Va. (7,124); Cumberland Gap, Ky., Tenn., and Va. (20,100); Morristown, N. J. (958); Saratoga, N. Y. (2,208).

National Monuments.—In all there are 84 national monuments in the United States. These, with the date of establishment and the acreage in parentheses, are as follows:

Ackia Battleground, Miss. (1938; 49): Chickasaw Indian village site, and memorial of the Battle of Ackia in which the Chickasaws and British defeated the Choctaws and French, May 26, 1736.

Andrew Johnson, Tenn. (1942; 16): the president's home, tailor shop, and grave.

Arches, Utah (1929; 34,050): extraordinary examples of erosion.

Aztec Ruins, N. Mex. (1923; 27): ruins of 12th century Indian town.

Badlands, S. Dak. (1939; 103,548): eroded layers of sedimentary deposits, containing many prehistoric animal fossils.

Bandelier, N. Mex. (1916; 27,049): prehistoric Indian houses of the later Pueblo period.

Big Hole Battlefield, Mont. (1910; 200): site of battle during retreat of Chief Joseph and the Nez Percé Indians, 1877.

Black Canyon of the Gunnison, Colo. (1933; 13,176): deep, sheer-sided canyon of geologic interest.

Cabrillo, Calif. (1913; 0.5): memorial to Juan Rodríguez Cabrillo, discoverer of San Diego Bay, 1542.

Canyon de Chelly, Ariz. (1931; 83,840): Indian ruins at the base of red cliffs, or in caves; modern Navajo farms.

Capitol Reef, Utah (1937; 33,971): long, colorful, buttressed sandstone cliff of Gothic appearance.

Capulin Mountain, N. Mex. (1916): huge cinder cone, a recently (geologically speaking) extinct volcano

Casa Grande, Ariz. (1918; 473); prehistoric adob tower built by Indians.

Castillo de San Marcos, Fla. (1924; 19): oldest masonry fort in the United States, started by Spanish, 1672.

Castle Clinton, N.Y. (1950; 1): built 1808–11, served successively as fort, entertainment center, and immigrant landing depot.

Castle Pinckney, S. C. (1924; 4): part of the early defenses of Charleston Harbor.

Cedar Breaks, Utah (1933; 6,172): great amphitheater eroded into the colorful Pink Cliffs.

Chaco Canyon, N. Mex. (1907; 20,989): 13 major Indian ruins, representing highest point of Pueblo civilization; hundreds of smaller ones.

Channel Islands, Calif. (1938; 26,819): large rookery of sea lions; unique plants and animals. Includes Santa Barbara and Anacapa Islands.

Chiricahua, Ariz. (1924; 10,481): unusual rock shapes.
Colorado, Colo. (1911; 17,596): eroded sandstone.
Craters of the Moon, Idaho (1924; 48,004): volcanic cones, craters, lava flows and other volcanic phenomena.
Custer Battlefield, Mont. (1946; 765): site of the Battle of the Little Bighorn River, June 25, 1876.
Death Valley, Calif.-Nev. (1933; 1,864,898): vast desert, weird formations, salt and borax beds; includes the lowest point in the Western Hemisphere, 282 feet below sea level.
Devils Postpile, Calif. (1911; 798): symmetrical blue-gray columns rising to 60 feet, an old basaltic lava flow.
Devils Tower, Wyo. (1906; 1,194): tower of columnar rocks rising 865 feet; the first national monument.
Dinosaur, Utah-Colo. (1915; 190,962); spectacular canyons; fossil quarry.
Effigy Mounds, Iowa (1949; 1,204): Indian mounds in shapes of birds and animals.
El Morro, N. Mex. (1906; 881): Inscription Rock of soft sandstone, in which are many old carvings, including inscriptions of early Spanish explorers.
Fort Frederica, Ga. (1945; 94): built by Gen. James Oglethorpe in 1736–48.
Fort Jefferson, Fla. (1935; 47,125): fort built 1846, a military prison; bird refuge.
Fort Laramie, Wyo. (1938; 214): old Oregon Trail fort.
Fort Matanzas, Fla. (1924; 228): Spanish fort, 1737.
Fort McHenry, Md. (1939; 43): fort whose defense in 1814 inspired the writing of *The Star-Spangled Banner.*
Fort Pulaski, Ga. (1924; 5,362): early 19th-century fort.
Fort Sumter, S. C. (1948; 2): site of start of Civil War.
Fort Vancouver, Wash. (1954; 60): site of fur-trade headquarters and military outpost which figured in development of the Pacific Northwest.
Fossil Cycad, S. Dak. (1922; 320): fossils of fernlike plants of the Mesozoic period.
George Washington Birthplace, Va. (1930; 394): house and gardens on site of Washington's birthplace.
George Washington Carver, Mo. (1951; 210): site of birthplace and home of the famous Negro scientist.
Gila Cliff Dwellings, N. Mex. (1907; 160): well-preserved cliff dwellings in natural cavities; 150 feet high.
Glacier Bay, Alaska (1925; 2,297,734): tidewater glaciers.
Gran Quivira, N. Mex. (1909; 451): 17th-century Spanish mission, mission buildings, and Indian pueblo house mounds.
Grand Canyon, Ariz. (1932; 196,051): part of the famous, many-colored canyon.
Great Sand Dunes, Colo. (1932; 35,522): shifting dunes.
Homestead, Nebr. (1939; 163): site of the first claim under the Homestead Act of 1862.
Hovenweep, Utah-Colo. (1923; 491): prehistoric towers, pueblos, and dwellings.
Jewel Cave, S. Dak. (1908; 1,275): limestone caverns.
Joshua Tree, Calif. (1936; 476,153): desert flora.
Katmai, Alaska (1918; 2,697,590): dying volcanic region, including the Valley of Ten Thousand Smokes.
Lava Beds, Calif. (1918; 46,239): principal theater of Modoc Indian War, 1873; volcanic phenomena.
Lehman Caves, Nev. (1922; 640): limestone caves.
Meriwether Lewis, Tenn. (1925; 300): burial place of Lewis, on the Natchez Trace.
Montezuma Castle, Ariz. (1906; 783): cliff dwellings.
Mound City Group, Ohio (1923; 68): Indian mounds.
Muir Woods, Calif. (1908; 485): stand of coast redwoods.
Natural Bridges, Utah (1908; 2,650): 3 natural sandstone bridges; highest 222 feet above stream bed, span 261 feet.
Navajo, Ariz. (1909; 360): three famous cliff dwellings.
Ocmulgee, Ga. (1936; 683): mounds and prehistoric remains.
Old Kasaan, Alaska (1916; 38): site of an abandoned Haida Indian village.
Oregon Caves, Oreg. (1909; 480): limestone caves.
Organ Pipe Cactus, Ariz. (1937; 328,162): traces of the Camino del Diablo, old Spanish route; unique desert plants.
Perry's Victory and International Peace Memorial, Ohio (1936; 14): site at Put In Bay, scene of Commodore Oliver Perry's victory, 1813; commemorates a century of peace between Canada and the United States.
Petrified Forest, Ariz. (1906; 85,304): display of petrified wood; Indian ruins; part of the Painted Desert.
Pinnacles, Calif. (1908; 12,818): spirelike rock formations 500-1,200 feet high, and other volcanic phenomena.
Pipe Spring, Ariz. (1923; 40): historic Mormon fort.
Pipestone, Minn. (1937; 116): quarry used by Indians to obtain material for making ceremonial peace pipes.
Rainbow Bridge, Utah (1910; 160): salmon-pink sandstone natural bridge, arching 309 feet above the gorge bottom.
Saguaro, Ariz. (1933; 54,972): cactus forest.
Scotts Bluff, Nebr. (1919; 2,196): Oregon Trail landmark.
Sitka, Alaska (1910; 54): site of Indian stockade where Indians made their last stand against Russian settlers; totem poles.
Statue of Liberty, N.Y. (1924; 10): huge copper statue on Bedloe's Island in New York Harbor; universal symbol of freedom and democracy.
Sunset Crater, Ariz. (1930; 3,040): volcanic cone, highly colored on the upper part; lava flows.
Timpanogos Cave, Utah (1922; 250): limestone cave.
Tonto, Ariz. (1907; 1,120): 14th-century cliff dwellings.
Tumacacori, Ariz. (1908; 10): historic Spanish mission.
Tuzigoot, Ariz. (1939; 43): excavated ruins of a pueblo which flourished between 1000 and 1400 A.D.
Verendrye, N. Dak. (1917; 253): memorial to the Verendrye explorations of the early 18th century.
Walnut Canyon, Ariz. (1915; 1,642): cliff dwellings in caves under ledges of limestone.
White Sands, N. Mex. (1933; 140,247): white gypsum dunes.
Whitman, Wash. (1940; 46): Oregon Trail landmark; site where Dr. and Mrs. Marcus Whitman ministered to Indians.
Wupatki, Ariz. (1924; 34,733): prehistoric pueblos of red sandstone.
Yucca House, Colo. (1919; 10): unexcavated ruins of prehistoric Indian pueblo.
Zion, Utah (1937; 33,921): colorful Kolob Canyon and Hurricane Fault, examples of geologic phenomena.

CONRAD L. WIRTH,
Director, National Park Service, United States Department of the Interior.

NATIONAL PORTRAIT GALLERY, The, in London, England, was originated by Philip Dormer Stanhope, 5th Earl Stanhope, an eminent historian. He made public the idea before the House of Commons in 1845. On Dec. 2, 1856, a board of trustees was appointed by the lords commissioners of Queen Victoria's Treasury, and money was given to it. The gallery was first opened at 29 Great George Street and in 1889 was moved to the present location, near Trafalgar Square. The purpose of the exhibition is to have an outstanding collection of portraits of the famous people of the British Empire. In 1932, the gallery contained 3,800 individual portraits. An extension was opened in 1933. The entire collection was stored during World War II but the gallery reopened in July 1945. See also NATIONAL GALLERY.

NATIONAL RECOVERY ADMINISTRATION (NRA), a former federal agency which was set up under the National Industrial Recovery Act, approved June 16, 1933, and which was dissolved by order of the president on Jan. 1, 1936, after the United States Supreme Court on May 27, 1935, in an unanimous decision, had declared Section 3 of Title I of the act, its most important provision, unconstitutional.

The National Industrial Recovery Act and its companion measure, the original Agricultural Adjustment Act (declared unconstitutional by the Supreme Court, Jan. 6, 1936), were the two most important legislative measures enacted during the early days of the Roosevelt (New Deal) administration for the purpose of combatting the economic depression which began in the fall of 1929, and in 1933 was at about its worst. The National Industrial Recovery Act was designed to relieve industrial unemployment (then very widespread) by shortening hours of labor, increasing wages, and eliminating unfair trade practices as well as destructive price-cutting through the enforcement of such codes of fair competition as might be adopted under Section 3 of Title I of the act and approved by the

president. The code-making authority was the vital feature of the act, and when the Supreme Court ruled that the making of codes was a legislative function which Congress could not delegate, even to the president, it cut the heart out of the law. Thereafter there was little reason for keeping the NRA alive, and it was kept alive only long enough to correlate and summarize such information as it had collected and could collect with respect to the effect on industry of code administration and the discontinuance thereof.

Immediately after approving the Industrial Recovery Act, President Roosevelt appointed Brig. Gen. Hugh S. Johnson, who had resigned from the army in 1919, to administer the provisions of Title I. He at once embarked upon the task of establishing codes of fair competition. By Jan. 1, 1935 it was stated that approximately 98 per cent of all American industry represented by 541 codes and 177 supplementary codes was operating under the industrial self-government program contemplated by the Recovery Act. Other accomplishments, according to a report, included: (1) The elimination of child labor and the curtailment of industrial housework; (2) the establishment of the principle of a limited work week and minimum rates of pay; (3) the decrease of industrial unemployment; and (4) the curtailment of wage-cutting in price competition.

General Johnson resigned as administrator Sept. 24, 1934, and three days later President Roosevelt, by executive order, created the National Industrial Recovery Board to carry on the work begun by General Johnson, and vested it with all of the powers which had been conferred upon him. Following the Supreme Court's decision, the president, on June 14, 1935, approved a joint resolution of Congress extending the provisions of Title I of the act, in greatly modified form, to April 1, 1936. The following day the National Industrial Recovery Board was abolished by an executive order which re-created the Office of Administrator, abolished when General Johnson resigned. Under the new regime, James L. O'Neill was appointed acting administrator, an assistant to the administrator to represent labor was created, an Advisory Council was set up, and a Division of Review and a Division of Business Co-operation were created. The executive order decreeing the dissolution of the NRA on Jan. 1, 1936, was issued by the president on Dec. 23, 1935. The same order abolished the Office of Administrator and transferred to the Department of Commerce the Advisory Council and the divisions of Review and of Business Co-operation to function therein until April 1, 1936.

While General Johnson was at the helm, NRA was front page news almost daily. He was a picturesque character with a remarkable flair for the dramatic. Throughout the country he made speeches threatening to "crack down" on those industrialists who balked at going his way. He adopted the "Blue Eagle" as NRA's emblem; insisted that it be used as a mark of identification on all goods manufactured under code provisions, and that all householders display replicas of it in their windows as evidence of their loyalty to the country and as a guarantee that they would purchase only products bearing the insignia. Among the public there was much criticism of the codes. Some contended that their effect was to give an undue advantage to big business; that they abolished competition; and that they were formulated by and for the benefit of the leaders in the respective industries without regard to the rights of small industrialists. No one accused General Johnson of undue partiality toward big business. His job was to see that the various industries adopted codes, while for the most part the codes were written by the industries themselves. The general impression now is that the NRA attempted entirely too much. It insisted upon the codification of all industries, big and little, even adopting codes for barbers and pants pressers, which, like some of the other codes, increased prices without improving workmanship or quality.

NRA

Decision.—Two principal questions were involved in the case which resulted in the final dissolution of the NRA. One was whether Congress had the right to delegate its legislative power, and the other was whether Congress had the power to fix the hours and wages of employees engaged in the internal commerce of a state because such wages and hours may have an indirect effect on interstate commerce. The answer of the Supreme Court to both questions was an emphatic "No." The facts in the case were briefly these: the A. L. A. Schecter Poultry Corporation and the Schecter Live Poultry Market; Joseph Schecter, operator of the latter and financial backer of the former; and Martin, Alex and Aaron Schecter, operators of the Poultry Corporation, conducted a wholesale poultry business in Brooklyn, N. Y., and had been convicted in a Federal District Court of violating in numerous ways the Live Poultry Code which had been promulgated under Section 3 of the National Industrial Recovery Act. Before the Supreme Court, to which the case was taken on appeal, attorneys for the government insisted that the provisions of the act authorizing the adoption of codes should be viewed in the light of the "grave national crisis with which Congress was confronted" when the law was enacted. To this contention the Supreme Court, in an opinion by Chief Justice Hughes, said:

"Extraordinary conditions may call for extraordinary remedies. . . . Extraordinary conditions do not create or enlarge constitutional power. . . . Section 3 of the Recovery Act is without precedent. It supplies no standards for any trade, industry or activity. It does not undertake to prescribe rules of conduct to be applied to particular states of fact determined by appropriate administrative procedure. Instead of prescribing rules of conduct, it authorizes the making of codes to prescribe them. For that legislative undertaking Section 3 sets up no standards, aside from the statement of the general aims of rehabilitation, correction, and expansion described in Section 1. In view of the scope of that broad declaration, and of the nature of the few restrictions that are imposed, the discretion of the President in approving or prescribing codes, and thus enacting laws for the government of trade and industry throughout the country, is virtually unfettered. We think the code-making authority thus conferred is an unconstitutional delegation of legislative power. Congress cannot delegate legislative power."

With respect to the right of the government to fix the wages and hours of labor, the court said: "We are of the opinion that the attempt through provisions of the code to fix the hours and wages of employes of the defendants in their

intrastate business was not a valid exercise of Federal Power. . . . On both the grounds we have discussed, the attempted delegation of legislative power, and the attempted regulation of intrastate transactions which affect interstate commerce only indirectly, we hold the code provisions here in question to be invalid, and that the judgment of conviction must be reversed."

NATIONAL RESEARCH COUNCIL. A scientific body in the United States, organized, at the request of President Wilson in 1916, by the National Academy of Sciences under its congressional charter for the purposes of promoting research in the natural sciences and encouraging the application and dissemination of scientific knowledge. As the principal operating agency of the academy, the council fosters research projects and furnishes professional advice to governmental and private organizations; it also administers funds entrusted to it for research and fellowship programs.

The membership is composed of representatives of nearly 100 scientific and technical societies, research institutions, or government agencies; and also of members-at-large appointed by the council. There are about 225 members. In addition to its general committees, the council has eight divisions: international relations; mathematical and physical sciences, including astronomy; engineering and industrial research; chemistry and chemical technology; geology and geography; medical sciences; biology and agriculture; and anthropology and psychology.

The work of the council is carried on largely through its approximately 400 committees, boards, and panels, which have as members more than 2,000 distinguished scientists. The council does not maintain its own scientific laboratories; its chief concern is the cooperation and integration of research activities.

The council receives no government appropriation. The administrative expenses are defrayed by the income from a permanent endowment established from a gift of the Carnegie Corporation of New York, a portion of which was used to erect the Academy-Council Building in Washington, D.C. Financial support of scientific projects and fellowships is obtained from contracts with governmental or private agencies and from special grants from foundations, societies, and individuals. This support amounts to about $3,000,000 annually. Almost half of this sum goes to support the advanced study of more than 400 fellows appointed under the 15 predoctoral and postdoctoral fellowship programs which the council administers for various organizations.

The publications of the National Research Council are: *Bulletins* consisting mainly of monographic reports on the work of council committees; *Reprint and Circular Series*, shorter papers of current scientific interest; *Highway Research Abstracts; Mathematical Tables and Other Aids to Computation; Prevention of Deterioration Abstracts;* and numerous miscellaneous reports, bulletins, and bibliographies.

RAYMUND L. ZWEMER,
Executive Secretary, National Research Council.

NATIONAL RETAIL DRY GOODS ASSOCIATION (NRDGA), a retail trade group with a membership of more than 7,000 retail stores located in every state in the United States, in Canada, and in 10 foreign countries, is incorporated under the laws of the State of New York. Its board of directors is chosen from the executives of member stores, and its purpose is to aid in developing increased efficiency in every phase of retail operating procedures.

It is a nonprofit, voluntary membership organization, with administrative headquarters in its own New York, N. Y., office building, and with branch offices in Washington, D.C., and in San Francisco, Calif.

The NRDGA is regarded as one of the leading trade associations in the world, functioning in all areas in which the interests of the retail trade are at stake. Its actions are particularly directed to matters which, except for association action, individual stores could not accomplish alone, or could not do so as economically as their association.

The NRDGA is subdivided into ten major groups and divisions, each staffed by experts in their particular field of retailing and each functioning under the supervision of its own board of directors, consisting of member-store executives in their special field of retail activity. These groups and divisions are:

The Controllers' Congress
The Merchandising Division
The Store Management Group
The Personnel Group
The Sales Promotion Division
The Credit Management Division
The Traffic Group
The Delivery Group
The Ready-to-Wear Group
The Smaller Stores Division

The association has back of it more than 40 years of experience and exhaustive research, upon which it draws to provide for member stores technical assistance and advice on every phase of retailing, and store operating problems.

One important aspect of NRDGA activity consists of the interesting and mutually helpful ideas on retailing exchanged by merchants who attend the association's yearly meetings of its groups and divisions and its annual convention. The value of such exchanges of information is evidenced by the fact that more than 20,000 store executives gather each year for these sessions.

NRDGA activities—its policies and functions—are entirely governed by the vote of member stores.

NATIONAL SAFETY COUNCIL. This noncommercial, nonprofit association, hub of the safety movement in the United States, was established in 1913. The membership, totaling about 7,500, includes industrial and transportation members employing more than 9,000,000 persons, service or professional organizations which may control or influence safety work in hundreds of branches or units, and community or state safety organizations which carry on extensive programs of safety in their territories. There is a staff of 275 persons at the headquarters office in Chicago. Regional offices are maintained in New York and San Francisco. Approximately 1,000 men and women serve without pay as council officers and committeemen. The work of the National Safety Council is financed largely through membership dues.

The principal activities are of three sorts:

1. **Printed Material.**—Published material is of three kinds: (a) nine monthly magazines, reviewing current happenings in every kind of

safety work; (b) several hundred technical pamphlets and memos, providing standard information on safe equipment and safe methods; (c) a constant flow of inspirational and interest-maintaining safety material, such as posters, newspaper publicity, radio releases, newsletters, and calendars.

2. **Conventions and Conferences.**—An annual, five-day, national convention is held, with an average attendance of 12,000 persons and comprising 125 sessions. Help is also given in the organizing of numerous regional safety conferences.

3. **Field Service.**—States and cities are given assistance in forming safety organizations, in improving traffic control measures, and in related problems. Some 75 community and state safety organizations are affiliated with the National Safety Council.

R. L. Forney,
General Secretary, National Safety Council.

NATIONAL SCIENCE FOUNDATION, The, is a federal agency, established by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense; and for other purposes."

The foundation has the responsibility of developing and encouraging the pursuit of a national policy for the promotion of basic research and education in the sciences; for initiating and supporting basic scientific research in the mathematical, physical, medical, biological, engineering, and other sciences, and for appraising the impact of research upon industrial development and upon the national welfare.

In carrying out these broad objectives, the foundation supports research and education through grants and fellowships, fosters the exchange of scientific information among scientists in the United States and foreign countries, and surveys the nature and extent of scientific research and development activities in the United States. In view of the magnitude of the over-all federal research and development program, which in the mid-1950's was more than two billion dollars, an especially important function of the foundation is the study of the federal program in support of scientific research, the role of the federal government in support of science, and the correlation of the foundation's scientific research program with those of other groups, both private and public. With the cooperation and participation of the scientific societies of America, the foundation maintains a register of scientific and technical personnel and provides a central clearinghouse of information covering scientific and technical personnel in the United States.

Organizationally, the foundation consists of the 24-member National Science Board, chosen by the president of the United States from among persons eminent in the fields of the basic sciences, medical science, engineering, agriculture, education, and public affairs; and a director chosen by the president to serve for a term of six years. The principal operating divisions are: Biological and Medical Research; Mathematical, Physical, and Engineering Sciences; and Scientific Personnel and Education, which is concerned with the award of scholarships and graduate fellowships and problems relating to education in the sciences.

Lee Anna Embrey.

NATIONAL SECURITY ORGANIZATION. The National Security Act of 1947 including the 1949 Amendments and Reorganization Plans 3 and 6 of 1953 forms the basis for the National Security Organization within the United States. The legislation provides for the determination of integrated policies and procedures for the departments, agencies, and functions of the federal government having to do with national security. It establishes three separately administered military departments: the Army, the Navy, and the Air Force, and provides for the coordination and unified direction of the military departments under the civilian control of the Secretary of Defense.

History and Nature of National Security Act.—The movement which finally led to the passage of this act originated shortly after World War I with certain proponents of air power who believed that greater autonomy and importance should be given to the United States Army Air Force. It was argued that this could best be brought about by a merger of the War and Navy Departments, with all air activities segregated in a single division of the merged departments. The proposed arrangement was not adopted because it would have deprived the Navy of essential control over its aviation activities. The early plans also contemplated absorption of the Marine Corps by the Army.

Drawing upon World War II experience, and the demonstrated value of certain inter-service procedures, the law, as passed on July 26, 1947, did not merge the armed services but set up a separate Air Force and attempted an integration of all of the forces and resources needed for waging modern warfare. Civilian control over the military forces was retained in accordance with the political philosophy of the Constitution of the United States, expressed in making the President Commander in Chief of the Army and Navy. James Forrestal became the first Secretary of Defense on Sept. 17, 1947.

Following recommendations made by the Hoover Commission, the National Security Act was amended in 1949. The military establishment became one executive department, the Department of Defense, and the former executive departments of the Army, the Navy, and the Air Force were designated as military departments, but the Secretaries of these three Departments ceased to have cabinet rank. The position of Chairman of the Joint Chiefs of Staff, which had existed informally since World War II, was made statutory.

Another reorganization of the National Security Organization took place in 1953 (Reorganization Plans 3 and 6) based on the report of the Rockefeller Committee. The National Security Resources Board, the Munitions Board, and the Research and Development Board were abolished; at the same time an Office of Defense Mobilization was formed and appointment of additional Assistant Secretaries of Defense were authorized.

The National Security Act is organized under four titles; Title I—Coordination for National Security; Title II—The Department of Defense; Title III—Miscellaneous provisions having to do with salaries of personnel, definitions, funds, and other such matters; Title IV—Promotion of Economy and Efficiency Through Establishment of Uniform Budgetary and Fiscal Procedures and Organizations.

TITLE I: COORDINATION FOR NATIONAL SECURITY

By this title, three activities are created: a National Security Council which recognizes the need for close and continued coordination on a high level within the federal government of the domestic, military, and foreign policies of the country; a Central Intelligence Agency which correlates, evaluates, and disseminates intelligence having a bearing on national security; and an Office of Defense Mobilization for improved and systematized planning in regard to the control and use, in the event of an emergency, of the country's manpower, natural resources, and industrial facilities.

National Security Council.—The function of the council is to advise the president with respect to the integration of the nation's domestic, foreign, and military policies, so as to enable the armed services and other departments of the government to discharge effectively their responsibilities with respect to national security. Specifically, it is the duty of the council to assess and appraise the objectives, commitments, and risks of the United States in relation to the country's actual and potential military power.

The council is composed of the president, who presides at its meetings; the vice president; the secretary of State; the secretary of Defense; the director of the Office of Defense Mobilization; and the director of the Foreign Operations Administration, as permanent members. Secretaries and under secretaries of other executive departments and the military departments may be appointed to the council by the president. No military officers are members of the council although they may be called on for advice and recommendation on any subject under consideration by the Council.

Central Intelligence Agency.—This agency is established under the National Security Council and makes its reports and recommendations to the council. The duties of the agency are to coordinate in the interest of national security the intelligence activities of the several government departments with a view to avoiding duplication of effort and working at cross purposes; with correlating and evaluating intelligence gathered by the intelligence activities of the several government departments and agencies; and with disseminating such intelligence within the government, using existing agencies and facilities where appropriate.

Office of Defense Mobilization.—This office took the place of the National Security Resources Board and was created by Reorganization Plan No. 3 of 1953 to advise and assist the president concerning the coordination of military, industrial, and civilian mobilization for the national defense, including policies and programs for vital material stockpiling, manpower, and production.

TITLE II: THE DEPARTMENT OF DEFENSE

The Department of Defense is an executive department of the government headed by a secretary of Defense who is the principal assistant to the president on all matters relating to the department. Within the Department of Defense are the three military departments of the Army, the Navy, and the Air Force.

Secretary of Defense.—The secretary of Defense is appointed from civilian life by the president with the consent of the Senate. He exercises direction, control, and authority over the Department of Defense. The secretary is assisted by a deputy secretary of Defense who coordinates the activities of the Department of Defense as directed by the secretary, and who exercises the powers of the secretary during his absence or disability. There are nine assistant secretaries of Defense with specific duties prescribed by the secretary as follows: comptroller; manpower and personnel; legislative and public affairs; international security; research and development; supply and logistics; properties and installations; health and medical; military applications engineering. Provision is also made for a general counsel, with the rank of assistant secretary, to act as chief legal adviser of the Department of Defense.

Officers of the armed services may be detailed to duty as assistants and personal aides to the secretary of Defense, but he is specifically enjoined from establishing a military staff.

The Armed Services.—The military departments of the Army, the Navy, and Air Force replaced the former executive departments of War and Navy. Each military department is separately administered by its civilian secretary under the direction, authority, and control of the secretary of Defense. Each has an under secretary and several assistant secretaries.

Department of the Army.—The term is construed by the act to mean the Department of the Army at the seat of government and all field headquarters, forces, reserve components, installations, activities, and functions under the control and supervision of this department. The head of the department has the title secretary of the Army. The United States Army, within the Department of the Army, includes land combat and service forces, and such aviation and water transportation as may be organic therein. The army is to be organized, trained, and equipped primarily for prompt and sustained combat incident to operations on land.

Department of the Navy.—No change was made in the name of this department, nor in the title of the secretary of the Navy. The term is construed by the act to mean the Department of the Navy at the seat of government; the headquarters, United States Marine Corps; the entire operating forces of the United States Navy, including naval aviation, and of the United States Marine Corps; all field activities, headquarters, forces, bases, installations, activities, and functions under the control and supervision of the Department of the Navy; and of the United States Coast Guard when it operates as part of the Navy in time of war. Naval aviation is integrated with the naval service within the Department of the Navy.

The act stipulates that the United States Navy is to be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea, and that it shall be generally responsible for naval reconnaissance, anti-submarine warfare, and the protection of shipping.

In order to leave no question as to the status of the United States Marine Corps, the act stipulates that the Marine Corps shall be organized, trained, and equipped to provide fleet marine forces, together with supporting air components, for service with the fleet in the seizure or defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign.

Department of the Air Force.—This newest of the military departments is headed by the secretary of the Air Force. The term is construed to mean the Department of the Air Force at the seat of government and all field headquarters, forces, reserve components, installations, activities, and functions under the control of the Air Force. The Air Force is to be organized, trained and equipped primarily for prompt and sustained offensive and defensive air operations, and shall be responsible for the preparation of the air forces necessary for the effective prosecution of war except as otherwise assigned.

Armed Forces Policy Council.—The council was formed to advise the secretary of Defense on matters of broad policy relating to the armed forces. Membership of the council consists of the secretary of Defense, chairman; deputy secretary of Defense; secretary of the Army; secretary of the Navy; secretary of the Air Force; chairman of the Joint Chiefs of Staff; chief of Staff, United States Army; chief of Naval Operations; chief of Staff, United States Air Force; and commandant, United States Marine Corps (only on Marine Corps matters).

Joint Chiefs of Staff.—The Joint Chiefs of Staff comprising a chairman, without voting rights; the chief of Staff, United States Army; chief of Naval Operations; and the chief of Staff, United States Air Force; plus the commandant of the Marine Corps when any matter under consideration directly concerns the Marine Corps, are the principal military advisers to the president, the National Security Council, and the secretary of Defense. The principal duties of the Joint Chiefs of Staff are: (1) to prepare strategic plans and to provide for the strategic direction of the military forces, including the unification, where appropriate, of commands in strategic areas; (2) to review major material and personnel requirements of the military forces, and to prepare joint logistic plans and responsibilities in accordance therewith; (3) to formulate policies for the education and training of the military forces, and (4) to provide United States representation on the military staff committee of the United Nations.

Joint Staff.—The Joint Chiefs of Staff are authorized to have a staff of not more than 210 officers composed of approximately an equal number from each of the three armed services.

WILLIAM J. MORGAN,
Division of Naval History, United States Navy Department.

NATIONAL SECURITY RESOURCES BOARD, an agency of the federal government, established by the National Security Act of 1947 (Public Law 253, 80th Congress, 1st Session, July 26, 1947). Its functions are set forth in Title I, Section 103, of that act, as follows:

(a) There is hereby established a National Security Resources Board (hereinafter in this section referred to as the "Board") to be composed of the Chairman of the Board and such heads or representatives of the various executive departments and independent agencies as may from time to time be designated by the President to be members of the Board. The Chairman of the Board shall be appointed from civilian life by the President, by and with the advice and consent of the Senate.

(b) The Chairman of the Board, subject to the direction of the President, is authorized, subject to the civil-service laws and the Classification Act of 1923, as amended, to appoint and fix the compensation of such personnel as may be necessary to assist the Board in carrying out its functions.

(c) It shall be the function of the Board to advise the President concerning the coordination of military, industrial, and civilian mobilization, including: (1) policies concerning industrial and civilian mobilization in order to assure the most effective mobilization and maximum utilization of the Nation's manpower in the event of war; (2) programs for the effective use in time of war of the Nation's natural and industrial resources for military and civilian needs, for the maintenance and stabilization of the civilian economy in time of war, and for the adjustment of such economy to war needs and conditions; (3) policies for unifying, in time of war, the activities of Federal agencies and departments engaged in or concerned with production, procurement, distribution, or transportation of military or civilian supplies, materials, and products; (4) the relationship between potential supplies of, and potential requirements for, manpower, resources, and productive facilities in time of war; (5) policies for establishing adequate reserves of strategic and critical material, and for the conservation of these reserves; (6) the strategic relocation of industries, services, government, and economic activities, the continuous operation of which is essential to the Nation's security.

(d) In performing its functions, the Board shall utilize to the maximum extent the facilities and resources of the departments and agencies of the Government.

The board also has continuing statutory functions in connection with the disposal of government-owned rubber producing facilities under the Rubber Act of 1948, in connection with the mandatory authority for the procurement of articles or materials needed for the armed forces or the Atomic Energy Commission under the Selective Service Act of 1948, and in connection with the need for improved highways for the national defense under the Federal-Aid Highway Act of 1948. Moreover, the chairman of the board is a statutory member of the National Security Council, and a member of the Defense Mobilization Board (Executive Order 10200, Jan. 3, 1951).

Following the establishment of the board in 1947, the president designated as its membership the chairman of the National Security Resources Board, the secretary of the treasury, the secretary of defense, the secretary of the interior, the secretary of agriculture, the secretary of commerce, and the secretary of labor. The secretary of state was added to the board's membership on Feb. 19, 1948.

Arthur Middleton Hill served as first chairman of the NSRB from Aug. 29, 1947, to Dec. 15, 1948. On Dec. 16, 1948, Dr. John R. Steelman succeeded him, as acting chairman, until April 26, 1950, when W. Stuart Symington, first secretary of the air force, took the oath of office as chairman, a post in which he served until May 4, 1951. The president then named as acting chairman Jack O. Gorrie who had served as the executive assistant to both Dr. Steelman and Mr. Symington.

During the years of its existence, the board, in cooperation with other agencies of the federal government, with the state governments, and representatives of industry, labor, and agriculture, has made a variety of studies on the nation's resources, prepared draft emergency legislation, laid the foundations for the establishment of the emergency defense agencies, participated in the work of the National Security Council, and advised the president on alternative mobilization plans and national security "readiness measures" involving the nation's human and material resources in the event of war.

In addition to its statutory functions, the board has exercised other responsibilities relating to the national security, executive orders, and other presidential directives.

To assist the president to coordinate emergency defense production activities under the Defense Production Act of 1950, the chairman of the

NSRB was directed by Executive Order 10161, Sept. 9, 1950, to resolve interagency issues, prescribe approved policy and program objectives, and advise the president on the progress of the defense production program.

While the board's mobilization planning proved useful in the nation's partial mobilization precipitated by the North Korean aggression in 1950, the board continues its primary concern with broad national policy which affects the nation's resources potential in the event of all-out war.

NATIONAL SOCIALIST (NAZI) PARTY. The National Socialist movement in Germany grew out of the economic dislocations, humiliations, and frustrations of the German people after defeat in World War I and the imposition of the Versailles Treaty. Loss of territories, abatement of military prestige, reparations burdens, and monetary inflation with resultant destruction of the independent middle class, created psychological conditions favoring acceptance of Nazi theories. These included repudiation of war guilt, assertion that the war had not been lost on the battlefield but on the home front by the treachery of non-German elements (particularly the Jews), contempt for democratic procedures, the need of a leader to raise Germany to her rightful place of world dominance, and the subordination of the individual to the state. The Nazi Party originated in the mildly radical German Workers' Party, founded in 1918, which Adolf Hitler and his friends renamed National Socialist German Labor Party (Nazionalsozialistische Deutsche Arbeiterpartei). At a party congress held in 1920 Hitler announced a 25-point program including both radical and conservative features. It won him the support of all important elements of the population, including the military, white-collar, and industrialist classes. The party dissolved on Germany's defeat in 1945. See also HITLER, ADOLF; GERMANY —*History.*

NATIONAL SOCIETY OF COLONIAL DAMES OF AMERICA, The. An ancestral and patriotic organization of American women, founded May 19, 1892, and composed of one Colonial Society from each of the 13 original states, one society from the District of Columbia, and one associate society from each of the 27 noncolonial states. To be eligible for membership, a woman must be descended from some worthy ancestor who rendered valuable service to the colonies and who became a resident of America previous to 1750. Membership is by invitation only. The membership in 1954 was about 13,200. The objects of the society are: to preserve colonial history, traditions, manuscripts, records, relics, and buildings, to perpetuate the brave deeds and glorious memory of the colonists, and to encourage patriotism.

Churches and colonial houses of historical importance have been restored, historical sites marked, and prizes awarded for essays on patriotic subjects to pupils of schools and colleges. Forty-four historical museums are maintained by 27 state societies.

Indian nurses have been trained by scholarships and returned to work among their own people.

Large sums of money were raised for relief during the Spanish-American War. In World War I over $100,000 was supplied to hospital ships in the United States Navy. In World War II many ambulances were purchased, Red Cross rooms maintained, USO branches at Ketchikan, Alaska, completely supported, and in the Korean War aid sent to the U.S.S. *Gunston Hall,* and to airbases at Keflavik, Iceland. Colors were presented to the First Marine Corps Women's Reserve in honor of Col. Ruth Cheney Streeter, member of the society; later, in her honor, a recreation area was equipped and presented to the Headquarters Detachment of the Women Marines in Washington, D.C.

A large endowment fund was raised for the restoration and support of Sulgrave Manor, the English home of the ancestors of George Washington.

Gunston Hall, home of George Mason, author of the Virginia Declaration of Rights, owned by the State of Virginia, is managed by a Board of Regents nominated by the National Society and appointed by the governor of Virginia.

Headquarters of the National Society is at Dumbarton House, Washington, D.C.

ELIZABETH C. KENT,
Recording Secretary.

NATIONAL SOCIETY OF UNITED STATES DAUGHTERS OF 1812, an organization founded for the purpose of memorializing historical events from the close of the war of the American Revolution to the formation of the United States (as such) and till the close of the second war with Great Britain in 1815.

This present society is the outcome of the "General Society United States Daughters 1812," founded by Flora Adams Darling in 1892, on the anniversary of the battle of New Orleans, January 8. Its work begins where that of the Revolutionary commemorative societies leaves off, namely, when the treaty of peace was ratified by the Congress in session on Jan. 14, 1784. The qualifications for membership are: Any white woman over 18 years of age, of good character and a lineal descendant of an ancestor who rendered civil, military or naval service during the War of 1812, or the period of the causes which led to that war (subsequent to the War of the Revolution), Jan.-14, 1784, to Nov. 2, 1815, may be eligible to membership, provided the applicant be acceptable to the society. The society was incorporated under federal laws in 1901.

NATIONAL TRANSCONTINENTAL RAILWAY (Canadian Government Railways). This railway is the eastern section, extending from Moncton to Winnipeg, of a railway spanning the continent, the western section of which, from Winnipeg to Prince Rupert, is called the Grand Trunk Pacific Railway. The entire system was the joint enterprise of the Canadian government and the Grand Trunk Railway. Owing to the inability of the Grand Trunk Pacific Company to operate the eastern section it was taken over by the government as part of the government railways in 1915. The Grand Trunk Railway Company of Canada amalgamated in 1923 with the Canadian National Railway Company under the name of the latter, at which time the government entrusted to it the management of the National Transcontinental Railway. See CANADIAN NATIONAL RAILWAYS.

NATIONAL WEALTH. See WEALTH, NATIONAL.

NATIONALISM AND INTERNATIONALISM. Nationalism is a state or condition of mind characteristic of certain peoples with a homogeneous culture, living together in close association on a given territory, and sharing a belief in a distinctive existence and a common destiny. Such persons have a deep sense of belonging, a keen feeling of loyalty to the in-group, and a desire to contribute to its welfare. These sentiments lead to like-mindedness, conformity, and even exclusiveness, which find their expression in group action designed to add to the liberty, prestige, prosperity and power of the nation. Nationalism connotes a loyalty to the group entity superior to all other loyalties, a pride in its achievements, and a belief in its excellence, or even superiority over all other similar entities, and thus readily leads to aggressiveness. As such, while its greatest impulsion has come from intellectual circles, it makes its greatest appeal to the masses. This state of mind may change substantially in intensity and depth, depending upon conditions of time and place. It varies all the way from the healthy patriotism of the Swiss nation to the fanatical intolerance of Nazi Germany.

Nationality.—Loyalty to the in-group, the core of nationalism, is of a type with similar feelings of attachment to tribe, clan, caste, or city. But eventually the sights are raised, and the focus is the larger group entity, the nation or the state. Nation and state may be one and the same, as in the case of the United States; indeed, most of the states of the world today are of the nature of nation-states. But an entity may be classed as a nation because it has attained a high degree of cultural homogeneity, although it is under the domination of another power, as in the case of Poland after its partition.

The nation is an aggregate of individuals united by certain ties—political, racial, religious, cultural (including language), and historical, notably a common origin or at least a belief therein. In any particular case, it may be that not all these bonds are present. Switzerland is a strongly integrated nation, although in each of its three separate divisions a different tongue is spoken. Race is also a powerful bond of unity, but there are strong nations which seem able to get along despite the presence of several races within their frontiers. The same is true of religion. In the usual case, religion is a strong bulwark of nationhood, although some strong nations have within their borders two or more religious faiths. The most important consideration in this matter is a corporate will: a sufficiently powerful determination to live and work together. For, as Giuseppe Mazzini once said, nationalism is "the consciousness of a mission to be fulfilled for the sake of mankind. It does not depend upon race or descent, but upon a common thought and a common goal."

BASIS OF NATIONHOOD

Having defined nationalism and nationality, we may proceed now to a discussion of the basic foundations of nationhood—the factors of language, race, national character, religion, territory, political institutions, and economic integration.

Language.—The factor of national language is of the utmost importance; it can be considered the major distinguishing mark of nationality. People speaking the same language obviously can understand one another, and this fact alone contributes to a sense of belonging, a sentiment of solidarity. Most men really feel at home only in their own tongue. Furthermore, possession of means of mutual communication permits the development of a national literature. Its earliest manifestations usually take the form of patriotic ballads and sagas, glorifying heroes and military victories in the nation's history. Thus is group loyalty inseminated. It is significant that after the Norman Conquest, English nationality had little chance to emerge before the fusion of Anglo-Saxon with Norman French to form a single English language. As the nation evolves, a writer of great eminence and force may emerge to contribute further to the creation of group consciousness, both because of the influence of his work, and because the masses, by honoring him, honor the country from which he sprang. Such a role was played in England by Chaucer and Shakespeare, in Spain by Cervantes, in Italy by Dante. It is thus evident that nothing makes a larger contribution to the emergence of a distinctive culture and way of life than the national language. The invention of printing was a milestone in this movement. The cheap newspaper which was the result of this epochal invention made possible the propaganda of the French Revolution, described below. Without the cheap printing press the emergence of the "nation in arms" in 1792 is almost inconceivable. Further proof of the close relationship between language and nationalism is found in the efforts of extremely nationalistic states to suppress rival languages and to exalt and propagate their own. In this connection should be noted the tendency of newly emancipated states to revive their ancient script, and to take extreme measures to obliterate the use of the language formerly current, especially if it is that of a hated former ruler.

It is not implied that the possession of a single national language is absolutely essential to the creation of group consciousness. In Belgium, Canada, and South Africa more than one official language is in use. The case of Switzerland has already been mentioned. But rival languages are undoubtedly a serious handicap which can be overcome only if other factors, for instance the fear of attack from abroad, are able to engender a sufficient degree of national unity.

Race.—Among the foundations of nationalism the factor of language, just discussed, is closely allied with the matter of race. When a given people is fired by a profound belief—whether true or false—that they are of common or even exclusive racial stock, they are well on their way to that group consciousness and pride which are the soul of nationalism and which sometimes develop into a belief that they are superior to all others. Many leaders have fostered the idea that their people are "God's chosen." Joseph Chamberlain wrote, "The Anglo-Saxon race is infallibly destined to be the predominant race in the history and civilization of the world." Other writers, like Hippolyte Adolphe Taine, confusing language and race, have contrived to create the myth of a peculiar Aryan race represented as superior to all others. Adolf Hitler, making wide use of the writings of Heinrich von Treitschke, Joseph Arthur de Gobineau, Adam Heinrich Müller, Houston Stewart Chamberlain, and that official spokesman for Nazi supremacy, Hans Günther, forced on the Germans that poisonous doctrine—an intolerant belief in the purity

and supremacy of the blond Nordic. This concept was invoked to justify the extermination of millions of Jews and the aggressive annexation of Austria, the Sudetenland, and Alsace-Lorraine. But while some of the worst manifestations of racialism were found in Nazi Germany and Japan, no great power has been entirely free from similar aberrations. Even small powers have given way to the temptations of racial prejudice and bigotry.

The dynamic forces of racialism are actually based on myth, but they are nonetheless potent and dangerous—since what counts in this matter is not so much what is true, but what one believes to be true. It should never be forgotten, however, that modern scholarship has demonstrated, first, that there is no such thing as a pure race and, second, that no race can be proved to be superior. This is particularly true of the Nazi concept of a distinct Nordic race, denied by all reputable anthropologists throughout the world. In fact, what is known as race is really a mere matter of environment, and race prejudice an artificial phenomenon, the creation of accident and the product of teaching and propaganda. Nevertheless, all peoples seem to be particularly susceptible to incitements through press, platform, and personal influence designed to arouse and stimulate pride of race. In fact, so great is the temptation for every nation to erect about itself high walls of race prejudice and exclusivism, that one of the first steps toward the creation of an effective international organization would have to be to break through these walls and work to promote a higher form of loyalty, namely, loyalty to the whole human race.

National Character.—A most significant factor in the evolution of modern nationalism is found in the growth of national character. That nations possess peculiar traits and distinct characteristics is generally admitted by scholars, although the latter deny that these are attributable to factors of race or origin. The explanation is found rather in the influence of environment—the effect of living together for generations under the same type of laws and government, in given conditions of economic life, territory, geography, climate, and world position, which produce a relative conformity and constancy of attitude. But national character is not completely constant or unchangeable; in the 17th century the Germans were generally indolent and peaceful, the British rebellious and turbulent. And the Americans, for so long isolationist in foreign affairs and in their relations with Europeans, curiously subject to an inferiority complex, show few signs of either of these traits today. Nevertheless, national character, and particularly a belief therein, plays an important role in the development of national consciousness. A peculiar pattern of institutions, customs and beliefs, including a distinctive development of the art forms, gives dignity to group life and a certain sense of belonging which are the very essence of the national spirit.

One important aspect of the culture pattern is a tendency to cherish historical traditions, notably by purposeful commemoration of historical events such as national independence and great military victories. Beloved national heroes of both peace and war are glorified and their praises sung. Pilgrimages to battlefields and the birthplaces of great men of the past are fostered. Such tendencies have been particularly apparent in Soviet Russia during the years after World War II, leading many authorities to believe that Russian nationalism, rather than the propagation of world revolution, is now the chief motive force in the Kremlin.

Religion.—Religion has always played a major role in the march of nationalism, and in fact in its primitive manifestations nationalism was really a religious phenomenon. This, however, has not continued to be the case; most religions today extend across a number of frontiers, as is the case with Christianity, Buddhism, Confucianism, Judaism, Hinduism, and Mohammedanism. And in some strong nations—the United States, for instance—freedom of religion has prevailed and numerous cults have flourished. Religious differences within a given nation have hindered or postponed the spread of nationalism, and the existence of a single powerful national church has been a potent nationalistic factor. This is particularly true when adherence to a given church is shared by the larger part of the population, and even more so where the church is "national" in the sense of belonging exclusively to one state, giving the people the sense of possessing something peculiarly sacred which is all their own. That there is a deep-rooted relationship between religion and the cult of the nation is shown by the canonization of Joan of Arc, and the tendency of some peoples to revere their national heroes as saints. The extent to which religion and nationalism may go hand in hand is shown by the role of Roman Catholicism in Ireland and in Prussian Poland; in both cases the church was largely instrumental in keeping the national spirit alive in the face of foreign domination. A similar role was played by the Scottish kirk after the 17th century; it differentiated the Scots sharply from the English and fed the flame of national sentiment as probably nothing else in the circumstances could have done. Coming to modern times, Nazi Germany and Soviet Russia showed their respect for the power of the church over the emotions of the people by taking the most extreme measures to mold it according to the needs of the national myth. It is interesting, too, that at the present time it is customary for the church, even in the freest countries, to preach the necessity of loyalty to the flag and obedience to secular authority. This is undoubtedly a prudent policy, since nowhere in our present-day world is the church in a position to challenge the power of the state to hold the loyalty and fidelity of the ordinary citizen.

Territory.—The fact that a given people is conscious of living within definite frontiers on a given portion of the world's surface constitutes an important element in the acquisition of nationhood. This is true despite the cases of those nations—the Poles in Russia, the Czechs in Austria-Hungary, and the Scots in Britain—which successfully maintained an intense group loyalty and patriotism while mere subdivisions of the larger entity by which they had been subjugated. Some nations have actually been formed precisely because they were a geographic-political entity with definite frontiers. At times the acquisition of too great an expanse of national domain has weakened the hold of group consciousness; but today, due to rapidity of modern modes of travel and the existence of remarkable methods of mass indoctrination—cheap newspapers, the cinema, radio, and television—it is possible to tighten and maintain the bonds of national unity even to the

remotest corner of the widest realm. In fact, the existence of such modern methods holds out hope that some day it may be possible to inculcate a sense of group loyalty and a feeling of mutual understanding throughout the entire globe.

Political Institutions.—There is a close connection between the emergence of political institutions in a given area and the intensification of the national sentiment. Consciousness of group solidarity—to put it more simply, the ability to live together smoothly and peacefully—is undoubtedly a prerequisite to the successful operation of common agencies and procedures of government. If the integration comes about by agreement, as in the case of the 13 British colonies that joined to form the United States, such sociological-psychological solidarity may be absolutely essential. But even where unification comes about by force, unless there is a certain degree of group understanding and loyalty, the union may not be able to endure. On the other hand, the existence of common political institutions—notably a strong central government—may itself exert a commanding influence in engendering and consolidating the national sentiment of a given people. Germany's unification was finally consummated only after Bismarck had imposed on the many local and rival sovereigns of that divided country the authority of a powerful central government. In the United States, without the centralizing influence of the federal government, acting under the firm authority of a Constitution whose integrity was guaranteed by that extraordinary institution, the Supreme Court, it is difficult to conceive how national solidarity could ever have been achieved; the disastrous experience of the new republic under the Articles of Confederation shows that this assertion is not based on mere speculation. A strong government is the focus of loyalty. It is depended upon for the most vital services to the people—the public order and the general welfare at home, and security against invasion from abroad. In fact it is the supreme agency for the pursuit of unfulfilled national aspirations. As it meets these responsibilities, it is loved and respected, its leaders revered and honored. Even more, once the government has been established, it has at its disposal remarkably effective means for the spread of patriotic loyalty among the masses; it may create it by education and propaganda, or even impose it by force of law.

Economic Factors.—The division of the world into strong nations is explainable in part by economic factors. At the close of the Middle Ages, the growth of great national states proceeded hand in hand with a remarkable commercial and economic expansion. The rivalry between states was tremendously stimulated by the great discoveries and by the colonizations that followed and facilitated the acquisition by each state of a distinctive national character. Furthermore, under the influence of mercantilism, the economic life of the nation, hitherto almost purely local, took on a national character, as commerce and trade came under the control of strong centralized governments. This process was greatly stimulated by improvements in means of travel and communication. The predominant influence of mercantilism served to strengthen the hold of the government over every aspect of the economic activity of the nation. Every effort was made to render the state self-sufficient. Thus exports were stimulated, imports discouraged, and the colonies integrated with the economic home front. This extraordinary economic expansion was buttressed by military power, notably by the building of great navies designed to protect the far-flung interests of the metropolis. In the process vast fortunes were amassed, and new heroes emerged, thus creating a new, influential class of persons, those most interested in inculcating among the masses a spirit of national exclusiveness. Furthermore, this class possessed the most potent agencies of propaganda to accomplish this purpose.

Coming to modern times, the close connection between economic factors and nationhood is quite evident. International competition for markets, rivalry for scarce raw materials, the tendency of the government to replace the individual in buying and selling in the international field, and even in banking, the frantic exclusiveness induced by depression and inflation, have led to a bewildering maze of measures of autarchy—quotas, subsidies, exchange controls, high tariffs, and other restrictions—and have served to heighten national feeling and hamper the growth of international understanding. Economic nationalism seems to be most prevalent in those countries least able to stand the pressure of international competition. The weak power is the first to suffer unrest and disunity, to demand a strong government to repress "subversion," and to set in motion the defensive and offensive measures deemed necessary to meet the emergency; but even the strongest powers have not been free from similar phenomena.

GROWTH OF NATIONALISM

Although nationalism is distinctly a modern development, its roots lie in the period when prehistoric men first organized themselves into tribes. For the tribe, with its intense religious loyalty, fierce clannishness, local pride, and hatred of the "barbarian," shows many of the traits of present-day nationalism. In tribal society, the struggle for the preservation and extension of group solidarity was waged intensively. On the other hand, the main bond among tribesmen was that of blood kinship, while relations within the tribe were personal rather than political. Moreover, at this period in man's development there was little trace of patriotism, or love of homeland; the sense of attachment to a particular territory developed later.

City-States.—The first signs of patriotism appear with the rise of the early city-states, when for various reasons—considerations of defense, economic advantages, religious values—men began to group themselves about certain vantage points. Here the growth of commerce at home and of foreign trade abroad led to the first breakup of the tribal system, and brought the first traces of the modern political system. A typical example of the early city-state—and the most famous—is provided by the story of Athens. Here was developed a strong sense of group solidarity. The citizen was conscious of a common origin, a distinctive cultural pattern, and an assumed common destiny. Cultural homogeneity was further enhanced by religious rites glorifying the national heroes and reinforcing a sense of superiority with respect to the foreigner or "barbarian." Furthermore, the citizens had become attached to a given territory. Thus in Athens we find many of the elements of modern nationalism.

But the city-states gave way to the patriarchal empires, a process brought about by the expansion of one city-state or its conquest by a rival power on the rise. Such expansion augmented the national pride of the conquering power, kindling further the national spirit, and at the same time served to intensify the group loyalty of the submerged or conquered minority. The best example of such an entity is the great Roman Empire. In its aggressive, unprincipled and hypocritical foreign policy it reminds us of the integral nationalism practiced by Hitler and Mussolini. But it lacked the cultural homogeneity, the intense feeling of patriotism, and the overall sense of loyalty to a state or sovereign characteristic of nationalism as we know it today.

Middle Ages.—If, in the city-state and the patriarchal empire, the historian can find many of the typical features of present-day nationalism, the same cannot be said of the period of the Middle Ages. The basic unit of political organization, the feudal domain, did not lend itself to the development of group solidarity, nor permit the growth of any national sentiment. Mankind in general lived in groups too isolated, too poor and small, too provincial, to feel any sense of attachment to a national or cultural entity. Medieval towns, in general, were so separated from one another and so dominated by a spirit of localism that they could not serve as the basis for any larger group loyalty. Furthermore, there existed a measure of universal solidarity which was incompatible with the separatism characteristic of nationalism. The church was a major focus of individual loyalty, and its sway was almost universal. The Holy Roman Empire, too, despite its weakness, exercised for a considerable time a cosmopolitan influence. In this matter it is significant that nationalism evolved most rapidly in those lands, notably in France and England, where the imperial power was most remote and its influence weakest. Another factor was the existence of a fierce parochialism within each entity later to become a nation; thus where Scottish clan hated its neighbor clan there was little chance, except perhaps in time of great peril, that all the clans together could feel a national spirit of solidarity as against England or even France. It was necessary to await the consolidation of the king's authority over the realm before the nation could emerge. Here the work of Henry IV in France and of Henry VII and Henry VIII in England is most significant. This crucial task accomplished by the monarch was made possible by a great commercial revolution, enabling a new middle class to emerge, which allied itself with the king and gave him the support required to overcome the anarchy and decentralization of the feudal system. It is also worth noting that national consolidation was accomplished earliest where the geographical situation was most favorable, as in England, isolated as she was from the Continent, and in France, where the king could operate from the strongly fortified bastion built about Paris, in the region known as the Ile de France. The process of consolidation went on in England, Spain, France, Russia, and Poland, with the result that by the middle of the 18th century national states had emerged in most of Europe. In the Balkans, however, and in Germany and Italy, this movement was postponed for another hundred years.

As powerful monarchs were gradually establishing their authority and laying the foundation for separate statehood, other important influences were at work. One was the slow but sure development of national languages, already discussed. This came about hand in hand with the weakening of Latin as the language of universal use for education, literature, and diplomacy. As a consequence national literatures emerged, permitting the dissemination among the masses of works which kindled the national spirit and engendered a consciousness of separate existence. Another result was the weakening of the church's hold over education, which gradually became more and more secular and at the same time less universal in outlook.

The Reformation, the rise of Protestantism, and the growing emphasis upon national churches all contributed to the consolidation of separate, exclusive states. For instance, Presbyterianism in Scotland served to quicken the parochial spirit of its people and give them a sense of national exclusiveness. In Germany, the effect of Martin Luther's famous addresses was the amalgamation of religion and patriotism into a militant national faith.

Another influence favorable to the emergence of modern nationalism was offered by the great discoveries and the ensuing economic expansion of Europe. The bitter rivalries thus engendered fed the national spirit, the glorious deeds of discovery fired the national pride, and the great wars which followed had a dynamic and lasting effect in this same direction. Finally the traders, bankers, and shippers, a new class representing vast wealth and wielding great influence, were not slow to feed the flame, for they realized the necessity of gaining the support of the citizens, from whom they had to enlist the sailors and the fighters if the nation was to keep pace with its rivals. In this connection the role of mercantilism must not be neglected—the narrow commercial policies adopted in most states after 1500. This system operated to promote interstate rivalry and jealousies, intensify national pride, and promote international friction. It was therefore a heady stimulant to the pride and arrogance of nations.

The major role played by the monarch in laying the basis for the modern national state has already been mentioned. The local sway of the feudal lords and barons gradually had to give way before the emerging power of the king, permitting the development of national instrumentalities of government and the establishment of the "law of the realm." This was particularly true in England, where the common law finally consolidated its hold over the entire country, contributing immeasurably to the consciousness of the citizens that they were set apart from the rest of the world. In some states the appearance of democratic government was a further step in this direction.

The French Revolution.—It is impossible to fix a date for the beginning of modern nationalism. The underlying social, economic, political, and intellectual forces accomplished their work only gradually, and at a different rate in each region depending upon the peculiar circumstances of the particular case. Some authorities place the actual origins of modern nationalism at the time of the Reformation; others date it from the Peace of Westphalia in 1648, which ushered in the modern system of independent sovereign states. Still other authorities, and they represent the majority, insist that nationalism as we know

it began with the French Revolution. But, as we have seen, the way had already been opened by the emergence of a system of strong, well-integrated states, the work of powerful monarchs. Also, the minds of men had been prepared for the spirit of nationalism by the teachings of the Enlightenment in the 18th century. The great apostle of modern nationalism was Jean Jacques Rousseau. He stressed the value of the moral unity of the masses, who are bound together in pursuit of a common purpose—the good of the whole. Furthermore, he insisted that the community should be governed by laws issuing from the people themselves, and not from a divine-right monarch standing above the law. He emphasized the necessity of a supreme loyalty to *la patrie* (the fatherland), a duty so sacred as almost to become an article of religious faith. He decried any idea of fidelity to something higher, for instance world society or the entire human race. In short, he sought to arouse the masses to a belief in a common heritage and a common destiny, claiming for men a status of democratic equalitarianism, and for nations a right of self-determination. It was for the men of 1789 to put these principles into practice, at least for a time.

At first professing absolute fidelity to the doctrines of popular sovereignty, individual liberty, social equality and fraternity, the Jacobins, under the stress of rebellion at home and attack from abroad, soon allowed the movement to deteriorate. Force and militarism took precedence over humanitarianism and fraternal love. The movement became fanatical. Soon there began to emerge those remarkable instrumentalities of nationalism which have been so widely employed ever since, notably by totalitarian dictatorships, but which have not been neglected by the most advanced democracies. The concept of the "nation in arms," universal conscription, emotional appeals for flag and country, the composition of a national anthem, the glorification of national heroes, the establishment of a system of public education grounded in the vernacular and dedicated to spreading revolutionary doctrines, insistence on the universal use of the French language, invention of a new kind of popular journalism and, finally, the organization of impressive rituals in the form of national ceremonies—all were employed as part of a vast scheme to create and intensify a national cult.

The doctrines of the revolution were professed to be universal—not designed for Frenchmen alone—but before long the Jacobins were thinking in terms of selfish national interest. They embarked on expansion and conquest. Nationalism, then as always, feeds on war. As the sansculottes marched to do battle abroad, they took their doctrines with them, and they spread their nationalism much faster than their democracy. This was true even before the rise of Napoleon, but when the Little Corporal assumed power he greatly intensified the development already under way. Fortified by supreme power and an admirable political organization and system of laws, he made excellent use of all the Jacobin paraphernalia of nationalism, employing it to the limit of his own keen shrewdness. Thus he was able to indoctrinate a whole generation of Frenchmen with the concepts of "glory." He taught lessons in this field which later governments, especially in other countries, have never forgotten. Everywhere he awakened submerged peoples to a sense of their own destiny, and thus did much to start Italy and Germany on that march for unity which they were to achieve several generations later. In fact Napoleon, who was actually destroyed by the dynamic national spirit he did so much to create, initiated the upheaval which ultimately transformed the continent, dividing it into separate entities inspired by the fervor of nationalism.

The metamorphosis of French nationalism after 1792, transformed as it was from a liberal, universalist movement into one marked by reaction and conquest, illustrates a point already made, namely, that nationalism is always a creature of environment, subject to change. It can be democratic, liberal, or fascist, according to circumstances. At times it may not exceed the bounds of a healthy patriotism, at others it will be the cause or the result, or even both at once, of expansionism and war. The story of nationalism since 1815 will bear out this assertion.

The 19th Century.—The 19th century has been called by some authors the great age of nationalism. During most of the century, after the aberrations of the Jacobins and Napoleon Bonaparte, what has been called "liberal nationalism" was revived and became predominant. This is a type of group consciousness characterized by intense patriotism and loyalty but faithful to the doctrines of individual and national freedom, in other words, espousing human rights and the right of self-determination of peoples. It tends to be high-minded and altruistic, universalistic and pacific. One of the greatest movements to be inspired by this spirit was the American War of Independence. This revolution was liberal and humanitarian, fought in the name of the great liberal principles dating back to John Locke and the Puritan Revolution, so admirably reformulated by Thomas Jefferson and Thomas Paine, and immortalized in the Declaration of Independence. In Britain, under the influence above all of Jeremy Bentham, liberal nationalism reached its highest point in the 19th century. As an intellectual movement it spread throughout western and central Europe. Based mainly on the middle classes, highly tinged with romanticism, and preaching the doctrine of free trade, this school of thought adopted certain typically Jacobin ideas, namely free popular education, universal military service, and popular journalism. These ideas were disseminated with great force and effect by Mazzini, who, as spiritual leader of the movement for unity and independence in Italy, became the most influential apostle of liberal nationalism in the entire century. Other leading philosophers of this movement were Giuseppe Garibaldi in Italy, Victor Hugo in France, and William Ewart Gladstone in England.

A major factor in the extraordinary emergence of nationalism during the 19th century was the first Industrial Revolution. By this is meant in general the amazing series of mechanical inventions ushered in by the invention of the flying shuttle in 1733 by John Kay. In modern states industry and commerce, and eventually society as a whole, were actually transformed by the developments made possible by the work of Thomas Savery, Thomas Newcomen, and James Watt in steam power, Sir Richard Arkwright and Samuel Crompton in textile manufacture, the Abraham Darbys and Henry Cort in coal and iron,

Sir Henry Bessemer in steel, and other pioneers. The consequences were incalculable. Mass production was introduced, great factory cities created, a working class or proletariat developed. Also, a new middle class was engendered, and the ranks of the capitalist class greatly augmented, from which the "empire builders," the keenest nationalists, emerged. The power of states to produce and to expand increased immeasurably. Demand for outlets for the investment of capital, and the need for raw materials to feed the hungry new factories led to the search for new possessions in distant regions—or gave empire builders the pretext to undertake such a search—and this meant a new wave of colonialism and imperialism. Exploits of adventurers and military geniuses like Robert Clive and Cecil John Rhodes were both a cause and a consequence of a new, intense kind of national pride. Another result was the development of modern methods for the communication of intelligence—through rail, telegraph, telephone, and cheap newspapers.

Major events of the 19th century owe their impulsion to the irresistible forces of nationalism. Greece and Belgium won nationhood early in this period. Nationalistic fervor inspired the great uprisings of 1830 and 1848. Across the Atlantic nationalism inoculated the Spanish and Portuguese colonies in Central and South America, which were able to win their independence, inspired and led by heroes such as Simon Bolívar and José de San Martín. During the two decades after 1855 both Germany and Italy belatedly won their unity through the genius of Prince Otto von Bismarck and Conte Camillo Benso di Cavour, respectively. Serbia, Rumania, and Montenegro won their liberty in 1878. Bulgaria was separated from Turkey. On the other hand, the Poles, Finns, Letts, Czechs, and Croats, among others, continued to be persecuted and oppressed, but this only served to solidify their national loyalty and to push them toward the independence they were later to win and—in some cases—to lose once again. Late in the century Japan, inspired by a high degree of national aspiration, became a world power. Since most of these events occurred through rebellion or war, it is evident that the pacifist slogans of liberal nationalism were often more honored in the breach than in the observance. Furthermore, as has so often been demonstrated, movements initially high-minded and altruistic readily deteriorated into expansionism, aggression, and war.

One may cite as examples Napoleon III and Bismarck, whose policies, originally professing fidelity to the doctrines of liberalism, eventually became reactionary and aggressive. Bismarck's unification of Germany was conservative and authoritarian, but Germany's annexation of Alsace-Lorraine in 1871 was accomplished in violation of the tenets of self-determination.

Toward the end of the 19th century came a remarkable intensification of nationalism, due in great part to a new industrial revolution. This caused Europe to burst its economic bonds and spread its power and influence throughout the world. New markets were sought in far-off China and Africa. A new wave of expansionism was initiated, as France spread further into Africa, encouraged by Bismarck after the debacle of 1871, and the British obtained control of Suez and embarked on new adventures in colonialism. Germany, too, seeking a "place in the sun," sought to extend her sway from Berlin to Baghdad. Even the United States was caught up in the current, and after a successful war with Spain found herself ensconced in Puerto Rico and the Philippines. New rivalries and frictions resulted, with new dangers of war, narrowly averted, as France and England clashed over Fashoda (now Kodok), Germany and France over Morocco, Russia and England over Persia. Grandiose schemes of expansion were dreamed up, mutual fears exacerbated, and a great armaments race launched. Some started new powerful navies, others augmented their existing naval power, compulsory military service was established in many lands, and in general the atmosphere was prepared for that great turning point in history, the explosion at Sarajevo.

The 20th Century.—As already remarked, the 19th century has been called the age of liberal nationalism, although it must be admitted that both at the beginning and at the end of that period, nationalism of an extreme variety was current. But if the 19th can be considered the century of liberal nationalism, certainly the 20th is the period of integral or fascist nationalism. The first decade, it is true, was relatively calm, and great hopes were held out for peace and security by optimists who reflected the spirit of the two Hague Conferences of 1899 and 1907. But these hopes were shattered in 1914. The nationalist and imperialist rivalries prior to 1914 undoubtedly contributed to the outbreak of World War I. In fact, nationalism was both a cause and a result of that conflict.

Since World War I the most dynamic manifestations of nationalism have occurred in authoritarian states, notably in Nazi Germany, the new Japan, Fascist Italy, and Soviet Russia. Some smaller states, too, have fallen under its sway—Juan Domingo Perón's Argentina, Francisco Franco's Spain, Antonio de Oliveira Salazar's Portugal, and Tito's Yugoslavia. Yet the Treaty of Versailles had been signed in an atmosphere of liberal nationalism. Woodrow Wilson's Fourteen Points were an expression of this philosophy, and the peace settlements were inspired in principle by the tenets of national self-determination, as shown by the establishment of the mandates scheme of the League of Nations, the creation of a free Poland, and the breaking up of the Austro-Hungarian empire into states based on national integrity. Unfortunately, however, many of the solutions adopted in 1919 ran counter to the Wilsonian ideal, for the American president was unable to obtain acceptance throughout for the formulas contained in his Fourteen Points. In defiance of the explosive verities of self-determination, new grievances were perpetrated. A status quo in which one finds a Fiume (now Rijeka), Shantung, or South Tirol, not to mention the Saar and the Polish Corridor, could hardly be expected to endure. In fact the eventual breakdown of the Versailles settlement, as well as the demise of the League of Nations, can be traced in large part to the injustices perpetrated in 1919 in violation of basic concepts of liberalism and self-determination. For one major cause of international disputes and resulting wars is simply unjust treatment meted out to helpless states, especially if they eventually become powerful enough to threaten the status quo.

Except for a brief period of comparative peace and optimistic hopes, extending roughly from

1920 to 1929, the world since World War I has been in almost constant turmoil. One of the major characteristics of the period—both a cause and a result of its cataclysms—has been the manifestation of extreme nationalism. No state has been free from this phenomenon, but in certain authoritarian powers nationalism has reached a pitch of frenzy never before seen, not even in the wildest days of Jacobin fanaticism. Thus Benito Mussolini, a follower of Niccòlo Machiavelli, Auguste Maurice Barrès and Georges Sorel (the apostle of violence) rather than of his liberal compatriot, Mazzini, indoctrinated a generation of Italians with the most extreme type of nationalism. Japan, already strongly nationalist, destroyed its democratic trappings in the early 1930's and became more and more rigorously fascist at home and expansionist abroad until it finally broke completely with the family of nations and embarked on total war. In fact, some authorities, contrasting Japan's meticulous compliance with international law during the Russo-Japanese War (1904–1905) with its incredible atrocities in World War II, ascribe this change to the purposeful inculcation among the masses of new doctrines of extreme, fanatical nationalism. The expansion which began in Manchuria finally overran Singapore and New Guinea. Hitler, destroying the democracy of the Weimar Republic, imposed a ruthless dictatorial regime on his people, broke the chains of Versailles, rearmed the nation, and marched into the Rhineland, Vienna, and later Prague. He took the final step when he attacked Poland in 1939. By his violent racial doctrines, his anti-Semitism, his bitter, intolerant, violent demand for absolute fidelity to a mystical and all-powerful Reich, and his control of the German mind through the corruption of press, platform, radio, the schools, and the universities, Adolf Hitler made himself the god of modern integral nationalism. He outdid Robespierre and Napoleon, and surpassed Barrès, Sorel, and Houston Stewart Chamberlain.

While the actual origins of great wars are difficult to determine, Hitler's aggressive imperialism and fanatical expansionism, seconded by a Mussolini already well schooled in such doctrines and with hands still bloody from his Ethiopian conquest, undoubtedly were major causes of World War II. Characteristic of this spirit is a negation of all humanitarian values, an uncompromising rejection of liberal and progressive principles, a total subjection of the individual to the domination of an all-powerful state, whose worship is postulated as a sacred, almost religious duty, and a devotion to the devastating doctrine that, in the pursuit of the national interest, any means is justified by the end in view. In a world imbued with this spirit, war is almost inevitable, and free nations can only conserve their liberty by constant vigilance and a determination to keep their powder dry.

Since World War II, nationalism has continued to play a major role throughout the world. The Hitlerian techniques were developed still further by Joseph Stalin, who proved himself an apt pupil of fascist nationalism. In Soviet Russia nationalism, stealing the show from the universalist doctrines of world communism, has inspired an expansion as rapid and as extensive as any in the history of the world. Many of the nations liberated after World Wars I and II have been subjugated anew, again as a result of a spirit of nationalism, but this time of a very different kind. This is true of Poland, Rumania, Czechoslovakia, Hungary, and China, although Yugoslavia, again due to the force of nationalism under a stubborn leader, Tito, has thus far escaped. Nor should we forget the fate of the once-free states, liberated as a result of World War I—Estonia, Latvia, and Lithuania. Elsewhere, however, the effect of nationalism has been to liberate certain regions from colonial rule. Thus India and Burma have separated from Britain, and Indonesia from the Dutch, while Indochina, Morocco, Tunis, and even Algeria strain at the leash of French sovereignty. In fact the slogan so often heard, "Colonialism is dead," is merely a general recognition of the liberating force of nationalism in the world today.

MAIN CHARACTERISTICS OF NATIONALISM

A brief description of the basic features of nationalism may serve to explain the nature of its dangers to individual states and to world peace.

Relativity.—As already suggested, the exact character of any particular case of nationalism is largely determined by environment. The state of mind of a given people may be entirely transformed according to changes in time and circumstance. Nationalism in the United States itself has shown significant variations explainable by factors of changing environment. Thus, while the Revolution was fought in a spirit of liberal nationalism which Locke and Rousseau would have applauded, the Spanish-American War was initiated in a wave of imperialist emotion. And the retreat from Europe and the League of Nations after 1920 was a clear manifestation of exclusive, isolationist nationalism. In World War I the general sentiment of the masses, even after American intervention in the conflict, remained basically isolationist. This is in sharp contrast with public opinion throughout World War II, at least after Pearl Harbor, for despite a national patriotism that reached a high pitch of intensity, Americans never faltered in their hopes for a new international organization which, it was confidently expected, would serve to ensure peace and security once the victory had been won. It has only been because of the disillusionments of the peace, and particularly since the outbreak of the "Cold War," that American nationalism has tended to become once again to some degree self-centered and isolationist, with some unmistakable signs of exclusiveness and intolerance.

Artificiality.—If nationalism is environmental, it is also to a large extent artificial. It is not a harmonious, natural growth, but the result of a long process which reaches its climax only after a given people has spent a long period of living and working together. This process can be greatly accelerated, however, by various methods, today only too familiar, of purposeful stimulation. In other words, nationalism is a state of mind which can be, and often is, induced by governmental and private propaganda. It can be the creature of ambitious leaders who wish to form certain patterns of opinion which they expect to use, for their own purposes perhaps, or for ends they consider to be in the public interest.

The most volcanic degrees of nationalism have been consciously and insidiously contrived. The fanatical propaganda of the French Revolution, the press-radio-platform paraphernalia of Joseph Paul Goebbels, the "brain washing" technique pe-

culiar to communism, are striking examples of such methods. In this process, the youth of the nation is singled out as most impressionable and most easily molded. The effort is begun among the youngest children, and includes attempts to enlist the active support of family and school. The Germans under Hitler, and the Russian Communists today, have developed their techniques in this matter to the pitch of perfection. No age-group, no portion of the population, is neglected. The nationalist organizations take the form of clubs, cells, societies, or parties, and all cooperate to augment the fanaticism of the masses to the greater glory of the state. Glorify the nation, exaggerate its accomplishments, convince the masses that they constitute "God's chosen people," spread broadcast the slogan, "My country right or wrong," or, even more lethal, "My country always right," establish a conviction that the fatherland is in imminent danger of attack (whether this be true or false) and, over it all, obliterate all sense of measure, any vestige of objectivity, and one has all the ingredients for concocting a high degree of extreme nationalism. In this matter the most effective formula appears to be a close cooperation of thinker and actor; someone must furnish the doctrine, but someone else must be ready to propagate it among the masses. Lazare Carnot and Bertrand Barère provided the philosophy, Robespierre and Napoleon put it into practice. Alfred Rosenberg wrote the doctrines (acquired abroad from Sorel, Charles Maurras and others, but with valuable assistance at home from Georg Wilhelm Friedrich Hegel and Treitschke), while Goebbels gave these doctrines violent application.

Irrationality.—The ability of governmental and civic leaders to spread the ferment of nationalism among the masses is greatly facilitated by its highly irrational character. The extreme patriot is largely impervious to rational argument. Even in free countries, he may never hear the truth, especially if he reads only tendentious newspapers or tunes in his radio to biased, chauvinistic commentators. Moreover, it is difficult to see how adults can consider the international problems facing their nation with any degree of objectivity if as young children their minds were formed by history books that were one-sided and biased.

Intolerance and Exclusivism.—In early times, man's supreme loyalty was centered on his religion. Today this place has been taken by the nation. As the most despised of antisocial individuals within the state, the traitor has displaced the heretic. This supreme loyalty is not only self-centered and exclusive; it has likewise a curious negative element. It thrives on anti-foreign sentiment, especially when this can be focused on a particular country, the object of special disdain. Thus the nationalism of the United States has been traditionally anti-British, that of England has been anti-French, that of France anti-German, while Polish nationalism (probably the most intense of all) has been anti-Russian and anti-German. A striking contemporaneous illustration of this phenomenon is found in the case of the USSR, whose integral nationalism is so violently anticapitalist. Given the atmosphere of exclusivism in which it flourishes, together with its negative character, nationalism is both a cause and a consequence of intolerance. Intolerance of all criticism of one's own government or its policies may result in the total suppression of free speech. Intolerance of foreigners, both as individuals and in the mass, and refusal to examine calmly and objectively the policies of a foreign government, tend to create an attitude favorable to international dispute and war; or it may take the form of arrogance toward the immigrant, an attitude which may go all the way from social discrimination to the passage of laws denying the foreigner comparable economic opportunities in particular or, in general, equal protection of the laws. Nationalistic intolerance finds expression in many countries, in various methods of oppression directed against devotees of religions having an international character, national minorities, members of so-called "inferior races," and persons espousing economic and social doctrines of foreign origin.

INTERNATIONALISM

Various meanings are attached to that elusive term, internationalism. To some it is a method of international cooperation, comprising a complex of instrumentalities of interstate organization—League of Nations, International Labour Organization, the International Court of Justice, World Bank, United Nations—and includes in its purview their origin, evolution and activities. To others the term means, in common with nationalism itself, a certain condition of mind, and it is in this sense that it is used here. Thus interpreted, internationalism means a consciousness of membership in a global society, or community of the peoples of the world, and a willingness to allow one's particular nation to join the existing organizations established by and for this community. It also includes a disposition to surrender to world institutions a greater or less degree of sovereignty, depending on the intensity of one's faith in the available methods of international cooperation. The "minimalist" would be willing to grant to a global institution only those powers considered essential for the maintenance and enforcement of international security. The "maximalist" is a partisan of some form of actual world government. The former champions the present United Nations; the latter will be found in the ranks of the world federalists. Between the two extremes one will find varying degrees of internationalism. This attitude or state of mind is unlike cosmopolitanism in that it does not imply an abandonment of one's loyalty to his particular state or nation, or a disposition to substitute for his attachment to the latter a higher relationship to the whole world, regarded as the only true fatherland.

It was only following World War I that internationalism as just defined reached the stage of practical experimentation. True, the way had been prepared for centuries, as advanced thinkers —Henry IV's great minister, the duc de Sully, Immanuel Kant, William Penn, and many others —formulated utopian plans for world organization designed to end war and maintain peace. But little came of these plans until 1919. Considerable progress had already been made, to be sure, in the field of international law, especially since 1648, and international arbitration had come into fairly frequent use during the 19th century. Two Hague Conferences, in 1899 and 1907 respectively, had spread the hope—too optimistic, so it turned out—for the codification of international law and the settlement of international disputes by peaceful means. But the actual birth of internationalism did not occur until the founding of the League

of Nations in 1919. The growth of internationalism from this point on is discussed in other articles. See League of Nations; United Nations, The; International Court of Justice; International Labour Organization; International Law, Changes in.

There is no incompatibility between liberal nationalism and a spirit of internationalism. If kept within reasonable limits, a healthy patriotism is a great spiritual force. In fact, it is a prerequisite to the spirit of fidelity, faith, and determination among the citizen body which is the soul of nationhood. Unless its people possess a high degree of loyalty and solidarity, no nation can endure in the present competitive world. But nationalism that is narrow or egotistical is incompatible with any degree of progress toward internationalism and will, as history demonstrates, become a lethal weapon of discord and conflict.

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NATIONALIST, in British politics, a term applied to the Irish political party whose program included a partial separation of Ireland from Great Britain. The party was organized by Isaac Butt, and after his death was ably led by Charles Stuart Parnell. After Parnell's death it was split into factions but was reunited in 1899 under the leadership of John E. Redmond. Its principal services to the Irish nation were the settlement of the land troubles and the establishment of institutions for the higher education of Catholics. The party, however, failed to keep in touch with the younger generation in Ireland; more and more it came to resemble the great parties of England; only men who pledged docility to its leaders received its support at elections. The cleavage between people and party became apparent soon after the outbreak of World War I in 1914, and after the revolt in 1916 the support of the masses was withdrawn altogether. At the various subsequent by-elections throughout the country the party's candidates were defeated by the Sinn Feiners. With the establishment of the Irish Free State the party ceased to exist, as its purposes had been accomplished, although not precisely as some of its members would have wished. Some former Nationalists took an active part in the new government, while others for various reasons remained aloof.

NATIONALITY. Nationality is both an ethnic and a legal term. As an ethnological concept it has reference to the racial status of an individual or group. Thus we speak of an individual possessing German, Polish, Italian or Greek nationality, without regard to his citizenship, for the terms citizenship and nationality are not synonymous. In general, people who have a common ethnic origin, who speak the same language and who have a common literature belong to the same nationality although they may be citizens or subjects of different states. Thus we find large numbers of persons of Polish nationality in Germany, Austria, USSR, and other states; Germans are found not only in East and West Germany, but in Austria, Switzerland and other countries; persons of Jewish nationality are widely scattered over the world and are citizens or subjects of many states. States and nations are, therefore, by no means identical; some states, like Austria, Hungary, the USSR and Switzerland, embrace within their territorial limits various nationalities.

On the other hand a nation may extend beyond the limits of a single state. Thus the French nation embraces practically the whole of the French Republic and most of Belgium. The Germanic nation extends beyond the limits of East and West Germany into Austria and Switzerland. The tendency of modern times has been toward identification of states and nations, that is, toward the organization of states with boundary lines which coincide with those of nations, this on the principle that the bringing of peoples having a common ethnic origin and language under the same state organization conduces to national unity and stability. The organization of the German and Italian states along national lines during the last century was in accord with this tendency. Disregard of this principle, as, for example, by the Vienna Congress in 1815 which undertook to reorganize the states of Europe without regard to considerations of nationality, has led to extremely unfortunate results.

As a term of municipal and international law nationality has reference to the status of an individual as a member of a particular state. In this sense the term is synonymous with citizenship (q.v.) though not invariably, for an individual may for certain purposes be a "national" of a particular state without being a citizen or subject in the full sense of the term. The term may also have reference to the national status of a ship or cargo.

The nationality of an individual is determined by municipal or state law while that of a ship or cargo is regulated for the most part by the rules of international law. As a consequence of the former principle it may and does frequently happen that two or more states lay claim to the allegiance of the same person. In that case the individual possesses a double nationality. Likewise it may happen that an individual is without any nationality at all, that is, he is *staatlos* or *heimatlos*, as the Germans say. Cases of dual nationality arise from the exist-

ence of two conflicting systems for determining nationality. These two systems are known as the *jus soli* and the *jus sanguinis*. According to the former rule nationality is primarily determined by the place of birth; according to the latter, by the nationality of the parents. The *jus soli* rule grew up in Europe during the feudal period and in time it became the general law on the subject on the continent of Europe. In the later Middle Ages, however, it was largely superseded by the *jus sanguinis* rule which originated in the Roman law. According to the strict principle of the *jus soli* all persons born within the jurisdiction of a particular state, regardless of whether the parents be citizens or aliens, are deemed to be citizens of that state. Likewise all children born abroad, even though their parents be citizens, are regarded as aliens. On the other hand, according to the strict principle of the *jus sanguinis* all persons born within the jurisdiction of a particular state, of parents who are aliens, are themselves aliens, while those born abroad of citizen parents take the nationality of their parents (or rather that of the father, in case of legitimate children, and that of the mother, in case of illegitimate children).

The *jus soli* principle is the basis of the law of Great Britain and the United States; the *jus sanguinis* rule prevails in Germany, Austria, France, Hungary, Switzerland and other states. Few states, however, apply either principle exclusively. Thus according to American law children born abroad of fathers who are citizens of the United States and who have themselves resided here are deemed to be citizens of the United States. Likewise, according to British law, children born abroad of British subjects are treated as natural-born British subjects. Thus both countries, although following in general the doctrine of the *jus soli,* have adopted the *jus sanguinis* principle for determining the status of children born abroad of citizen parents. In many other states a mixed system prevails. Thus according to French law while all children born of French parents anywhere in the world are deemed to be French citizens, those born in France of alien parents and not domiciled in France at the age of their majority are regarded as foreigners. A child, therefore, born in the United States of French parents would be a citizen of the United States *jure soli,* but a citizen of France *jure sanguinis.*

Concerning the test for determining the nationality of ships in time of war there has been much diversity of opinion. The continental European view has generally been that national character in such cases should be determined by the nationality of the owner; English and American opinion, however, has regarded the flag which the ship is entitled to fly as the proper test. During the World War, however, the British government rejected the former rule and put into effect the rule that the neutral or enemy character of a vessel should be determined by the nationality of the owner. See also ALLEGIANCE and CITIZENSHIP IN THE UNITED STATES. For bibliography see article CITIZENSHIP IN THE UNITED STATES.

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NATIONALITY ACT OF 1940. This act replaces the several acts of the Congress providing for the naturalization of persons serving in the armed forces of the United States. The new code contains a section applying uniformly to persons who served honorably in the army, navy, marine corps, or coast guard for an aggregate of three years. Under the law the five-year period of residence in the United States, declaration of intention to become a citizen, and certificate of arrival and residence within the jurisdiction of the naturalization court are no longer required. Proof of good moral character and favorable disposition toward the country is facilitated for applicants.

The code broadens the prohibition against the naturalization of persons who are members of anarchistic or other subversive groups or who believe in, or advocate, subversive doctrines or sabotage. The prohibition is applicable to any person who within ten years prior to filing a petition for naturalization has entertained any such views or has been affiliated with any organization or group of a subversive nature, even though such views or affiliation may have been abandoned before the filing of the petition.

Another provision in the new code permits the acquisition of citizenship by children through adoption by citizen parents. They may be naturalized before reaching the age of 18 upon petition of the adoptive parent or parents, provided they were admitted to the United States for permanent residence, were adopted in the United States before reaching the age of 16, and were adopted and in legal custody of the adoptive parent or parents for at least two years prior to the filing of the petition for the child's naturalization.

NATIONS, Law of. See INTERNATIONAL LAW.

NATIONS, League of. See LEAGUE OF NATIONS; WAR, EUROPEAN: PEACE TREATIES.

NATIVE BEAR, the Australian koala (q.v.).

NATIVE COMPANION, an Australian name for a large local crane (*Grus australasianus*) peculiar to that island-continent.

NATIVISM, that theory which bases some tangible part or phase of our knowledge on the inborn nature of mind and not on sense-experience alone. It is opposed to empiricism (q.v.), which finds in sense-experience the origin of all knowledge. While the distinction between truths of reason and truths of sense dates from Heraclitus, or even earlier, Plato was the first to make nativism a leading tenet of his philosophy. Over against the knowledge of sense, he maintained the existence of a knowledge of ideas due to a recollection, stimulated indeed by sensory experience, but reaching back beyond birth. Aristotle's views as to the origin of knowledge, though not greatly emphasized, seem to be essentially of the same nature as those of Plato. The Stoics were the first to use the word *innatus* or truths, applying it primarily to the moral law. The realists of the Middle Ages, holding as they did that universals have a separate existence, were practically driven to nativism, unlike the nominalists, who maintained that nothing is in the intellect which was not previously in sense. In modern times nativism and rationalism have gone hand in hand, and Descartes, Spinoza and especially

Leibniz believed in the existence of innate ideas, such as those of God and of the self. Locke opposed this opinion, and pointed out that the new-born child does not possess a ready-made stock of ideas. Kant maintained a theory of knowledge essentially nativistic, but departed from his predecessors in not making knowledge consist in the possession of representative ideas and in holding that the phase of knowledge independent of sense — the knowledge of pure form — is not so much congenital as extra-temporal. The modern discussion of evolutionism has given a new turn to nativism, in that some writers, such as Spencer, have upheld the view that the knowledge of the individual is in a large measure inherited racial experience. However, according to Weismann's theory of evolution, acquired characterictics cannot be inherited, so that racial experience can have no direct effect on the individual. The innate substratum of the mind, on this theory, is the result of the accumulation of fortuitous variations which have been able to survive through special fitness. Neither this view nor Spencerianism are in the original sense forms of nativism, since the sort of innate knowledge which the classical nativism maintains is the same in nature for all minds.

It is not essential for nativism to maintain that the new-born babe actually has certain conceptions perfectly formed, or that he will form them without any sensory stimulus. An item of knowledge may be innate even if it requires experience to evoke it. For this reason Locke's refutation of Leibniz will not hold water. On the other hand, to be an antithesis to empiricism, the nativist must maintain, not merely that the general nature of man is a condition of all sensory experience, for the empiricist would agree with him in this, but that some phase of knowledge, such as that of necessary truths, is peculiarly dependent on the nature of thinking minds themselves. Consult Aristotle, 'De Anima'; Locke, 'Essay on the Human Understanding'; Kant, 'Kritik der reinen Vernunft'; Leibniz, 'New Essays'; Locke, 'Essays on the Human Understanding'; Mill, J. S., 'A System of Logic' (London 1843); Moore, G. E., article on 'Nativism and Empiricism' in 'Baldwin's Dictionary of Philosophy and Psychology' (new ed., New York 1911); Plato, 'Meno'; 'Phaedo'; 'Theaetetus'; Zeller, 'Stoics, Epicureans and Sceptics' (tr. London 1892).

NATIVITY, *in astrology,* the theme or figure of the heavens, and particularly of the 12 houses, at the moment when a person is born, supposed to indicate his future destinies, and synonymous with horoscope. See ASTROLOGY.

NATORP, nä'tôrp, **Paul Gerhard,** German scholar: b. Düsseldorf, 24 Jan. 1854; d. 1924. He was educated in Berlin, Bonn and Strassburg and accepted a professorship in Marburg in 1885. He wrote 'Descartes' Erkenntnisstheorie' (1882); 'Platos Staat' (1895); 'Platos Ideenlehre' (1903); 'Socialpädogigik' (3d ed. 1909); 'J. H. Pestalozzi' (2d ed., 1910); 'Die logischen Grundlagen der exakten Wissenschaften' (1910); 'Philosophie: ihr Problem und ihre Probleme' (1911); 'Hoffnungen und Gefahren unserer Jugendbewegung' (1914).

NATROLITE (from "natron," native carbonate of sodium), a native hydrous silicate of sodium and aluminum, having the chemical formula $Na_2Al_2Si_3O_{10} + 2H_2O$, and crystallizing in slender prismatic forms belonging to the orthorhombic system. It is transparent to translucent, and usually white (or nearly so), with a vitreous lustre, a hardness of from 5 to 5.5, and a specific gravity of from 2.20 to 2.25. It occurs in cavities in basaltic rocks, and in seams in granite, gneiss and syenite. It occurs in many parts of Europe, and fine crystals are found in southern Norway. In the United States the mineral occurs in Connecticut, New Jersey and Arkansas, and also in the Lake Superior region. It is likewise found in Nova Scotia. Natrolite takes a good polish, and has been used as a gem stone.

NATRON, a carbonate of soda or mineral alkali, $Na_2CO_310H_2O$. It is produced from the ashes of several species of marine plants and is also obtained by evaporating the waters from some mineral springs. It is also found as an efflorescence in the ground. It occurs in nature, but only in solution, and is generally found in an impure state, being mixed with other sodium salts, such as the sulphate and chloride. The soda lakes of Egypt have supplied great quantities of this substance for many centuries; t was used by the ancient Egyptians as an important ingredient in their embalming fluids. A similar but impure hydrogen sodium carbonate is found deposited by evaporation on the shores of the Caspian and Black seas, also on the banks of alkali lakes and springs in California, particularly in the neighborhood of San Bernardino.

NATTER, Heinrich, Austrian sculptor: b. Graun, Tyrol, 16 March 1846; d. Vienna, 13 April 1892. He was five years apprentice to a sculptor in Meran and subsequently was taught drawing at Augsburg by Johann Guyer, a famous painter of humorous genre. Subsequently he studied with great profit under Max Widnmann (q.v), the sculptor, in the Munich Academy. Weak health compelled him to travel and he visited Riva on Lago de Garda and Venice, until the war of 1866 called him to active military service. He afterward took up his residence at Munich, where he made his reputation by his portrait busts, sepulchral statues, a colossal statue of the god 'Odin' (1873) and the head of a 'Sleeping Satyr.' A career of wider activity opened for him after his settlement in Vienna, where, besides numerous bust portraits and monuments, he executed the statue of Zwingli for Zürich; the statue of Haydn for Vienna; the portrait statue of Laube and Dingelstedt for the municipal theatre of that city; and the statue of Walter von der Vogelweide for Bolzano (1889). His statue of Andreas Hofer, which is his masterpiece, was unveiled after the sculptor's death on a height near Innsbruck. A poetic delicacy of conception and a certain life-like expression, oftener found in painting than in sculpture, are the characteristic features of his work. His literary remains were published by L. Speidel, under the title 'Kleine Schriften' (1893).

NATTERJACK, an Old World toad (*Bufo calamita*), light-brown in color, spotted with patches of a darker hue. It does not leap or crawl like the common toad, but rather runs, whence it has the name of walking or running toad. It has a deep and hollow voice

audible at a great distance, and is often found in dry situations.

NATTIER, nä'tyā, **Jean Marc,** French portrait painter: b. Paris, France, March 17, 1685; d. there, Sept. 7, 1766. The son of a portrait painter, he probably studied under Jean Jouvenet and won first prize at the French Academy at the age of 15. During the course of Peter the Great's European travels, Nattier was summoned by him to Antwerp in 1715 to paint his portrait, his wife Catherine I, and prominent members of his entourage. Nattier's *Petrification of Phineus and His Companions* led to his election to the Academy in 1718. He turned from mythological and historical subjects to portrait painting and soon became one of the most fashionable portraitists of his time. He received numerous royal commissions from Louis XV to paint the ladies of his court, including Marie Leszczynska and Madame de Pompadour.

His graceful, elegant portraits were characteristic of the period. Elegance and tact overcame faithful characterization in them. He usually treated his subjects as mythological themes portrayed in soft, rounded lines and light colors, especially a bright blue. Nattier is well represented in European museums and his portrait of the *Princesse de Condé as Diana* is at the Metropolitan Museum of Art in New York City.

NATTY BUMPPO, bŭmp'ō, the central character in James Fenimore Cooper's *Leatherstocking Tales* (q.v.).

NATU LA (Nathu La), nä'tōō lä, Himalayan pass, Sikkim, Protectorate of India, on the Sikkim-Tibet border, at an altitude of about 14,000 feet, 15 miles northeast of Gangtok. This much-traveled pass is on the main road which leads from Sikkim into the Chumbi Valley, Tibet, and connects with the main India-Tibet trade route. When snow closes the Jelep La six miles southeast, Natu La often is used as an alternative.

NATURAL BRIDGE, village, New York, in Jefferson County, eight miles northeast of Carthage. This tourist resort has a natural bridge and caverns carved out of limestone by the Indian River. The caverns extend about 1,000 feet underground. Pop. (1950) 600.

NATURAL BRIDGE, village, Virginia, in Rockbridge County, 16 miles south of Lexington, near the James River, at the entrance to Jefferson National Forest. A famous natural bridge over Cedar Creek, one of the natural wonders of America, is located just west of the village. This limestone arch is about 215 feet high, 50 to 100 feet wide, and has a span of about 90 feet. It was once part of a cave roof or the roof of an underground tunnel through which the creek flowed. Thomas Jefferson owned the bridge at one time and a public highway now passes over it. There also are magnesia and lithia springs and a saltpeter cave in the village. Pop. (1950) 950.

NATURAL BRIDGES NATIONAL MONUMENT, Utah, in the southeastern part of the state, San Juan County, about 30 miles west of Blanding, with an area of 2,649.7 acres. It consists of three natural bridges, spectacularly carved out of sandstone by erosion. The bridges cross canyons as much as 2,500 feet deep in a 6,000-foot high plateau. Sipapu Bridge, the largest, is 222 feet high with a span of 261 feet. Its name, taken from Hopi legends, refers to the gateway through which men's souls emerge from the underworld and finally return to it. Kachina Bridge is next in size with a height of 205 feet and a span of 186 feet. Its name is a Hopi word for "sacred dance" and it was chosen because Hopi dance symbols were found carved on the bridge. Owachomo (Hopi "flatrock mound") is 108 feet high, has a span of 194 feet, and is considered to be the oldest (at least 10 million years old). The colors of the bridges range from salmon pink to deep violet.

Cliff dwellers originally inhabited the area and a series of their dwellings and caves remain in the canyon walls. Ute and Paiute Indians displaced them at least 500 years ago. The first known white visitor was a man called Cass Hite who explored the region in the 1880's. In 1908 they were set aside as a national monument.

NATURAL GAS. See Gas, Natural; Mineral Production of the United States.

NATURAL HISTORY, American Museum of. See American Museum of Natural History.

NATURAL HISTORY, in its widest sense, that department of knowledge which comprehends the sciences of zoology and botany, chemistry, natural philosophy or physics, geology, palaeontology and mineralogy. It is now, however, commonly used to denote collectively the sciences of botany and zoology, or these together with geology, mineralogy and palaeontology, exclusive of physics and chemistry, and it is sometimes restricted to denote the science of zoology alone.

NATURAL HISTORY OF SELBORNE, The, a celebrated work by Gilbert White (q.v.), published in 1789. Its material consists of White's letters to Daines Barrington and Thomas Pennant, in which the writer describes outdoor life in the little Hampshire village which his works made famous and interesting alike to students of nature and to lovers of good books, among which the *Natural History* ranks as a classic of science and of letters.

NATURAL LAW. For more than two millenniums the idea of natural law or the law of nature has played a prominent part in philosophical thought and political theory. It has been applied in each field as a criterion of contemporary ideas and institutions and thus has served to justify either conservatism or change. However, since the words *nature* and *natural* have many meanings, the modern attempt to extend a consideration of natural law beyond ethics and politics to natural sciences has created ambiguities and has caused the doctrine of the law of nature to be challenged by materialists since the mid-18th century.

Although there has been much difference of opinion about the contents of the law of nature, yet almost all admit the existence of such a law. Many definitions of natural law have been given by Greek philosophers, Roman jurists, patristic theologians, medieval scholastics, and modern savants. But generally, throughout most of mankind's western history, the notion of natural law has been conceived as the ultimate norm of right

and wrong, as the ideal pattern of the life according to Nature, as the law discernible to reason and distinct from what positive law has been contained in codes established by the state or the church.

Probably the most influential *description* of natural law is that formulated by the Eastern Roman Emperor Justinian the Great in 533 A.D. when in his *Institutiones* (I.2.11), he declares: "The laws of nature, which are observed equally among all nations, established—as it were—by divine providence, remain ever firm and immutable." Perhaps the best *definition* of natural law is that furnished by St. Thomas Aquinas in 1269 when in his *Summa Theologica* (I-II.91.2) he writes: "The function of the natural law" is to "discern what is good and what is evil. . . . The natural law is nothing else than the rational creature's participation of the eternal law."

If we combine the above description and definition, we can consider that natural law is (1) that part of morality which provides universal rules for governing man's external acts; (2) the code dictated by conscience. It is not a law deduced from human education and experience, but a law regulating man's general rights and duties in relation to God's or Nature's moral government and man's moral capacity and accountability. From these considerations we find that the law of nature has three characteristics: (1) universality, because its precepts are always the same in all times and among all peoples; (2) necessity, because it is a demand upon man's rational nature; (3) immutability, because it is independent of all human authority.

The conception of natural law appears early among historical conceptions of justice. The opinions of Marcus Tullius Cicero (106–43 B.C.) perhaps have had the most influence of several opinions current before the Christian era. Influenced by Greek Stoicism, Cicero repeatedly and eloquently exalts the natural law which he calls "the supreme law, which was born in all the ages before any law had been written or any state had been established" (*De Legibus,* I.6.19). He claims that "True law is right reason in agreement with nature; it is universal, unchanging, everlasting; it summons to duty by its commands; it averts from injury by its prohibitions" (*De Republica,* III.22.33.). But Roman jurists eventually identified the characteristic concept of natural law (*jus naturale*) with the law of nations (*jus gentium*), a system of positive law which incorporates principles found in the laws of all nations, which points to a similarity in the ideas of all peoples, and which is common to the whole human race (Justinian, *Institutiones,* I.2.2).

During the Middle Ages natural law was conceived mostly in its humanistic aspect, that is, in its application to particular conditions. Because of the dominant religious trend of those troubled times, the law of nature was identified with the law of God. Gratian, the codifier of canon law (*jus canonicum*), considered natural law as what is contained in the Law and the Gospel whereby everyone is commanded to do to another what he wishes to be done to himself, and is forbidden to inflict upon another what he does not wish to be done to himself. In other words, natural law became identified with the so-called golden rule of Matthew 7:12 and Luke 6:31 (*Concordia Discordantium Canonum,* I. D. 1, praef.).

After the Protestant Reformation the theories and doctrines of natural law were prominent in discussions both on international law (*jus inter gentes*) and on general jurisprudence. International law was, in fact, built on natural law by Hugo Grotius (1583–1645) who held that human laws can establish nothing contrary to nature (*De Jure Belli et Pacis,* II.3.6). In general jurisprudence, Sir William Blackstone (1723–1780) maintained that no human laws are valid if they are contrary to the law of nature and that such of them as are valid derive all their force and all their authority from the natural law (*Commentaries on the Laws of England,* introd., sect. 2, p. 41). In politics and in political economy the liberal rationalists of the 17th and 18th centuries, notably John Locke and Jean Jacques Rousseau, adopted natural law to assert man's claim to the natural rights of life, liberty, and the pursuit of happiness. These natural rights are recognized in the American Declaration of Independence (1776) and in the French Declaration of the Rights of Man and of the Citizen (1789), both instruments born of political revolution.

Despite the attacks of totalitarian foes, the concept of natural law has survived into the 20th century to reassert mankind's natural rights—notably in the Universal Declaration of Human Rights (1948) promulgated by the General Assembly of the United Nations.

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NATURAL RESOURCES. See individual countries.

NATURAL RIGHTS. See Natural Law.

NATURAL SELECTION, the theory proposed by Charles R. Darwin and Alfred Russel Wallace in 1858 to explain the vast diversification of species in the plant and animal kingdoms, with their multitudes of distinct types adjusted to meet almost every possibility of self-maintenance in the variety of conditions set by the external world. Natural selection bears upon the phenomena of evolution in general. The facts in nature from which the theory of natural selection is argued are the great diversity of individual organisms; the heritability of variant characters; the enormous overproduction of plant spores and seeds and of animal eggs and young; and the consequently inevitable "struggle for existence." Parallel to the artificial selection of variants by man in breeding domestic animals, it is inferred that there is a natural selection in nature favoring advantageous variants and tending to eliminate disadvantageous ones. Modern interpretation emphasizes selection of groups rather than selection at the individual level. Progressive divergence of plant and animal populations is regarded as arising from the greater breeding potential of members of each generation that vary

in the direction of better adjustment to their environment—to some particular feature of it, to environmental changes, or to newly-invaded, different environments. Less favorable variations have a correspondingly lessened probability of survival, and accordingly are progressively eliminated. Adaptation is, therefore, the basis for selection. Continuous structural modifications, in line with a constantly changing environment, lead to the origin of new species. Darwin also stressed sexual selection, which is a factor in developing courtship adornments of animals and other sex differences.

Improved adjustment to the environment may be physiological, anatomical, or behavioral. It may consist of improvements in internal physiology—capacity to digest special foods, greater resistance to heat or cold, or improved internal controls of body functions (homeostasis). Adaptation also may involve varied mechanical adjustments of body parts to opportunities offered by the environment such as locomotion above or below the ground, in trees, or in the air. Special habits of food getting, mating, and reproduction, or self-defense likewise may cause similar adaptations. It is very striking that improved or changed adjustments may lie wholly in changes of behavior, without discernible changes of structure. A good example is found in the nest-building instincts of animals, which are inherited just as are their color, form, and physiological changes.

One of the principal objections to the theory of natural selection is that the incipient variation would be of too little advantage to be favored. This does not seem to be the case with variations in behaviour. In the development of *acquired* (physical) characters, special behavior sets the stage for preserving any incipient *heritable* variation, either structural or behavioral. This is referred to as the "Baldwin principle" by George G. Simpson (1953) and Conrad H. Waddington (1953). Geographic isolation explains another difficulty in establishing the origin of new forms. This factor was underemphasized by Darwin according to Moritz F. Wagner (1868), Ernest Mayr (1942), Warder C. Allee and others (1949). There are many instances in which a character that has become established and distinctive under conditions of isolation is preserved in a distinct species when parent form and derived form are brought together again.

A specific objection formerly was raised against the interpretation that natural selection is the operative factor in producing the slight differences that appear to be adaptive. A good example is wild mice's coat color, which varies and tends to blend with the color of their native terrain. Francis B. Sumner was able to demonstrate by breeding experiments in 1932 that minor differences in the color of the hair of white-footed mice (the most abundant and ubiquitous of North American wild mice) are inherited. Lee R. Dice devised another set of experiments in 1947 to meet the further objection that such color differences and resemblances to soil could not afford effective protection to the mice because they are nocturnal. He used owls as the natural predator and simulated the conditions of terrain and light in laboratory cages. Statistical analysis of the results showed that the differential in the number of mice captured from a natural background, as against one to which their color was not adjusted, was such that rapid evolution by selection would take place.

The effectiveness of natural selection in relation to predation was tested by Sumner in 1935 in an ingenious experiment with small fishes that have the capacity for color change. A considerable number of such fishes were placed in two tanks, one painted black on the inside and the other white. In a few weeks the color of the fish matched their respective tanks. When two small penguins were introduced as typical predators into each tank with an equal number of black and white fishes the penguins ate the fishes voraciously. After the two penguins were removed, three-fourths of the fishes eaten in the black tank were white, whereas in the white tank the majority eaten were black. This differential certainly makes possible effective selection for either background resemblance or for the capacity to adjust to background by color change. Further experiments by Dwight Isely in 1938 with protectively-colored grasshoppers and chickens as predators fully confirm Sumner's results.

The rapid development of insect strains immune to DDT and other insecticides (Henry J. Quayle, 1943) and rusts capable of attacking rust-resistant strains of wheat and other cereal grains (Helen Hart, 1944) indicate a *selection pressure* affecting all organisms in their flow from generation to generation.

Paleontologists, ecologists, and geneticists have contributed to the interpretation of the natural selection theory. The fact that cooperation may be a characteristic of "survival value" throws much light on the evolution of societies and on the evolution of man, according to authors Julian S. Huxley (1942), George G. Simpson (1944, 1949, 1953), Warder C. Allee and others (1949). See EVOLUTION, ORGANIC; DARWINIAN THEORY; GENETICS; and HEREDITY.

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NATURAL TONES are tones produced by the natural alteration of nodal points in wind instruments by pressure only. See also HARMONICS.

NATURALISM, in the fine arts, is a representation of nature closely approximating its appearance, but without either photographic fidelity or attempt at illusion. Opposed to *idealism* and implying less crudeness than *realism* naturalism is the mean between the two.

In literature, naturalism is a style of fiction writing which aims at scientific objectivity in the portrayal of characters conceived of as motivated primarily by impersonal biological, economic, and social forces. Thus the social environment, rather than individual character, is the driving force affecting plot development. The forerunners of naturalism in France were Stendhal and Balzac. Flaubert, acclaimed a leader of the school, rejected both the terms "naturalism" and "realism" as not applicable to his work. The Goncourts and Alphonse Daudet, usually regarded as of this school, might better be termed impressionistic than naturalistic writers. Émile Zola defined the naturalistic method and is popularly regarded as the exemplar of the type; but the novelist of

that late 19th century epoch best deserving the title is Guy de Maupassant.

From France naturalism spread to other countries. George Gissing and George Moore were leading British novelists who adopted the method, while in the United States Stephen Crane and Frank Norris were prominent early followers of a movement that soon became worldwide.

NATURALISM. In philosophy, this term stands (1) for a certain type of philosophy in general or (2) for a certain kind of ethical theory. In the former usage naturalism is sometimes defined as a particular way or method of approaching philosophical problems and sometimes as a particular set of conclusions arrived at as answers to these problems. Thus many naturalists describe naturalism, not as a theory of the nature of reality, but as a specific temper of mind, namely, a confidence in the empirical, experimental, or scientific method as the only reliable method of reaching the truth about man and the world, or of guiding action; and a rejection of faith, revelation, authority, tradition, a priori reasoning, and intuition as sources of truth or guidance. For it all meaning originates in experience, and all beliefs must be tested by experience in accordance with the general canons of scientific method. In this sense, then, naturalism is roughly equivalent to empiricism.

On other occasions naturalism is described primarily as consisting of certain philosophical conclusions which are opposed in general to the characteristic doctrines of religion, supernaturalism, and idealism. The main tenets thus ascribed to naturalism are the following. (a) Every state of the world or event in it can be explained causally or mechanically by reference to previous states or events, or else is the result of chance. Teleological or purposive explanations are not necessary or even possible, and no cosmic purpose is involved in the world process. (b) No God or other supernatural being or kind of entity (such as Plato's Ideas) is required to explain the world, and, indeed, no such beings exist at all. The natural world of objects and events in space and time is all that is real, and it is self-existent and self-explanatory or else is simply inexplicable. (c) Man is wholly a part of this natural world in space and time, both as to body and mind and as to origin and destiny. No element of his being is immortal, and he is only an incidental product of the world process, whether considered as an individual or as a species. (d) There are no absolute values or transcendental norms, known to us in non-empirical ways. All values and norms are in some sense a function of human attitudes, interests, needs, satisfactions, individual or social, or at least of natural processes and regularities. They have no support of a supernatural, nonnatural, or cosmic nature, even if they have some sort of universal validity.

It is not clear that all of these doctrines are essential to naturalism. For example, Bertrand Russell's essay *A Free Man's Worship* expresses a naturalistic view of the world, and yet he was at that time an absolutist in ethics. But at any rate, these doctrines are typical of naturalism.

The relation of naturalism (in the sense of a set of conclusions) to monism, materialism, and determinism requires comment. Naturalism is often represented as denying any dualism of mind and matter and as affirming some monistic view of their nature, and in general this is true. But, again, Russell in *Mysticism and Logic* was a naturalist and a dualist, so that monism hardly seems essential. More specifically, naturalism is frequently identified with materialism, both by opponents and by proponents. And indeed, materialists are usually naturalists, for example, Democritus and Roy Wood Sellars (though not always, for example, the Stoics). But the reverse cannot be said to be true, since many naturalists, like John Dewey and his followers, decline to call themselves materialists. Determinism likewise is said to be a part of naturalism, but there have been naturalists who were not determinists, namely, Epicurus, Lucretius, and Dewey. Naturalists commonly do hold that nature is a realm of causal law, but it is not necessary for them to do so. They may, for instance, be indeterminists in their interpretation of quantum mechanics.

We may, then, describe naturalism either as a certain view about method or as a certain set of conclusions. We should, however, not regard a man who holds this view about method as a naturalist unless he also holds this set of conclusions; nor should we call a man who holds these conclusions a naturalist unless he has arrived at them by this method. The point seems to be that, whether there is a strict logical connection between the method and the conclusions or not, in practice naturalism is a combination of the two. The naturalist adopts and generalizes the scientific approach, and following this scientific method he feels forced to accept the conclusions indicated.

In a narrower sense, the term "naturalism" is used in 20th century ethical discussions for a certain kind of ethical theory. This use of the term is due to George Edward Moore. Here "naturalism" stands for the view that ethical concepts or properties can be defined in terms of nonethical concepts or properties of the sort that appear in empirical or scientific judgments of fact. For example, if one holds that "good" means "desired" or "satisfying," or that "right" means "dictated by society" or "conducive to the general happiness," and that similar definitions can be given for all other ethical terms, then he is a naturalist in this sense. It follows on such a view that moral and other value judgments are true or false and can be established by empirical observation—in fact, ethics becomes a branch of some empirical science like psychology or sociology.

It is obvious that a naturalist in the more general sense will often be a naturalist in this narrower sense when he comes to deal with ethics and values. But one may be an ethical naturalist without being a naturalist in one's general philosophical position; one may believe, for example, that all ethical terms can be defined by reference to desire and satisfaction, and yet be a supernaturalist. One may also, however, be a naturalist in the wider sense without being an ethical naturalist, if one holds, as some do, that value judgments are not assertions which are true or false but expressions of emotion, attitude, and so forth.

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NATURALIZATION, any process by which a state confers its nationality or its citizenship upon a person after birth. Persons acquire the original nationality of the state in whose territory they are born (*jus soli*), or the state of the

parents' nationality (*jus sanguinis*), or both, according to the law of the respective states. This original nationality may change by a transfer of territory, which normally changes the nationality of permanent residents who had the nationality of the transferring state; by marriage to an alien, which under the law of some states changes the nationality of the wife; by special legislative grant of nationality to an individual or a group; or by emigration and voluntary acceptance of the nationality of the state of immigration in accordance with its laws.

While all these modes of transfer of nationality constitute naturalization in the broad sense, the term is often applied in a narrower sense only to the last method. Nearly all states now have general laws declaring the conditions under which individual naturalization may be effected. Qualifications in respect to length of residence, age of the applicant, and moral character are usually prescribed, and qualifications as to literacy, wealth, health, beliefs, culture, and race must sometimes be complied with. Naturalization is often treated as an executive process, sometimes as a legislative or judicial process. Formal application (first papers) usually has to be made some time before naturalization (second papers) is finally granted. Sometimes the latter is celebrated by a formal ceremony involving the taking of an oath of allegiance. In the interval between formal application and the final grant, the applicant sometimes has to submit to certain tests and investigations to make sure that he conforms to the requirements of the law.

Limitations of International Law upon Naturalization.—Nationality, as a legal status, is to be distinguished from citizenship (q.v.). The latter is a status under the law of a state which confers certain legal advantages and imposes certain obligations upon the individual. Nationality, on the other hand, is a status under international law giving a state the right to legislate for and protect its nationals, even in foreign countries. While, in general, nationality is derived from citizenship and both from the law of the state, international law imposes certain general limitations upon the capacity of the state to confer nationality and treaties may impose special limitations. (Tunis Nationality Decrees, P.C.I.J., Ad. Op. No. 4; Acquisition of Polish Nationality, P.C.I.J., Ad. Op. No. 7, World Court Reports, vol. 1, pp. 156, 245.) International law may also consider a person a national of a state even though that state had not conferred citizenship upon him. Thus, in the United States, Indians in the tribal condition and the native inhabitants of the insular possessions were originally nationals of the United States but not citizens; however, special legislation since 1924 has conferred citizenship upon the Indians and upon persons born in the islands since their acquisition by the United States.

While international law permits a state to impose nationality at birth upon individuals according to the law of the soil (*jus soli*), or the law of the blood (*jus sanguinis*), or both, it does not in general permit a state to naturalize persons without their consent. (*Mackenzie* v. *Hare,* 239 U.S. 299.) Thus, efforts of a state to escape international responsibility for injuries to resident aliens by passing laws (so-called Calvo clauses) declaring that such persons who acquire land or concessions are to be regarded as its nationals in respect to such interests have been held invalid by arbitral tribunals. (*North American Dredging Co.* v. *Mexico,* U.S.-Mexico Claims Commission, Opinions, 1927, p. 21.)

International practice has permitted the imposition of nationality upon wives and minor children of men who naturalize, but the modern tendency has been to permit a married woman to retain her original nationality. The inconvenience which often follows from the division of the family on nationality lines has induced some states to create a presumption that all members of the family have the nationality of the husband and father, to be overruled only by express declaration of an intention to retain the original nationality.

In transfers of territory, the practice permitting imposition of the new nationality upon permanent residents of the territory who have the transferring state's nationality has often been mitigated by treaties giving such persons the option to retain their original nationality by declaration within a stated period of time. (*Schwartzkopf* v. *Uhl,* 1943, 137 F. 2nd 898.) In the treaty of peace between the United States and Spain in 1898, this option was given to natives of Spain resident in the ceded islands, but not to natives of the islands. The United States treaties acquiring California (1848) and Alaska (1867) included similar provisions, but no such option was permitted in the treaties for the annexation of Louisiana (1803) and Florida (1819). Treaties ending the world wars of the 20th century have generally given the inhabitants of transferred territory an option to retain their original nationality by suitable declaration, at least if they spoke the language of the ceding state.

In individual naturalization, international law requires that it be a voluntary act of the applicant, open only to persons clearly connected with the naturalizing state by permanent residence or service in a civil or military capacity. In the absence of such conditions, the state of alleged naturalization cannot protect the individual against another state. (*Nottebohm* case, *Liechtenstein* v. *Guatemala,* I.C.J., 1955.)

Dual Nationality and Statelessness.—Although international law imposes limitations upon the capacity of states to make naturalization laws, yet within these limitations states have wide discretion, and a difference in the laws of states may create conditions of dual or multiple nationality or of statelessness. Efforts have been made to develop international law by treaties to avoid such conditions. The Conference for the Codification of International Law, called by the League of Nations in 1930, drew up three conventions at its session at The Hague, based upon its conviction "that it is in the general interest of the international community to secure that all its members should recognize that every person should have a nationality and should have one nationality only."

Dual or multiple nationality may exist at birth when a person acquires the nationality of one state by the *jus soli* and of other states by the *jus sanguinis,* which is sometimes applicable both to the father and the mother if they have different nationalities. One of the Hague conventions of 1930 sought to avoid this by permitting the individual to choose, and by requiring third states to recognize that he had only the nationality of the state with which he was most closely connected.

A person may be born stateless if the state in whose territory he was born applies only the *jus sanguinis* and the state of his parents' nationality applies only the *jus soli.* To avoid this, one of the Hague conventions provided that states accord their nationality to persons born in their territory who would not otherwise acquire any nationality, provided the mother was a national.

Dual nationality may also arise from the refusal of the state of origin to recognize naturalization as effecting expatriation. The common law maintained the principle of permanent allegiance, and Great Britain's refusal to recognize the naturalization of British subjects in the United States was a contributing factor to the War of 1812. Strangely, while the United States was insisting through its diplomats that naturalized persons had expatriated themselves and could not be impressed into the British naval service, American courts continued to support the common law doctrine of permanent allegiance until 1868, when Congress declared that "the right of expatriation is a natural and inherent right of all people," that any order or decision of any officer of the United States to the contrary was invalid, and that "all naturalized citizens of the United States while in foreign countries are entitled to and shall receive from the government the same protection of person and property which is accorded to native born citizens." The United States has made a number of treaties since that time providing for expatriation by naturalization. Great Britain abandoned the principle of permanent allegiance, by statute, in 1870.

Married women may have dual nationality or be stateless because of a conflict of laws concerning the effect of marriage to an alien or the naturalization of the husband upon the nationality of the wife. If the law of the husband's state recognizes the unity of the family under his nationality and that of the wife's state recognizes individual nationality, the wife will have dual nationality. But if the situation is reversed, the wife will be stateless. One of the Hague conventions provided that the wife shall not lose nationality by marriage to an alien or by the naturalization of her husband unless she acquires his nationality, and the naturalization of the husband shall not change the wife's nationality without her consent.

NATURALIZATION LAWS

Although nationality is a fundamental relationship in both international and national law, national laws governing the matter vary greatly among states and in most modern states have been subject to frequent and radical changes. The general character of naturalization laws depends in considerable measure on the country's situation regarding immigration and emigration. Young, sparsely populated, and rapidly developing countries, such as those of the Americas, have generally welcomed immigration and have consequently provided by law for easy naturalization, resulting in loss of previous allegiance. Old, more densely populated, and less rapidly developing countries, such as those of Europe, have had little immigration and have often sought to discourage emigration, to make naturalization difficult, and to recognize expatriation only if the government consents. Countries generally tend to take this position in time of war.

The United States shifted its position after World War I from one of welcoming immigration and naturalization to one of imposing rigorous restraints on economic, cultural, and political grounds. Restrictions based on national origin, literacy, health, moral character, and ideology have created serious obstacles to immigration and naturalization. On the other hand, the human rights movement, which demands equality for women, equality of races and economic opportunity, and freedom of movement, has tended toward the elimination of arbitrary racial and other discriminations, and toward the relaxation of restrictions in favor of refugees. These diverse pressures have led to numerous special laws and regulations in the field of immigration and naturalization, especially in the period after World War II. The same factors have been operative, though in less degree, in other countries, and naturalization laws have become increasingly fluid.

United States.—The Constitution authorizes Congress "to establish an uniform rule of naturalization" (Article I, section 8, clause 4), and an act of 1790 provided that the children of citizens of the United States born abroad should be considered "natural born citizens" provided the father had been at some time resident in the United States. An act of 1855 eliminated the term "natural born" and made it clear that nationality could be conferred *jure sanguinis* only by the father. The act of 1790 also provided for the naturalization of "free white persons" who had resided in the United States for at least two years. This period was raised to five years in 1795, to 14 years by the notorious alien acts of 1798, and restored to five years by an act of 1802, which also provided for the automatic naturalization of minor children upon the naturalization of the father.

After the Civil War, an act of 1870 extended the naturalization act to "aliens of African nativity and to persons of African descent." An act of 1882 forbade the naturalization of Chinese. A series of judicial decisions held that Chinese (before the act of 1882), Japanese, Hindus, Afghans, Filipinos, Koreans, and Hawaiians were not "white persons," but that Syrians, Armenians, and Mexicans (even though largely of Indian blood) were. Thus Asiatics east of Persia could not naturalize and, as immigration was made contingent upon capacity to naturalize, could not migrate to the United States. These discriminations were eliminated with respect to the Chinese by an act of 1940 and the treaty of 1943 with China. The McCarran-Walter Act of June 27, 1952, eliminated explicit Asiatic discriminations, putting all Asiatics and Africans on the national origins quota first introduced for Europeans by the act of 1924. In accordance with this principle, the total permitted immigration (154,000 a year as of 1955) is apportioned among all countries in proportion to the estimated contribution of that country to the American population as it was in 1920. Asiatics and Africans are limited to a quota of 100 from each country. Eastern Europeans have very small quotas, while the British, Irish, Germans, and Scandinavians have the largest.

The act of 1855 provided for the first time that women eligible for naturalization became citizens automatically on marriage to a citizen. This was repeated in the law of 1907, with the addition that an American woman would lose her nationality on marrying a foreigner but could

resume citizenship at the termination of the marital status if she registered in an American consulate or returned to the United States.

The 14th Amendment, which went into force in 1868, gave constitutional validity to a principle which had been accepted in a law of 1866, by providing that "All persons born or naturalized in the United States, and subject to the jurisdiction thereof [thus excluding tribal Indians, children of foreign ambassadors, and natives of unincorporated territories of the United States], are citizens of the United States and the State wherein they reside." Previously, citizenship had been primarily a state matter, federal citizenship being a derivative. It was held that even Chinese and other persons ineligible to naturalization were citizens if born in the United States. (*United States* v. *Wong Kim Ark,* 1898, 169 U.S. 649.)

The act of 1868, already noted, provided for expatriation upon naturalization and the act of 1907 created a presumption of expatriation of naturalized citizens who resided for two years in the country of origin or five years in any other country without registering at a United States consulate.

Comprehensive regulations for naturalization were provided for the first time by an act of 1906. It gave federal district courts and state courts of record jurisdiction in naturalization; established a Bureau of Immigration and Naturalization, changed in 1933 to the Immigration and Naturalization Service in the Department of Labor; and provided in detail for naturalization procedures. Five years' residence was required and a declaration of intention (first papers) had to be made at least two years before final naturalization. As amended in 1918 and 1926, this law provided that persons who had served in the United States armed services were excused from the residence requirement; and enemy aliens, deserters, anarchists, polygamists, persons not of good moral character, and persons not attached to the principles of the Constitution were excluded. Conscientious objectors were held to be in the latter category in the cases of Mme. Rosika Schwimmer, a Hungarian pacifist (*United States* v. *Schwimmer,* 1929, 279 U.S. 644, 652), and Professor McIntosh, a Canadian conscientious objector in the Yale Divinity School (*United States* v. *McIntosh,* 1931, 283 U.S. 605, 626).

The Cable Act of 1922 modified the act of 1907 by providing for individual naturalization of women married to citizens, with a reduction of the residence requirement, and for retention of citizenship by American women marrying foreigners in the absence of an express renunciation of citizenship. An act of 1934 further equalized the status of men and women by permitting acquisition of nationality *jure sanguinis* through the mother as well as the father, and permitting a reduction of the residence required for the naturalization of an alien marrying an American woman.

An act of 1940 codified the law of nationality, and permitted the naturalization of Chinese, Indians, and Filipinos. By the Alien Registration Act of 1940, all aliens living in the United States for 30 days or more were required to be registered and fingerprinted. Over 5 million registered during the next year. The Internal Security Act of 1950 required the annual reporting of all alien residents. Some 2 million reported in 1951, of which two thirds were Mexicans (324,000), Italians (229,000), Canadians (217,000), Poles (213,000), British (193,000), Russians (126,000), and Germans (118,000).

The entire field of immigration and nationality was again codified by the McCarran-Walter Act of 1952, passed over President Harry S. Truman's veto. It occupies 118 pages in the statutes and repeals 48 acts previously in force on the subject. The act made all Asiatics eligible for naturalization and immigration, extended the quota system to Asian countries, gave a preference to immigrants with special skills and with family connections in the United States, and introduced new qualifications for immigration and naturalization designed to exclude the ill, indigent, illiterate, immoral, and seditious, including Communists. The design was to facilitate the rapid naturalization of aliens lawfully in the United States. Declarations of intention two years before naturalization were no longer required and naturalization could be effected 30 days after petition and rigorous examination. The act also provided for cancellation of naturalization by discovery of fraud, by seditious behavior, or by prolonged residence abroad. The administration of the law was entrusted to the attorney general and the secretary of state.

The number of annual naturalizations has varied greatly. It reached a peak of 442,000 in 1944 and a low point of 55,000 in 1951, rising to 118,000 in 1954. Of this number, about two thirds originated in nine countries: Great Britain (16,565), Canada (13,062), Germany (11,679), Italy (10,926), Poland (8,342), Japan (6,750), Ireland (5,324), Soviet Union (3,832), Mexico (3,710). The large number of Japanese reflects their eligibility resulting from the act of 1952.

Great Britain and the Commonwealth.— The British Nationality and Status of Aliens Act of 1914 repealed earlier legislation and for the first time dealt with the subject comprehensively. It defined natural born British subjects as including "any person born within His Majesty's Dominions and allegiance" or born in a British ship even in a foreign port, and "any person born out of His Majesty's Dominions whose father was at the time of that person's birth a British subject." The secretary of state was authorized to grant certificates of naturalization to aliens who had resided in British territory for five years or had served the crown for that length of time, provided they were of good character, had "an adequate knowledge of the English language," intended to continue British residence or service, and took an oath of allegiance. The act also provided for revocation of naturalization obtained by false representation or in case evidence emerged of trading with an enemy, of continued allegiance to an enemy, of serious crime within five years of naturalization, of bad character at the date of naturalization, or of seven years' residence abroad other than in British service or in the service of a British business or institution. The act gave governments of British possessions similar powers to issue certificates of naturalization, provided that, in a self-governing dominion, the legislature had conferred such powers.

This act provided that the wife of a British subject should be deemed a British subject and the wife of an alien should be deemed an alien. An amendment of 1933, however, provided that a woman would not lose British nationality by

marriage to an alien or by the naturalization of her husband unless she acquired her husband's nationality. Provision was also made for a British woman who married an alien to retain British nationality by declaration. Furthermore, the naturalization of an alien would not naturalize his wife unless she consented by declaration.

The Nationality Act of 1948 re-enacted most of the earlier legislation, but provided that "British subjects" should include "citizens" of the United Kingdom and of the scheduled dominions. It also provided for acquisition of United Kingdom "citizenship" by birth and by naturalization.

The British Dominions in general adopted the British legislation of 1914. In principle there is a common allegiance of the crown, and therefore, as provided in the act of 1948, nationals of all British Dominions have a common status of "subjects," which can be acquired by naturalization under authority of any government of the Commonwealth. Prior to this act of 1948, the Dominions might create a local citizenship or nationality not in conformity with the British Nationality Act of 1914 and, therefore, not making the individual a subject of the crown in the general sense.

The Irish Free State, by the Constitution of 1922, provided for the status of "citizen of the Irish Free State," not precisely conforming to the status of British subject. Ireland has subsequently ceased to be a member of the Commonwealth, and India, though it continues to be a member of the Commonwealth, has not, since it achieved independence, considered its nationals subjects of the crown.

Other Countries.—The variety of the laws in effect in other countries can be illustrated by statistics for 71 countries, based upon those prepared for the Harvard Research in International Law in 1929. Nationality at birth is acquired solely by the *jus sanguinis* in 17 countries, including the Soviet Union, Germany, Austria, Hungary, Switzerland, China, Japan, and most of the countries of Eastern Europe; primarily by the *jus soli,* but with limited provision for *jus sanguinis,* in 27 countries, including the United States, Great Britain, the British Dominions, and most Latin American states; by both systems, with primary emphasis on the *jus sanguinis,* in 27 countries, including France, Spain, the Scandinavian countries, Italy, Turkey, and most Western European and Middle Eastern states.

The age required for naturalization varies from 18 to 25 years and the period of residence required from one to ten years, with five years the commonest. Most states provide for a shortening of the period of residence for persons married to a national or employed in the state's military or civil service. Nearly all countries provide for automatic naturalization of minor children on the naturalization of the father.

The naturalized citizen enjoys an equal status with the native-born citizen in 10 countries, including Great Britain and Canada. In other countries, the naturalized citizen is under certain disabilities, especially ineligibility for certain offices, as in the United States, or subject to expatriation by prolonged foreign residence. Thirty-seven countries, including the United States, Great Britain, Germany, and Japan, recognize automatic expatriation by naturalization abroad; 24, including France, the Scandinavian countries, and China, require the consent of the country of origin, in most cases to assure fulfillment of the military service obligation. Seventeen countries regard foreign military or civil service as automatically resulting in expatriation, and 13 recognize such a result conditionally. Twenty-nine countries, including the United States, provide for expatriation of manifestations of disloyalty or bad character; 19, by extended residence abroad.

In the 19th century, nearly all countries provided for the naturalization of alien wives by marriage to a national or by the naturalization of the husband, but since the United States Cable Act of 1922, a large number of countries, including Argentina, Uruguay, and the Soviet Union, have eliminated one or both of these rules. Similarly, in the 19th century most countries provided for the expatriation of women on marriage to an alien or on the naturalization of the husband, but since World War I the United States, Great Britain, the British Dominions, France, Germany, Italy, Japan, the Scandinavian countries, and many others have eliminated this rule.

Naturalization laws have fluctuated between the principles of family solidarity, national solidarity, and individual freedom of choice. While the latter principle has in the main prevailed since World War I, the principle of national solidarity has not disappeared and has even been strengthened in some countries since World War II as a consequence of radical ideological cleavages and the "cold war." See also ALIEN; CITIZENSHIP.

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QUINCY WRIGHT.

NATURE STUDY, the study of our natural surroundings. This means the near and the far away, the very small and the extremely huge, the visible and that which is invisible. It means trees, birds, bacteria, clouds, wind, rocks, and stars. It also includes sounds we can hear, heat that we can feel, gravity that pulls us to the earth, and a number of radiations that, like radio, require special instruments to detect. In short, it includes everything and anything that is natural as well as man-made gadgets that depend upon natural materials and forces for their operation.

In the early history of mankind the natural environment was the source for food and shelter. Natural materials were used to fashion tools and natural fires were tamed to provide heat and light. The calls of animals could indicate danger or mere contentment and man learned to know the difference because life depended in large part upon such knowledge. Lightning and thunder were frightening until their nature was understood. Man was curious about his surroundings and tried to find out just how ordinary rocks or minerals might be changed to precious metals such as gold and silver. Much of what was in part observed and in part imagined became folklore, and various sayings, especially sayings about the weather, were passed from person to person and from generation to generation. When a written language was developed much of what had been

passed by word of mouth became a written record and many aspects of nature were included in such writings. Here one can find the observations and thoughts of the great philosophers. The great religious leaders found that the use of commonplace knowledge about nature could be made the basis of their moral and ethical lessons. Such ideas were taught as parables and many of these have meaning to people today because accurate observations and reports of natural events have an element of permanence that depends very largely upon the accuracy of the observer and the honesty and care of the reporter. Thus we can say that nature study is as old as man himself.

Nature study is commonly a part of elementary school work but it is often carried on rather informally. Just as children must have asked questions about the wind, stars, insects, and birds of John Amos Comenius (1592–1670), so they ask questions about natural things and their environment today. Comenius is credited with preparing the first schoolbook with pictures so we have reasons to think that he began the trend toward our illustrated books of today. He taught that the beginning of knowledge was with the seeing and hearing and other sense impressions of things. He argued that the beginning of teaching should also be with actual things—real and useful things that could be noted by the senses. After having observed real things there would be opportunities to tell about them and to develop a written record. The ideas of Comenius were developed by Jean Jacques Rousseau (1712–1778) and were given wide acceptance through Johann Heinrich Pestalozzi (1746–1827) who emphasized the need for studying the child and taught that sense impressions of nature were the true foundations of instruction and the only true bases of human knowledge. Since these early recorded ideas concerning nature study were promoted on the European continent, one is impressed with the greatness of Benjamin Franklin (1706–1790) who was advocating the study of nature when Pestalozzi was only three years old. In this connection it is with a sense of pride that we can read from *Franklin's Proposals Relating to the Education of Youth in Pennsylvania* that " . . . Children are capable of studying nature, for they have eyes, and don't want curiosity; they ask questions, and love to be informed; and here we need only awaken and keep up in them the desire for learning and knowing, which is natural in all mankind."

North America was a relatively new continent in the time of Franklin and this newness brought a host of explorers many of whom were serious students of nature. They also prepared written and often artistic records of the natural environment. A host of such persons can be named and their contributions to nature study cited. Such persons as John Bartram (1699–1777), André Michaux (1746–1802), Alexander Wilson (1766–1813), Benjamin Silliman (1779–1864), Asa Gray (1810–1888), Louis Agassiz (1807–1873) and many others have left a heritage of nature study in America that has been carried forward by a growing number of persons who have studied natural materials and events and who, through their work, have also influenced the education of youth.

Nature study as a part of educational practices in our schools was given its great initial beginnings by such persons as Edward Austin Sheldon (1823–1897), William Torrey Harris (1835–1909), and Wilbur Samuel Jackman (1855–1907). Sheldon is often looked upon as the person who introduced the nature study idea into the United States through his enthusiasm for, and development of, the object study method. He came to this idea at a training institute held in Toronto in 1859 where he saw collections of things and their educational values in an exhibit developed by Pestalozzian workers in England. He brought these ideas into the Oswego (New York) Primary Teachers' Training School where teachers from many parts of the United States came to study. His book *Lessons on Objects,* published in 1865, also helped to extend the idea. Harris became superintendent of schools in St. Louis and later United States Commissioner of Education. His work in developing a syllabus in nature study for the St. Louis schools in 1871 did much to introduce nature study into schools of the United States. Jackman grew up in Pennsylvania and became head of the teacher training work at the University of Chicago. He put his ideas about nature study in several textbooks and in 1903 presented his ideas in the 3d *Yearbook of The National Society for the Study of Education.* Much of the nature study emphasis in education is due to the efforts of the educators and scientists that have been mentioned in the foregoing discussion.

When we discuss nature study we associate many of the ideas and developments with the work of Anna Botsford Comstock (1854–1930) and E. Laurence Palmer (1888–), and with Cornell University where they carried on much of their work. The nature study emphasis in New York State grew out of the great agricultural depression of the period 1891–1893. This depression caused youth from the farms to flock to the cities where they could not find work. The New York State Legislature, upon the recommendation of a state-wide committee, made an appropriation in part to foster the teaching of nature study in the rural schools. This was done with the idea that if youth came to know and enjoy the natural environment, they would decide to remain on the farm. The development of the program was assigned to Liberty Hyde Bailey and in 1896 he wrote the first leaflet on nature study for teachers. Bailey's book, entitled *The Nature Study Idea,* published in 1903, justified nature study to meet the objections of educators, teachers, and scientists. He gave arguments in support of the importance of early studies of nature as a means of attracting youth into an area where they may wish to do serious studies later. He answered the educators who reasoned that there should be increased stress on the classics rather than studies of toads. He reasoned with the teachers who felt that nature study could not be added to an already crowded curriculum by showing them that nature study was not anything new but only something that would make the regular school program more interesting and educational. He justified the notion that studying nature for oneself was better than to read or to be told about natural events.

Bailey emphasized that nature study was primarily a process of seeing the things that one looks at and the drawing of proper conclusions from what one sees. He felt that it was possible to educate a child in terms of the environment and in the process make life fuller and richer. He wanted the study of the environment to be careful and thoughtful so that the ideas gained would be

accurate and meaningful. Mrs. Comstock and her many associates at Cornell University developed these ideas and much of her thinking was brought together in a book, *The Handbook of Nature Study,* published in 1911. Palmer carried forward the nature study leadership at Cornell from 1919 to 1952. His extensive writing, speaking, and teaching helped both to develop and extend the emphasis on nature study as a school activity as well as its relationship to hobbies, writing, and the wise use of natural resources.

Nature study in the 1950's was a major part of the science work in our elementary schools. Much of it continues to be incidental and depends upon the questions of children about natural things and events. Curriculum leaders interested in science are giving increased attention to a planned science program which encourages youth to study many aspects of their natural environment. In almost all such programs one finds attention given to animals, plants, rocks, winds, shadows, weather, heat, stars, and other aspects of the natural environment. A real nature study curriculum leader will stress real experiences with the animals, plants, and other natural things in the immediate environment. Other leaders in elementary program planning will often stress the unusual that most children may experience only in a zoo or a botanic garden. With a stress on the unusual there is great dependence on illustrations and the accompanying text with whatever inaccuracies and unplanned distortions that the published materials may have included. This introduces the danger that nature study may become something to be learned from books alone without opportunity for the eager and direct study of natural materials and forces with all the joys of a discoverer. This danger has been of deep concern to members of the American Nature Study Society since its organization in 1908.

Some people have assumed that nature study is limited to a study of living animals and plants. Such was not the case with the leaders of the nature study movement nor is it the point of view of nature study leaders today. While their own preparation often stressed the biological aspects of nature they encourage and help the teachers with the study of rocks and minerals, the candle flame, toys of the home, electricity and magnetism and their uses, and other aspects of the physical world.

The nature study emphasis is not uncommon in our junior and senior high schools. More attention would be given to this emphasis if the teachers had had opportunities to learn from nature while making their preparation for teaching. The nature study approach is given much prominence in the methods and materials studied in many science courses in our colleges. Thus it can be said that the nature study idea has permeated and added richness to the educational process from nursery school into post-graduate work. More than that, nature study has become a hobby for millions of people who love to collect and study rocks, shells, nature photographs, and ideas for conversation or writing.

For some people nature study is an occupation and for some a profession. There are many persons who study nature and write about their observations in such interesting ways that their books are sought by people who frequent the booksellers and by librarians who seek materials for public and for school libraries. Some persons find a profession in the study of nature by means of photographic and sound equipment. They find a ready market for their photographic and related records in the moving picture industry, through illustrated lectures, and through publications.

More and more the people of the United States are growing aware of the dwindling of our natural resources. The complete disappearance of the once abundant passenger pigeon and the near disappearance of the whooping crane brings to all the challenge of learning to live with our natural surroundings. Thus there is added impetus for the study of nature with the hope that an understanding and love of nature will bring about a public opinion that will safeguard and conserve our resources so that our children and our children's children may find much to study and enjoy in our natural environment.

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NATURE WORSHIP. The worship of the heavens, the planets, the elements, the manifestation of all forms of life, vegetable and animal, including the personified life attributed to inanimate objects. Nature worship, though probably everywhere occasioned by the natural impulse of man to fear the terrific manifestations of nature and to show great respect for the powerful and the mysterious, has taken many different bypaths in the development of the various human races and families. The early investigators into the phenomena of natural religions failed to recognize this diversity of development, and they proceeded to build universal theories on divergent growths. Hence all of their theories have either partially or completely fallen by the wayside, or have survived the test of time only as a diminutive part of the original whole. Yet the work of the early investigator has not been done in vain; for, inasmuch as he has thought deeply he has set others thinking. Concerning no part of the extensive field of mythology have more divergent theories been advanced than nature worship. By various writers the origin of worship has been traced to ancestor deification, to the fructification engendered by earth and sky, to the fear inspired in primitive man by the lightning, storms and winds, to the fearful ravages of mysterious all-powerful beings who brought diseases and death. Others claim that the first worship of man was given to powerful and cunning animals and especially to the serpent. Still other writers have maintained that man's first gods were his own ancestors; while others see him worshiping the glory and majesty of the sun and the mystic beauty and mysterious healing powers of the moon. Others have traced his first religious ideas to the rains and the mists and have placed his primitive gods on

the mountains amid the sources of the streams or in the clouds, the home of the rains.

To these early mythological investigators it never seemed to occur that man's early conceptions of this nature were not at all religious in the modern acceptation of the terms; that they grew out of fear and mysterious dread. This primitive religious conception continued one of the strong features of man's worship far down into the monotheistic age of religion. Metaphorically the Jehovah of the Hebrews was a god of mysterious might who rode upon the winds and planted his footsteps upon the storm. At the sound of the horns of the priests of Israel walled cities fell down, just as the forests of old fell before the whistles of the wind gods. The fervid poetry of the greatest of the Hebrew poets is fairly alive with images borrowed from the polytheistic nature worshipers who surrounded them or with whom the race came into contact during its periods of exile. In this Hebrew poetry every phase of nature seems alive, as it is in the Greek and Roman, Egyptian, Babylonian and Indian poetry. In primitive Hindu literature and in the poetic imagery of China and Japan nature appears as one great whole deified in different yet, in many respects, suggestively similar ways. Among the American Indians the deification of the more striking forms of nature is everywhere evident. These primitive ideas became conventionalized, elaborated, amalgamated with other ideas and they long continued to act upon and to be reacted upon by society. A primitive belief was that people were drowned because spirits hidden in the depths dragged them down. The wind was supposed to cry like a lost child. The combination of the two made the Llorona of Spanish lands in Europe and America, who, crying like a lost child, leads the unwary, after nightfall, into a pool or bog where she or her attendants catches him by the legs and drags him down to death. Many primitive nature myths and unions of myths have become much more complicated than the Llorona. In fact little in nature worship even among the most primitive races now existing is to be found in anything like its original form. Hence the analysis of nature myths is a very complex and difficult matter. Yet the general conception of how primitive man thought is not difficult to understand.

Society and Nature Worship.— Although apparently simple, all modern manifestations of worship, however primitive, are in reality very complex; for society and its beliefs have, for long ages, been continually acting and reacting upon one another. In the more primitive society existing to-day, the medicine-men are universally believed to possess spiritual or magical powers. They are generally the medium between the people and the powers of the material universe and of the future world. They thus bear, in a sense, a divine character which belongs to them through the natural logic of their official position. Here we see, in the early stage of its development, one of the powerful factors in the organization of primitive beliefs of the nature worshipers into organized and complicated mythology. The governing class, consisting of priests or medicine-men, chiefs and leading warriors, early learned to claim descent from their nature gods, about whom they began to invent and relate the stories which we now call myths. The sun became the great ancestor of the Peruvian priests and nobility, of the Mixteca warrior class, as of the ruling body of other great races, the most noted of which was the Egyptian. Once this relationship had been attained the glorification of the sun became the glorification of the ruling powers and the consequent subjugation of the masses to them. Ritual, ceremony, a highly organized and disciplined priesthood and religious society followed; and of this the governing class soon became the head. Among the Toltecs in Mexico, Quetzalcoatl the wind god became the ruling deity and his superior priests, who were always chosen from the nobility, were believed to be his representatives upon earth and his lineal, blood descendants. The royal family and the nobles also represented themselves as god-born. Very frequently the king was also high priest of the nation and as such he was known as *the* Quetzalcoatl, or the chief of the gods. The principal races of Chiapas and Yucatan also believed themselves to be descended from the wind god, while the Mixtecas and several tribes of Guatemala called themselves «Children of the Sun.» The latter wore upon their breasts and backs the yellow symbol of the sun. In Persia and Egypt the complicated court life centred on the belief of the classes and the masses in the divine origin of the priesthood and the nobility and their descent from Re, the sun god. Thus the relation of religious primitive belief to the rulers of the people developed a complicated religio-political condition that finally became very complex in its nature. Out of this condition grew the acknowledged relationship of the hierarchy of the gods. This was the birth of the great religious systems of Persia, Babylonia and Egypt, which continued to grow more complex until their ultimate decline and disappearance. This, too, is more or less the path followed by the great religions of antiquity, all of which bear plainly the marks of primitive nature worship. The development of a religious theocracy gave very specified functions to the most prominent of the deities. Thus Thoth, the Egyptian wind god, being the original messenger god, became the carrier of souls; and the moon goddess, Isis, the mother of medicine and the healing art. Thoth, as the bearer of moisture and rains and the generator of growth, became the culture god, the patron of learning and the judge of good and evil in men's lives. All these conventionalized ideas of Thoth and Isis are very far removed from primitive man's conception of the wind and the moon as factors in his life. The great changes that took place were due to the peculiar organization of Egyptian society and the antiquity of her civilization.

Animism.— Primitive man undoubtedly held beliefs that we can scarcely comprehend to-day. One of these has been termed animism, a designation that appears to mean different things to different investigators and writers using it. It has been variously defined as belief in souls, spirits and magic power.

All recent investigation tends to show that primitive man made practically no distinction as to animation or life, between himself and the active elements of nature around him. The sun, moon, stars, winds, clouds, thunder and lightning were beings like himself who had at

their command very superior magic power. The stories of all Indo-Europeans and the American Indians are filled with myths depicting the contests in magic that took place between their deities and nature heroes. The Indian stories especially present characters essentially human, so human indeed that they are frequently deceived and duped not only by man himself but also by the lower animals and even at times by inanimate things. These hero characters are neither divinities, nor souls, nor spirits in the modern acceptation of the terms. They are simply the wielders of magic power. Therefore, when certain writers on mythology talk glibly about the religious emotion in the presence of nature giving birth to animism, they are speaking about the past in terms of to-day, forgetful of two facts. The first of these is that even races as far advanced in civilization as the Indians of southeastern Canada and the United States seem to exhibit no appreciation of the beauties of nature, as nature itself. The second is, that religious emotion is the result of the teachings of organized religion, exercised consciously or unconsciously to stir up such feelings. Fear and terror of any object inspired respect in all ages of the past as they do to-day. Out of these primal elemental feelings combined with that of admiration, ancient religious beliefs and systems were built up slowly from primitive nature beliefs. The belief in souls and spirits, as things apart from the existence of humanity, came very much later in the religious development of humanity.

Transmigration.—Intimately connected with animation is the belief in transmigration. In fact the one presupposes the other; and both seem to belong to certain stages in the social development of all society. The wind was a most powerful agent of destruction, the mysterious beings hidden in the clouds shouted with their thunderous voices and shot forth their darts of fire. Other beings sent forth the rain from the heavens and the mountains. Yet they all remained invisible as did the spirits that moved the trees and the water; therefore, they must possess the power of rendering themselves invisible, reasoned the nature worshipper. The same mode of reasoning accounted for spirits in everything and endowed the personified elements, planets and phases of nature with the magical power of taking upon themselves other bodily forms at will. Out of this idea of transmigration grew the Hindu belief in reincarnation, which, in the case of Vishnu (q.v.), was carried to an almost unlimited number of bodily changes, each one bringing with it a new existence upon earth. Among many fairly civilized races there still exist in the masses at least a belief in spirits that inhabit trees, rocks, lakes, rivers, mountains, hills, clouds, caves and winds; and this belief teaches us how nature worship grew up and long continued to claim the unquestioned faith of humanity. The belief that human souls may be transmigrated into the bodies of animals, and vice versa, is still held by many races and peoples, and the ghost or disembodied spirit has but recently retreated from the stronghold of science; and so recent is its departure that a goodly body of so-called scientists are gravely experimenting with and seeking data as to its existence and habits.

Another development of animism and transmigration was the belief in guardian spirits which seems to have been almost universal. Very early in his social development man is found attempting to subject to his will and his uses, by his magic, the various mysterious powers of nature. Dances, charms, incantations, amulets, magic potions and other primitive means were made use of to this end. Amulets, believed to be powerful, were carried about on the body for self-protection and the wearer made efforts to get some supernatural being to become his protector. Often this being was supposed to reside in the fetish he carried upon his person. These developed by a complexed society became, in the course of time, household gods, probably through totems. Later society made patron saints to replace the grosser conceptions of heathenism. But all hail back to nature worship with its belief in transmigrating spirits, which has been father to ghosts, fairies, pigmies and a host of good and of evil-disposed supernatural beings.

Taboo.— Connected with these supernatural beings, which later became classed as gods, demigods, ghosts, or non-natural beings, were many tabooes or restrictions on the actions of humanity with respect to these nature spirits. The taboo might be a restriction from doing a certain thing at a certain time or under a certain condition; or it might enjoin the performance of a certain act or ceremony under like conditions. The custom of observing tabooes added, in the course of time, a species of veneration and of sacredness to the act and to the object of the taboo. Thus acts intended originally for the protection of the tribe, through continued repetition, grew to be part of the most sacred ceremonies. Thus the tabooes of the nature worshipers seem to have played a very prominent part in the building up of their most revered religious rituals. The taboo was closely associated with the tribal totems and with tree and other worship.

Through long years of association with nature worship particular places, days, epochs, trees, streams and persons were looked upon as sacred and, as such, subject to taboo. The emperors of the Aztecs and the Peruvians, at the time of the discovery of America, were believed by their people to be so sacred as to be almost gods; and around them clustered as many ceremonial tabooes as about the temples of their most revered deities. But in each case these tabooes reacted upon the ruler himself, placing many restrictions upon his actions in public and in private. Moctezuma II might not place his foot upon the bare earth lest his divine character be thus soiled. So he was carried about in a palanquin by official royal bearers, while other attendants spread before him a gorgeous carpet to protect his imperial feet from contamination when he left the palanquin. He might wear a suit of clothes but once, and if state or other reasons required a change of apparel a dozen times a day, it also demanded a completely new outfit. But while to wear a suit of clothes twice would defile the emperor, the representative of the gods, it was likely to bring special heavenly blessings to anyone of noble birth wearing it. So Moctezuma's cast-off clothing was eagerly sought and proudly worn by the highest nobility in the empire. In Peru it was taboo to make the vessels of the temple of the sun in the capital of any other material than gold whose shining color represented the

radiant face of the deity; while all the furnishings of the moon goddess were required to be of silver. This latter example well illustrates the extreme growth of naturalistic ideas from commonplace, natural associations to taboo of the most rigid sacred character. About these nature tabooes grew up many legends to account for them or to explain them. The Peruvians asserted that gold was formed from the tears of the sun god; the Mixtecas declared that it was the sacred excrement from his shining body. The Colombian Indians in the neighborhood of Bogotá inaugurated their new emperor into office by painting his naked body completely with gold dust, thus symbolizing that he was the direct representative of the sun, the great racial father upon earth. Such complicated ceremonies with their rigid, uncompromising tabooes, imply a long-developed civilization or culture built upon nature worship.

The Nature Gods.— Nature worship, which, as has already been said, had its origin in the fear of the destructive forces of nature and a desire to placate them, or in respect for virile qualities in the same, grew in time, as man became more civil in his habits, to be a very complicated institution. Under the Aztecs, Mayas, Quiches, Zapotecas, Mixtecas, Pueblo Indians and Peruvians in America and among the great civilized nations of Europe, northern Africa and southern and western Asia, in the pre-Christian era, nature worship had become organized, in each case, into a most complicated religio-philosophical system which defined the attributes and sphere of action of each of the deities and explained his relationship to the gods as a whole, to the state, to the priesthood, to the nobility and to the masses. This called for an extensive classification and cataloguing of the nature deities. This had already taken place in the religious systems of all the great civilized nations in pre-Christian days. Naturally, under such a system, where almost every phase of animate nature was represented by its special deity, the list of the gods became very great. Yet they all came under a few primary divisions. The upper religions were occupied by the sun, moon and other planets, by the dawn and the darkness, the clouds, the thunder and the lightning, the winds of the four quarters of the heavens and their accompanying night spirits or wind spirits. In most nature religions these regions were divided into the upper heavens, inhabited by the sun, moon, planets and gods of dawn and darkness; and the lower heavens, the home of the clouds, winds, rain gods and other deities of the elements. The earth was the home of the deities of growth and fertility and the general habitat of the household penates and guardian spirits; while the regions within the earth or beyond the borders of the natural world, that is out on the great elemental ocean which, in most mythologies, surrounded the earth, were the regions of death and decay. Within the earth, too, quite frequently were the regions of birth. These ideas and divisions sprang naturally out of nature worship. At death all things go back into the earth; at birth all the vegetable kingdom evidently comes out of it. This was one of the patent facts that first appealed to the imagination of myth-making primitive man. There was a tendency to divide the deities of these divine regions into beneficent and malevolent beings. Thus arose the idea of the warring of the nature gods.

The Functions of the Gods.— Nature worship, originating independently, as it undoubtedly did, in different quarters of the world, naturally developed along different lines among people racially and linguistically different. But as the origin of the pantheistic conceptions that distinguished it were essentially the same, there is a striking similarity in the functions and attributes of the nature gods everywhere. The earth, which gives birth to all things, is the universal mother; the sky, which sends the fructifying rains, is the husband of the earth and the great nature father. The sun, with his vivifying rays is the father of growth. The winds, with their ceaseless movements and their great speed, become the messengers of the gods, the bringers of culture and the purifiers or healers. But there are beneficent winds and harmful winds, gentle winds and destructive winds. Those working in the interest of man are represented as in a constant struggle with those seeking to harm him. This feature of nature worship is strongly evident in many myths. In the Mexican mythology Quetzalcoatl, the beneficent east wind is represented as the culture hero struggling with Tetzcatlipoca, the black spirit of the night, or the night wind. Hiawatha fought and defeated the Great Pearl Feather, the wind that broods over the pestilential marshes; and he fought his own father Mudjikierwis, the west wind and the father of all the winds of heaven, who finally shares his kingdom with him, making him the Keewatin, the northwest wind, the home wind.

The Serpent in Nature Worship.— Everywhere the serpent drags its tortuous length through the habitat of the nature gods. Many explanations of its presence there have been presented by students of mythology, but most of these explanations have been unfortunately fanciful or manufactured to fit preconceived theories. The serpent is inseparably associated with the wind gods. Sometimes, he is a kindly deity; at others he is the spirit of malevolence. This is a natural development of nature and in no way demands a supernatural explanation since it fits in with the nature of the winds. Quetzalcoatl (q.v.), the great culture hero of Mexico, Yucatan and Guatemala, was represented as a plumed serpent, and the serpent formed the most conspicuous decoration of his temples. Yet others of the Mexican wind gods also bore the sign of the serpent. The robe of the mother of the gods was represented as consisting of interwoven snakes. The serpent was frequently intimately connected with the deities of fruition and birth, probably because the wind gods were also thus connected. But the destroying force was also represented as a winged serpent in many parts of the world. This is but another form of the evil wind. This latter conception gave birth to the dragons of destruction bearing with them fire or lightning as their destroying agents. From this conception to that of the evil one, the old serpent, the personified force of evil as found in the Persian and other related religions, is but a step. Christianity and the Hebrew faith borrowing the imagery of the nature religions have made it vividly familiar to us.

In Roman and Greek mythologies, the gods of healing are associated with the serpent and not the least of these is Apollo. This association of the serpent with the gods of birth and healing explains their relationship to public worship which has produced so much discussion and investigation and has given birth to the so-called theory of serpent worship. With the Chinese, as with the Toltecs, the wind god (in the case of the Chinese in the shape of a dragon) became a sort of world divinity, the great wisdom, the universal benefactor. As the fructifying rain bringer, the serpent represented kindly forces; as the rain preventer his tendencies were evil.

The Cross in Mythology.— Throughout all primitive America and in many of the mythologies of the eastern hemisphere the world was divided into four quarters over which ruled one of the winds, all of which were frequently represented as so many serpents or dragons. Quetzalcoatl, the Toltec culture god, sailed away to the unknown land on a raft of snakes, or in a boat moved by supernatural serpents, which were at once symbolical of his origin as a wind god and his office as the greatest culture hero of the American races and the symbol of divine wisdom and earthly progress. Being the symbol of fertility, the serpent naturally became that of the so-called pallic worship which was also symbolized by the cross, as the representative of the four quarters of the earth in which lived the winds and the rain gods. In pre-Columbian times the cross was the symbolical representation of the activity of the winds as the bearers of fertility throughout Mexico, most of Central America and the Pueblo and some other Indians of the United States. In the form of the swastika (the four-footed cross with the ends bent, generally at right angles), the cross became the symbol of good fortune and (among the American Indians) of generation. The Cretan mother goddess, the great deity of fertility, is represented, in her surviving statues, with snakes coiled about her waist and arms; and she was worshiped in the temple of the sacred cross. Throughout Crete, where her worship seems to have had a very important place, the cross was looked upon as a sacred symbol. Like the rain gods of Mexico and Central America, the mother god of Crete was worshiped on the tops of the hills and the high places from whence descended the fructifying waters. Like the tlalocks and other gods of the rain cross she was connected with death and life, more especially the latter. In the course of time the cross, especially in America, came to form a very important part of the decoration of temples and sacred places in pre-Columbian days. The trail of the cross, like the trail of the serpent, runs across Mexico and Central America and a very considerable part of the United States.

Fire.— Along with sunshine, rain, air in motion and regeneration, fire early became for man one of the sacred elements. To him it symbolized (among many races) the sun, the great generator and the source of all heat. By the use of fire it was possible for him to greatly enlarge his range of diet, to fell the huge forest trees and shape his canoes from them.

It enabled him to shatter great masses of rock and to shape them roughly to his ends. Later on it enabled him to smelt metals and to attach them to his car of progress. As it was hurled from the cloud it became symbolical of the power that hurled it. As it was vomited forth from the volcanoes, it came to signify the titanic forces of the underworld and became inseparably connected with punishment for offenses connected with the infernal regions, in various mythologies. From these primitive beliefs later religious systems borrowed much of their systematized ideas of the nature of future punishment.

The Future Life.—As the beneficent beings who brought their favors to the earth occupied the upper air; and as there, too, is the home of the sun, the moon and the planets which were supposed to strongly influence human life for good or evil, very many races looked upon these regions as the home of their future life. Some beliefs held that the souls of the dead went to the sun, others to the moon, still others to the great cloud land, a mid-region between the earth and the home of the superior deities. Some races placed the future world in the far north or northwest, in the region of the northern lights, whose brilliancy probably suggested the idea. Among many Indian tribes the rainbow was believed to be the bridge that spanned the great gulf separating the earth ocean and the sky ocean. Numerous other American tribes believed that the dead went to some great underground region. But all the nature religions presented the future life as essentially the same as that upon earth though surrounded by happier, because more fortunate conditions. Communication was not only possible between the earth and the future world but the rainbow bridge had been climbed or the great gulf had been frequently crossed in the magic stone canoe by the mortal heroes of nearly every United States Indian tribe. Some legends depict the tribal hero as scaling the heights of heaven on the back of a great bird, or in the wicker-car of the star or sun-maidens or in numerous other manners; for to the nature worshiper the universe was one great whole, the parts of which were not essentially different from one another.

Theories of Nature Worship.—At the head of the early naturalistic school is Max Müller. He maintains, with the disciples of his school, that the worship of nature was the primary religious efforts of man; and he attempts to prove his position by means of comparative mythology. His theory, which applied only to the Indo-European races, was carried to an absurd limit by many of his school. E. B. Tylor looks upon the worship of the dead as the earliest of human cults and Herbert Spencer takes the same ground. The latter derives from this source all other forms of worship. Tylor traces the history of the so-called animistic faith, while Spencer displays its evolution. Wundt maintains that religion finds its origin in the primitive belief in human souls and in an early animism out of which a belief in magic and fetishism grew. Dunkheim believes that the totemic principle, or belief in mysterious power (the mana or magic power) is the source of all religion. All of these investigators have hit upon certain important truths, but no one of them has been able to grasp the significance of the wide field of mythology, for they all have made cate-

gorical statements upon which they have built up elaborate theories.

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NAUCRATIS, nô'kră-tĭs, Egypt, an ancient Greek colony, the remains of which are 50 miles by rail southeast of Alexandria. It existed as early as the beginning of the 7th century B.C., and was approached by a navigable canal in the western part of the delta, near the Canopic branch of the Nile. Its chief period of splendor was during the reign of Amasis II, 570–520 B.C., under whom it was recognized as the official capital of the Greeks in Egypt. Its site was rediscovered in 1884 by Professor Flinders Petrie. Subsequent excavations have uncovered the remains of buildings described by Herodotus, the Hellenium, temples to Apollo, Aphrodite, the Dioscuri, and others; and there have been valuable finds of early Greek pottery and other archaeological treasures.

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NAUCYDES, nô-sī'dēz, Greek sculptor. He flourished in the first quarter of the 4th century B.C. His birthplace was Argos, and he was the pupil of the elder Polyclitus of the Peloponnesian school of sculpture. He carved a gold and ivory statue of Hebe for the temple of Hecate at Argos; a bronze statue of Hecate; a Hermes; several statues of Victory; a portrait of the poetess Erinna; *Phryxus Sacrificing the Ram* (for the Acropolis at Athens); and a discus thrower. The younger Polyclitus was his pupil.

NAUEN, nou'ĕn, town, East Germany, in Brandenburg, is located 25 miles northwest of Berlin. Its manufactures include machinery, soap, and food products. A powerful radio station here was dismantled in 1945–1947. The town was first mentioned in 981, and was chartered in 1292. Pop. (1946) 13,106.

NAUGATUCK, nô'gă-tŭk, town and borough, Connecticut, New Haven County, is located on the Naugatuck River, 5 miles south of Waterbury, on the New York, New Haven and Hartford Railroad. The chief industry is the manufacture of rubber footwear and chemicals, and there is a huge rubber regenerating mill. Other manufactured products are cosmetic containers, plastics, safety pins, chocolate bars, airplane instruments, glass, mirrors, copper floats, chains, metal stampings, tools, and screw machine products. Charles Goodyear, discoverer of rubber vulcanization, lived here and established a factory here in 1843. Two early buildings of historic interest are Porter Tavern, built about 1752, and Collins Tavern, built in 1810.

Naugatuck is an Indian phrase meaning "one tree." In 1679, while still a part of Mattatuck (now Waterbury), the community was referred to as Judd's Meadows. In 1773 a new ecclesiastical society was created under the name of Salem Society, and somewhat later the area came to be called Salem Bridge. It was incorporated in 1844 as Naugatuck, the name by which the town had been more generally called since the opening of a post office there in 1834. The borough was incorporated in 1893. The government is vested in a warden and board of burgesses who hold office two years and who appoint many of the administrative officials. Pop. (1950) 17,455.

NAUGATUCK, a river in Connecticut. It rises in the northern part of Litchfield County, flows south through a hilly part of the state, and enters the Housatonic River at Derby. It supplies water power to many mills and factories. Waterbury is the chief city on its banks.

NAUGHTY MARIETTA, nô'tĭ mâr-ĭ-ĕt'ȧ, a light opera by the Irish-American composer, Victor Herbert (1859–1924), produced in New York in 1910. Several of its songs are still widely popular and are frequently heard. Among them are *Italian Street Song, Ah! Sweet Mystery of Life, I'm Falling in Love with Someone.* Herbert composed some 40 light operas.

NAUHEIM or **BAD NAUHEIM,** bät' nou'hīm, town, West Germany, in the state of Hesse (1945), is located 17 miles northeast of Frankfurt, on the northeastern slope of the Taunus Mountains. It is a well-known health resort noted for its warm carbonated mineral springs which are highly saline. It became a town in 1854. Napoleon Bonaparte gave it to Marshal Louis Davout, but from 1815–1866 it belonged to the electorate of Hesse-Cassel. It was ceded to the grand duchy of Hesse-Darmstadt in 1866. Pop. (1946) 12,909.

NAULETTE, nô-lĕt', a limestone cave in Belgium, on the Lesse River, near Dinant, where in 1866 an imperfect human lower jaw was found together with bones of the mammoth, rhinoceros, and reindeer. The jaw, now in the Brussels Museum of Natural History, was assigned to the Mousterian period.

NAUMACHIA, nô-mā'kĭ-ȧ, or **NAUMACHY,** nô'mȧ-kĭ (from the Greek *naus,* ship, and *machē,* battle), among the Romans a public spectacle, representing a naval action. Julius Caesar was the first who exhibited a spectacle of this sort, which soon became the favorite amusement of the Roman people. Buildings were erected by the emperors, specially adapted for the purpose. They resembled the amphitheaters, and like them were at first built of wood. Domitian erected one of stone. A *naumachia,* built by Augustus, was 1,800 feet long and 200 feet wide, and was capable of containing 50 ships with three banks of oars, besides many small vessels. They were flooded by means of subterranean canals, so that the ships were raised from the dry floor before the eyes of the spectators. These sea-

fights were exhibited with the same splendor and reckless disregard of human life which characterized the gladiatorial combats. Titus exhibited a sea fight in which 3,000 men were engaged and ships almost equal in number to two real fleets were shown in combat by Domitian. The crews generally consisted of gladiators, prisoners or condemned criminals.

NAUMANN, Friedrich (in full, JOSEPH FRIEDRICH), German politician: b. Störmthal, near Leipzig, Germany, March 25, 1860; d. Travemünde, Germany, Aug. 24, 1919. He left the Lutheran ministry in 1894 to enter politics. In 1896, together with others, he founded the National Socialist Party, of which he became the first president. In his book *Mitteleuropa* (1915) he outlined a plan for a central European German empire. After the November Revolution in 1918, he became one of the founders of the German Democratic Party.

NAUMANN, Johann Friedrich, German ornithologist: b. Ziebigk, near Köthen, Germany, Feb. 14, 1780; d. there, Aug. 15, 1857. He studied with his father, who was an ornithologist. His most valuable contribution to the science of ornithology was *Naturgeschichte der Vögel Deutschlands* (*Natural History of the Birds of Germany*), 12 vols. (1822–1844).

NAUMANN, Johann Gottlieb, German composer: b. Blasewitz, near Dresden, Germany, April 17, 1741; d. Dresden, Oct. 23, 1801. The interest of a rich Swedish amateur, Weeström, enabled him to go to Italy at the age of 16, and there he studied under Giuseppe Tartini. He became court composer of sacred music at Dresden in 1764, of chamber music in 1765, and *kapellmeister* in 1776. He accepted an invitation to reorganize the orchestra at Stockholm in 1777. His music, including operas, oratorios, and symphonies, was essentially Italian in style.

His son, KARL FRIEDRICH NAUMANN (May 30, 1797–Nov. 26, 1873) was a mineralogist and geologist. He was a professor at Freiberg in 1826, and at Leipzig from 1842 to 1872. Among his works are *Elemente der Mineralogie* (1846; 15th ed. 1907) and *Lehrbuch der Geognosie,* 2 vols., with an atlas (1850–1853).

Karl Friedrich's son, KARL ERNEST NAUMANN (Aug. 15, 1832–Dec. 15, 1910) was an organist and composer. In 1858 he received the Ph.D. degree at Leipzig University, where he published as his dissertation *Über die verschiedenen Bestimmungen der Tonverhältnisse.* Later he was music director and organist (1860–1906) at Jena University, and became professor there in 1877. His compositions were chiefly in the field of chamber music.

Karl Ernest's cousin, EMIL NAUMANN (Sept. 8, 1827–June 23, 1888) was also a musician. He was a pupil of Felix Mendelssohn (1842), and studied further at Leipzig University (1843–1844) and Bonn University. He was appointed court director of sacred music at Berlin in 1856. Beginning in 1873, he was at Dresden, where he lectured at the conservatory. He published *Die Tonkunst in der Kulturgeschichte,* 2 vols. (1869–1870), *Deutsche Tondichter* (1871), and other volumes.

NAUMANNITE, nô'mân-īt, in mineralogy, the name given to a native selenide of silver and lead found in the Harz Mountains, Germany, and so called after K. F. Naumann. It has a formula of (Ag_2Pb) Se, and occurs in large cubes, or masses, which have a metallic luster. The specific gravity is 8.0. The color is iron-black. Naumannite is also found in Owyhee County, Idaho.

NAUMBURG, noum'bŏŏrk, or **NAUMBURG AN DER SAALE,** än dĕr zä'lĕ, city, Germany, located in Saxony-Anhalt, on the Saale River near the junction of the Unstrut, 25 miles south-southwest of Halle. Its varied manufactures include toys, soap, metal goods, and food products. The Romanesque-Gothic cathedral of St. Peter and Paul, with its notable sculpture, dates from the 13th and 14th centuries. Naumburg was founded by the margraves of Meissen in the 11th century, and beginning in 1028 was the seat of the bishopric of Naumburg-Zeitz. It later belonged to the Hanseatic League. In 1564 it passed to the electors of Saxony, and in 1815 to Prussia. It was part of Prussian Saxony until after World War II, when it passed to Saxony-Anhalt. Pop. (1946) 41,379.

NAUNDORFF or **NAUNDORF,** noun'dôrf, **Karl Wilhelm,** French pretender: d. Delft, Netherlands, Aug. 10, 1845. In 1812 he was an established watchmaker at Spandau, Germany. He married Johanna Einert in 1818. In about 1824 he adopted the title of duc de Normandie, and in 1833 went to Paris to press his claims as the Dauphin, Louis Charles de France. He bore a striking resemblance to the Bourbons. After bringing suit against Marie Thérèse Charlotte, duchesse d'Angoulême, for the restitution of the dauphin's private estate, he was expelled from France in 1836. He never ceased to claim that he was Louis XVII, titular king of France (q.v.). His tomb bears the inscription, "Louis XVII, roi de France et de Navarre (Charles Louis, duc de Normandie)."

NAUNTON, nôn't'n, SIR **Robert,** English statesman and political leader: b. Alderton, Suffolk, England, 1563; d. Letheringham, Suffolk, England, March 27, 1635. He received the B.A. degree at Trinity College, Cambridge, in 1582. In 1585 he became a fellow there, and in 1594 public orator. For several years, ending in 1600, he travelled on the continent, and supplied information on conditions there to Robert Devereux, earl of Essex. He entered Parliament in 1606, and sat in five parliaments. In 1618–1623 he was secretary of state. His *Fragmenta Regalia,* first published in 1641, is a valuable account of Elizabeth I's courtiers.

NAUPLIA, nô'plĭ-ȧ (Gr. NÁVPLION), city, Greece, capital of Argolis and Corinth Department, located at the north end of the Gulf of Argolis, about 25 miles south of Corinth. A seaport, it was occupied by the Venetians during the Middle Ages, and later, by the Turks. In 1830–1834 it was capital of Greece. Pop. (1951) 8,546.

NAUPLIUS, nô'plĭ-ŭs, in Greek mythology, the father of Palamedes. He is said to have avenged the death of his son by deceiving the Greeks by false beacons, as they returned from Troy, causing their vessels to be wrecked.

NAUPLIUS, in zoology. See LARVA.

NAURU, nä-o͞o′ro͞o (formerly PLEASANT ISLAND), island, located in the southwest Pacific, 26 miles south of the equator at longitude 166° 56′E, 160 miles west of Ocean Island. It is oval-shaped, has a circumference of about 12 miles, and is about 3.5 miles in length and 8 square miles in area. It has large phosphate deposits.

Nauru was discovered in 1798 by Captain Fearn of the American whaling vessel *Hunter,* and named Pleasant Island by him. It was formally annexed to the German Empire in 1888, and became part of the Marshall Islands Protectorate. Australian forces occupied it in 1914, and held it until June 1921, when a civil administrator took over under the terms of a League of Nations mandate. The Japanese occupied Nauru during World War II, from 1942 to 1945. In 1947 it came under a United Nations trusteeship jointly held by Great Britain, Australia, and New Zealand; and Australia assumed administration.

NAUSICAA, ancient Greek heroine mentioned in the *Odyssey.* She was the daughter of Alcinous, king of the Phaeacians, who befriended the shipwrecked Odysseus.

NAUTCH, nâch (Hind. *nāc*), in India, a dance performed by the dancing girls attached to the temples, called Nautch girls, who are brought up and trained in the art.

NAUTICAL ALMANAC, a publication containing tables and astronomical data for the use of seamen. The *American Nautical Almanac* has been issued annually since 1855 by the United States government. See also NAVAL OBSERVATORY —*Period Since 1893.*

NAUTILOIDEA, nô-tĭ-loi′dē-ă, one of three subclasses in the Cephalopoda. The genus *Nautilus,* which contains the chambered nautilus, is the last surviving member of this once large and varied group of Cephalopods.

The earliest fossil nautiloid shells appeared in the Upper Cambrian Period and became greatly differentiated and very abundant in the Ordovician and Devonian. By the Cretaceous Period they had diminished to but a single order or group, the Nautilida, and by mid-tertiary had almost completely disappeared. Since then they have persisted only as a single genus, *Nautilus,* which occurs in the tropical portions of the western Pacific and Indian oceans. Over 300 genera and 2,500 fossil species have been described in this subclass. The large number of genera are grouped into 14 orders.

The study of this group as well as other fossil cephalopods is exceedingly complex and relationships between the various orders are far from being understood. A vast number of terms have been employed to describe the complex morphology of the shell structure.

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WILLIAM CLENCH.

NAUTILUS, nô′tĭ-lŭs, a genus of Cephalopods in the subclass Nautiloidea. Only three or four living species are known, of which *Nautilus pompilius* is the most abundant. These various species occur in the tropical portions of the Indian and western Pacific oceans. They live on the ocean floor in depths ranging from four to as much as 700 meters, and they are captured mainly in fish traps. Little is known regarding their life history. The shell they produce is quite remarkable as it is septate, that is, it contain a series of chambers, the animal itself occupying the outer or last chamber produced. As the animal grows larger, the outer wall of the shell is built forward, and the animal moves forward and then seals off the vacated area with a thin partition or septum. All of the septa are perforated in the middle by a single, narrow tube, or siphuncle, which is a slender tubular prolongation of the visceral hump. All of the vacated chambers contain a gas similar to air, except for having a little less oxygen and somewhat more nitrogen. This gas increases materially the buoyancy of the shell, and makes it easier for the animal to swim.

A thin mantle covers the entire animal and, in addition, adheres to the shell. The head contains a pair of lateral eyes which lack crystalline lens. The tentacles, which may number up to 90, form two circles about the mouth. There are a pair of horny or calcareous jaws, a radula, and a tongue. There is a short tubular esophagus which connects with the stomach, and behind the stomach there is a large liver and other digestive glands. A simple tubular intestine is coiled backward and ends at the anus, which empties into the anal chamber or mantle cavity. There are four gills and no ink sac. The heart lies ventral of the intestine and posterior to the gills.

There is a much thickened area over the head known as the hood, which acts as an operculum when the animal withdraws into the shell.

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NAUTILUS, in hydraulic engineering, a diving bell (q.v.) requiring no suspension. Water admitted through the cock into pipes flows into the exterior chambers, causing the apparatus to sink. The workmen enter through an aperture at the top, closed by an airtight cover, and can in still water move the machine in any required direction by stepping on the ground and pushing. Air is condensed in a reservoir at the surface to a degree somewhat greater than the condensation due to the depth, and passes through a pipe into the chambers, rendering the machine specifically lighter than water and enabling it to lift stones or other objects below. A gauge indicates the amount of lifting power attained as the air is admitted into the chambers.

NAUTILUS, The U.S.S., a submarine embodying some principles of the fictional archetype for which it was named, described in 1870 by Jules Verne in his classic tale of scientific adventure, *Twenty Thousand Leagues Under the Sea.* But where the power plant of the fictional Captain Nemo's *Nautilus* was electric (like the real submarines the French Navy began building only 16 years later), the U.S.S. *Nautilus* is powered by an atomic pile. The keel of this first atomic-powered submersible was laid in June 1952, and she was launched in January 1954. The engineering plant consists of a reactor in which the terrific power of uranium is harnessed to a "slow" chain reaction. The uranium, consumed at the rate of about one pound per month, requires replenishment only once a year. Situated behind the control room is the reactor. Heavily lead-shielded for protection against radiation, it

converts water into superheated steam which, in turn, operating through a heat exchanger, converts other water into steam that drives a turbine. Thus, the *Nautilus* is not only the first atomic but also the first steam submarine.

With the exception of its power plant, and of the absence of fuel tanks and of most batteries, internally the 3,000-ton *Nautilus* resembles the standard-type submarine in having a forward torpedo room, fore and aft crew's quarters, air purifier, ventilation system, complicated diving system, and so forth. Externally the principal design changes are the absence of a snorkel and the modified contour of the 300-foot hull to facilitate increased underwater speed. The underwater speed of this pioneer atomic-powered submersible is over 25 knots, or approximately double that of a standard-type submarine. Another great advantage is the ability to continue submerged for weeks. Guided missiles are among its equipment of nuclear weapons.

NAUVOO, nô-vōō′; nô′vōō, city, Illinois, in Hancock County, 10 miles south of Fort Madison, Iowa, on a promontory on the Mississippi River and served by the Atchison, Topeka, and Santa Fe Railroad at East Fort Madison, Ill. It is situated at an altitude of 620 feet in a fruit-growing region and its principal industries are connected with the manufacture of wine and blue cheese.

Settled in 1830 as Commerce, its name was changed to Nauvoo when Joseph Smith and his followers of the Church of Jesus Christ of Latter-day Saints (Mormons, q.v.), settled there in 1839. The Illinois legislature granted the Mormons a charter and a militia called the Nauvoo Legion. Smith was mayor and commander in chief of the legion. By 1845 Nauvoo was the largest city in Illinois, with a population of 20,000. A temple was begun on a hill, but it was burnt and demolished later. After a riot in which Smith and his brother Hyrum were murdered, the Mormons left the settlement. From 1849 to 1857 the Icarians, a French communistic group under Étienne Cabet (q.v.) had a settlement there but internal disagreements split the community some going to St. Louis and others to Corning, Iowa. Later, Irish and German immigrants rebuilt Nauvoo. Grape growing was introduced and wine making prospered. In 1920 the making of blue cheese was begun. There is an annual Grape Festival attended by thousands. The Joseph Smith homestead, the Brigham Young house, and other old buildings are historic shrines. Pop. (1950) 1,242,

NAVAJO CHURCH, năv′ä-hō. This name is given to a remarkable spire of white sandstone rising from the top of the red cliffs just west of the Continental Divide a short distance east of Gallup, N. Mex. It is visible for several miles from the Atchison, Topeka, and Santa Fe Railroad near Wingate station. Navajo Church is an object of veneration for the Navajo Indians of the vicinity. Its rock formations have several large caves.

NAVAJO or **NAVAHO INDIANS,**[1] an important tribe of the Athapascan stock of Indians, in 1955 on four reservations aggregating 15,364,828 acres in northeastern Arizona, northwestern New Mexico, and southeastern Utah, at an average elevation of 6,000 feet above sea level. According to Fray Alonso Benavides (1630), who referred to the tribe as "Apaches de Navajó," the word "Navajo" meaning "great planted fields," the name was never applied to the Navajo by themselves, their own tribal designation being "Diné" (people).

There is no evidence that the Navajo were seen by the Spanish explorers of the Southwest in the 16th century, although the latter passed through the present Navajo country in 1540, 1583, and 1598. It is therefore believed that at this early period they were an insignificant agricultural tribe, but gradually increased in population largely through the adoption of natives of both allied and other stocks during succeeding years. Their territory is entirely within the arid region and their lands are chiefly desert; but in the canyons and about the bases of the mesas that abound in their territory, horticulture is practiced through deep planting in the sandy soil, while in the valley of the Rio San Juan, which is the largest stream in their country,

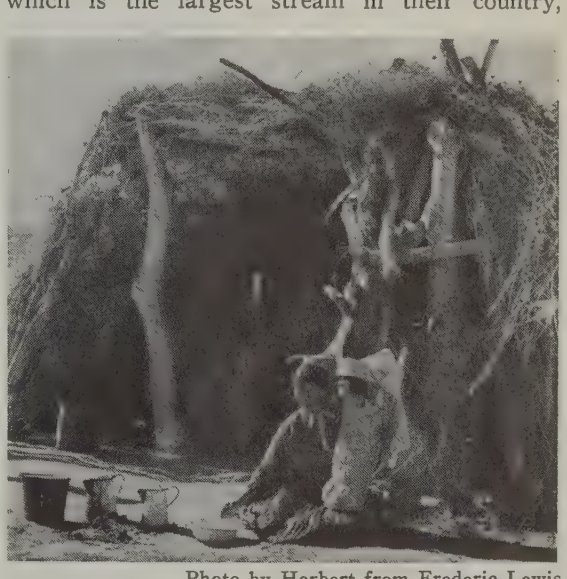

Photo by Herbert from Frederic Lewis

Navajo mother preparing a meal in front of her summer hogan.

farming is carried on to a greater extent, in 1950 the total acreage planted in vegetal crops totaling 38,064.

Agriculture, however, forms but a meager part of Navajo subsistence, his livelihood being gained principally from the flocks and herds, of which in 1953 there were 423,406 sheep, 2,284 beef and dairy cattle, and 63,879 goats, the sheep, besides furnishing the chief food supply, netting a large sum in wool and blankets. These blankets, which are celebrated, are woven by the women on simple looms and in pleasing and sometimes intricate designs of various colors. Formerly native dyes of rare delicacy of tone were employed, but these have given way to glaring aniline colors, and the decorative patterns have also been largely modified to meet the demands of the white man. The Navajo also weave belts, garters and saddle girths, and make a few basket trays, for ceremonial use. Some of the men are expert silversmiths.

Although more closely related to the Apache than to any other tribe, the Navajo are con-

[1] Modern authorities prefer Navaho spelling.

siderably mixed, embodying elements of Pueblo, Shoshonean, Yuman, and even of Spanish blood; hence there is perhaps a greater variety in their physical features than among many Indian tribes.

The typical Navajo dwelling is a conical framework of logs or sticks covered with brush, bark or grass, and earth, with a smoke hole at the apex and a doorway in one side. Rude shelters with open fronts are erected for use in summer. If a person dies in a house the dwelling is believed to become haunted and is destroyed.

Dr. Washington Matthews (q.v. 1843–1905), one of the foremost students of the Navajo, discovered the existence of 51 clans, grouped into about a dozen phratries, which are probably not homogeneous organizations as among some Indians. A Navajo belongs to the clan of his mother, and a man may not marry a woman belonging to his own clan, or, as a rule, one of his own phratry. The religion of the Navajo is elaborate and complicated. They have a great many ceremonies, most of which are performed for healing the sick, but others are conducted to ensure success in planting, harvesting, building, war, nubility, marriage, travel, and for bringing rain. Sacrifice, elaborate dry paintings with sand and pigments, masquerade, dancing, prayer, and song are the elements of the ceremonies, the gods being personated by the masked performers.

History.—Almost from the beginning of the 17th century the Navajo were enemies of the sedentary tribes and of the Spanish colonists, and although they were never so predatory and warlike as their Apache cousins, the Spanish villages and Pueblo settlements suffered almost continuously from their raids up to the time of the conquest of New Mexico by American forces in 1846, followed by the establishment of military posts throughout the Southwest. Treaties were made with the tribe in 1846, 1848, and 1849, but they were of no avail in keeping in check their depredations, which continued at intervals until 1858, although expeditions were led against them. In 1849, after the Navajo killed a Negro servant at Fort Defiance, it became necessary to wage warfare against the Indians from August until December, when 50 Navajo were killed and a large number of sheep and other stock were lost. Another treaty was signed, but during 1860 the depredations continued, and another expedition was led against them, but without success. In April the natives boldly attacked Fort Defiance, but were repulsed. In the winter of 1860–1861 an active campaign was made against them, and although practically their only loss was in sheep, they were compelled to sue for peace in February 1861, when an armistice of a year was agreed to, during which the troops were withdrawn. In a dispute over a horse race at Fort Fauntleroy (near the present Fort Wingate), New Mexico, a dozen Navajo were brutally killed.

Emboldened by the withdrawal of the troops on account of the Civil War, the Indians resumed their raids, which they continued almost uninterruptedly until 1863, when Col. Christopher (Kit) Carson began operations against them and a plan was formulated to transfer the Navajo from their old haunts to Fort Sumner, at the Bosque Redondo, on the Pecos River, in eastern New Mexico. All who refused to go after July 20, 1863, were to be regarded as hostile and be treated accordingly, yet by the close of the year only 200 prisoners were at Fort Sumner or on the way there. Early in 1864 Carson made a campaign to the Canyon de Chelly in the heart of the Navajo country in northeastern Arizona, where he killed 23 and captured more than 200 of the Indians. As a result, by the close of 1864 more than 7,000 of the tribe were held as prisoners at the Bosque Redondo. By 1865 there were 8,491, but it was supposed this number represented only half of the tribe. The experiment, however, proved a failure, so that after the death of about a thousand of the Indians, the escape of others, and an expenditure of a million dollars in their support in a region ill-adapted to their progress, the remainder, numbering 7,304, were removed to their old country in July 1868, an appropriation of $422,000 having been made in that year to give them a new start.

Since that time the Navajo have been peaceable and industrious. They make good laborers and are slowly developing agricultural pursuits, which the government has assisted by increasing the amount of water for irrigation, domestic, and stock purposes. The internal government of the Navajo, which has met much success, is conducted by a tribal council whose numbers come from various parts of the reservation. There are four sectarian missions and two mission schools on or near the reservation. In 1890 a partial census showed 17,204 Navajo; in 1950, 64,390, hence they are the largest tribe in the United States. See also INDIANS, AMERICAN—*North American Culture Areas* (Southwestern).

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F. W. HODGE,
Southwest Museum, Los Angeles.

NAVAJO MOUNTAIN, peak, Utah, rising high above the Arizona Plateau in the extreme southern part of San Juan County, Utah, at an altitude of 10,416 feet. It has rarely been ascended by white men; there are no motor roads to it, and it can only be visited by pack-trips from Goulding's Trading Post. From its summit, a short distance south of the rim of Glen Canyon of the Colorado River, a great view is obtained of the upper part of the Grand Canyon region, the Henry Mountains, the Vermilion Cliffs, and other features of the high plateaus.

Left: A Navajo silversmith fashioning a piece of the silver and turquoise jewelry for which the tribe is famous. This worker is on a reservation in northern Arizona.

American Airlines

Right: Navajo weaver at Roughrock on the reservation between Canyon de Chelly and Monument Valley, displaying another Navajo hand skill.

A Navajo rides guard over a sheep flock, with a typical butte rock formation in the background.

Santa Fe Ry. Photos

No pictorial record of Navajo skills would be complete without an example of sand painting, using sands of different colors. The Navajos use these sand pictures in healing ceremonies.

The mountain is forest clad, several springs issue from its sides, and in its northern slope are the Great Rainbow and Owl natural bridges. A dome-shaped uplift of the sedimentary rocks created the mountain, and its top is capped by Dakota sandstone.

NAVAJOITE, năv-ă-hō'īte, a rare mineral of dark-brown color, fibrous structure, silky luster, and probable monoclinic symmetry; chemically hydrated vanadium pentoxide, $V_2O_5 \cdot 3H_2O$; found in vanadiferous uranium ore in the Monument No. 2 mine on the Navajo Indian Reservation, Apache County, Arizona, and named in honor of the Navajo Indians on whose reservation it was discovered in 1951.

NAVAL ACADEMY, United States. See UNITED STATES NAVAL ACADEMY.

NAVAL ARCHITECTS AND MARINE ENGINEERS, Society of, a society organized under the laws of New York State on May 10, 1893, its object being the promotion of the art of shipbuilding, both commercial and naval. Classes of membership, which in 1955 numbered 6,200, consist of members, associates, juniors, honorary members and associates, benefactors, and permanent members.

NAVAL ARCHITECTURE, the science and art of designing ships to give them the nautical and structural qualities needed to accomplish their commercial, military, or recreational purposes. The construction of ships belongs to the subject of shipbuilding and will be touched upon in this article only in so far as the problems of construction influence the design of ships. Naval architecture as an art dates back to the earliest efforts of man to improve his means of locomotion and transportation. The primitive canoe probably antedated the wheel, but the promotion of naval architecture to the realm of the sciences did not take place until the 19th century. It lagged behind some of the other sciences largely because it is not an exact science, susceptible to precise mathematical treatment as, for example, astronomy or electricity. Naval architecture must in fact be viewed as an art with scientific foundations, rather than as a science.

During the 18th century European mathematicians developed various theories concerning floating bodies, some of which they considered applicable to ships. Their aim was to express the underwater form of ships mathematically with the hope of arriving at forms that would offer the minimum resistance to passage through the water. In 1721 Emanuel Swedenborg, the Swedish philosopher and mathematician, wrote a treatise on the subject entitled *A Mode of Discovering the Powers of Vessels by the Application of Mechanical Principles.* The most notable scientific contributions to naval architecture during that century were those made by Fredrik Henrik Chapman (1721–1808), a Swedish naval officer who was for many years in charge of Sweden's dockyards. He began the practice of passing on his knowledge of the subject through published papers. The French also contributed much in that way. The more common practice in such matters until the 19th century was for master builders to guard as valuable secrets what had been handed down to them and what they learned from their own experience.

During the first half of the 19th century the advent of iron for shipbuilding and steam for propulsion necessitated a more scientific approach to naval architecture. The advances made in all of the physical sciences during that period also contributed to the development of naval architecture as a science. By the end of the 19th century, existing knowledge in this field was well disseminated and all of the leading shipbuilding countries of the world had schools for teaching naval architecture.

Just as in the past, the primary purpose of practically all ships today is to serve as vehicles for the transportation of men and materials. This is as true of the humble tramp ship carrying in cargo twice the weight of its hull, machinery, and outfit, as it is of the luxury liner carrying a comparatively small amount of cargo, a large amount of fuel to enable it to make high speed, and with its space devoted largely to accommodations for passengers. In the case of warships the things carried consist of ammunition, consumable stores, and fuel, besides weapons, a large crew to man the weapons, and protection against enemy weapons.

Design Requirements.—The naval architect is faced with two fundamental requirements in designing a ship: the ship must be able to go from place to place at a speed appropriate to its service, and it must be able to do so with safety under all reasonable conditions of sea, weather, and loading. The measures that are at his disposal to meet these requirements are, however, circumscribed by the fact that the thing he is designing is a floating object. The weight he can devote to any one element of the design, whether part of the ship itself or to its cargo, is limited by the consideration that a floating body can weigh no more than the water it displaces. Weight devoted to one feature of the design ceases to be available for other features. Thus, every pound of weight entering into the construction and equipment of the ship must serve a useful purpose if it is to stand critical scrutiny. The architect of a structure on land is confronted with no such problems and limitations. One of the chief preoccupations of the naval architect is, therefore, the judicious use of the weight at his disposal and as a corollary the continuous search for lighter materials and equipment and for weight-saving methods in constructing ships.

Nevertheless, by the nature of the problem the characteristics given to any particular ship must always be a compromise of its many important features. This is less so for merchant ships than for warships because the service for which the merchant ship is designed is known with some degree of certainty, whereas there is always considerable uncertainty as to the conditions under which the warship will be called upon to fight, and hence as to the relative importance of its various characteristics. See WARSHIPS, MODERN for a more complete discussion of this subject.

Classification Societies.—It is at this point appropriate to describe briefly the part that the marine insurance business plays in naval architecture. Marine insurance affects importantly the design of merchant ships because the merchant ship is a commercial proposition that must be able to compete with other ships in the same trade. Its construction must, therefore, be such that the owner will not be at a disadvantage with his competitors in obtaining insurance at reasonable rates. In order to underwrite such risks the

marine insurance companies must have some guide as to the quality of the ship they are requested to insure. This is furnished by classification societies that have been established in a number of maritime countries: Lloyd's Register of Shipping combined with the British Corporation Register in Great Britain; the American Bureau of Shipping in the United States; the Bureau Veritas in France, and others. These societies set standards of design, construction, and equipment for merchant ships, many backed by laws and international agreements.

Normally all ships other than warships are built in accordance with the standards and under the supervision of one of these societies or the ship can be built without such supervision, surveyed afterward, and then granted classification if it meets the society's requirements. A classed ship must be surveyed from time to time in order to retain its classification. So long as the ship's classification remains in effect the owner can obtain insurance at prevailing normal rates. The principal features that are covered by classification are reserve buoyancy as implemented by load line regulations, watertight subdivision, communication and other equipment stipulations, minimum requirements as to quality, disposition, and dimensions of materials used in the construction of ships, and regulations with regard to tonnage measurements. Classification thus acts in the common interests of the owner, the insurance underwriters, the shipper, and the traveling public. There is divided opinion whether such associations have been a stimulus to the development of naval architecture, or whether they have been a retarding influence due to their normal conservatism.

Buoyancy.—When a ship is floating in still water the weight of water it displaces is exactly equal to the weight of the ship and its contents. The volume of the enveloping surface of the ship must, however, be greater than the volume of water displaced, otherwise the slightest additional weight would cause it to sink. For safety there must, therefore, be a margin or reserve of buoyancy over and above the buoyancy required for floatation. The percentage of reserve buoyancy provided in a design depends on the kind of vessel in question, ranging from close to zero for a submarine when in diving condition, and about 25 per cent when running on the surface to 100 per cent or more for passenger vessels with watertight upper decks and high sides. Certain types of warships, such as large cruisers and airplane carriers, also have large reserve buoyancy.

Reserve buoyancy fluctuates with the loading of ships. The actual amount considered necessary in merchant ships varies with the size and type of vessel, with the season of the year, and with the geographical area in which the ship will operate. Vessels engaged in winter service in the North Atlantic Ocean are considered to need a greater margin of safety in this respect than in any other service. Because reserve buoyancy can be easily visualized and checked by measuring and controlling the draft and freeboard of ships, load line regulations have become the standard method of controlling reserve buoyancy.

Great Britain, acting through the government Board of Trade in conjunction with Lloyd's classification society and the associations of naval architects, was the first to give legal status to such requirements. So far as merchant ships operating under the American flag are concerned, the first act of Congress requiring compulsory load line markings was passed in 1929 and became effective on Sept. 2, 1930. It applied only to American ships engaged in foreign trade. A Coastwise Load Line Act was passed by Congress in August 1935, covering also vessels operating on the Great Lakes. Broadly speaking, the objects aimed at in load line requirements are to permit the deepest possible loading of the vessel compatible with safety under all conditions of weather and areas of operation, after making provision for minor casualties that might jeopardize the reserve of buoyancy.

Stability.—In addition to adequate buoyancy ships must also have the necessary stability to resist the capsizing effect of wind, waves, unequal load distribution, and flooding to at least a limited extent. Meeting the requirements of stability are unique to naval architecture and present problems encountered in no other engineering profession. The general principles underlying stability are comparatively simple and may be readily understood by analyzing what happens when a ship floating in still water is given a small inclination from the upright as shown in the accompanying figure.

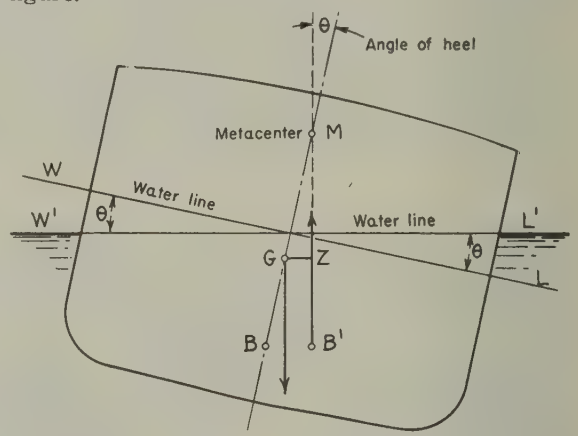

Fig. 1. *W'L'* is water line when ship is upright. *WL* is water line when ship is inclined at angle θ.

The elementary rules of hydrostatics apply to ships under such circumstances. These are that the weight of the ship equals the weight of the water displaced and that with the ship upright the center of gravity *G* of the ship and the center of gravity of the water displaced, known as the center of buoyancy *B*, lie in the same vertical line. When the ship is inclined, the center of buoyancy *B* moves to *B'* because of the change in the shape of the displaced water. The force of buoyancy then acts vertically upward through B^1. If this line cuts the center line of the ship at a point *M* above the center of gravity *G*, the two forces produce a couple tending to rotate the ship back to the upright and the ship is said to be in stable equilibrium. If the vertical through *B'* cuts the center line below *G* the couple that is formed rotates the ship further away from the upright and the ship is said to be in unstable equilibrium. The point *M* is called the transverse metacenter. It is not a fixed point except for small angles of inclination, up to about 15° for ships of normal underwater form. The distance *GM* is called the transverse metacentric height or simply the metacentric height of the ship. It is the criterion used for visualizing broadly a ship's initial stability and behavior when inclined from the upright and for comparing one

ship with another in respect to initial stability. Longitudinal stability lends itself to similar analysis with rotation taking place around the athwartship axis of the ship, but as such stability is never critical in ships of normal form and use, no further discussion of this aspect of stability is necessary in this article.

For larger angles of inclination the position of the metacenter *M* moves downward until an angle of heel is reached where it falls below the center of gravity. The ship is then unstable and any further inclination will lead to capsizing. Calculations are made to determine the righting moments at the various angles of inclination. These are plotted as ordinates in terms of righting arms (*GZ* in the diagram) against angles of inclination as abscissae, thus producing a curve which shows the full range of stability of the ship and the inclination at which the righting moment (actually the righting arm *GZ*) is at its maximum and finally becomes zero. The description of the calculations necessary for producing this curve is too complicated and space consuming for inclusion in an article of this kind.

Many factors affect the actual stability and the range of stability of ships such as the location of the center of gravity; draft and form of underwater hull; loading, and freeboard. For example, ships with a high freeboard have a long range of stability through which they can be inclined without danger of capsizing. The range of stability is seldom made less than 50° and for vessels with high freeboard may be as much as 100°. It is the business of the naval architect to provide such stability in the design that the vessel will be safe and seaworthy in all weather if handled with ordinary skill and if the loading is as prescribed.

For safety alone it is not necessary for the metacenter to be above the center of gravity when the ship is upright. A ship can be so designed that with the metacenter slightly below the center of gravity it will list a few degrees to one side or the other until it reaches an inclination at which the metacenter arises above the center of gravity. The ship will remain in the slightly listed position if in still water and if no change in the distribution of weights on board is made. If the vessel has a high freeboard and a long range of stability such a vessel may be entirely safe and seaworthy. Atlantic liners were at one time deliberately designed with little or no initial metacentric height in order to give them an easy and slow rolling motion.

Structural Strength.—In addition to making provision for adequate buoyancy and stability the naval architect must also design ships with sufficient strength to withstand all of the stresses to which they may be subjected in service. The greatest stresses are those which result from the interaction of the forces of gravity and buoyancy causing the ship to bend as a beam. The distribution of the weight of the ship and its contents and the support of buoyancy along its length are not uniform even in still water. When the ship encounters waves at sea the uneven distribution of weight and buoyancy is accentuated many fold.

Under these circumstances two extreme situations may arise: one with the ship supported at mid-length on the crest of a wave; the other with the ends supported on the crests of waves and with the trough of the waves amidship. An assumption must then be made as to the height of the waves because upon this are dependent the bending stresses to which the ship will be subjected. Some naval architects assume that under the most adverse circumstances the height of the waves will not be greater than $\frac{1}{20}$th of their length, the maximum length of storm waves being pretty well known; others assume a height equal to $1.1\sqrt{\text{wave length}}$. It is, however, impossible to foresee all combinations and contours of waves that may be encountered in a storm, thus there is always some uncertainty as to the magnitude of the forces that may be involved. The actual calculations follow the same lines as those for loaded beams under various conditions of support. In addition to the girder stresses to which ships are subjected there are transverse and panting stresses; concentrated stresses due to heavy local weights such as machinery, armor, and guns; the battering effect of waves, and the stresses that are imposed on the structure in docking or grounding.

Practical experience must come to the aid of theory in deciding on the structural strength needed to resist these forces, because of uncertainty as to their magnitude in many cases. In general, if the design under consideration is not too dissimilar from previous designs that have shown no weakness in service the naval architect can feel reasonably certain of the adequacy of the new design. The accumulated experience of navies and of the merchant service is of great value in confirming or modifying the theoretical considerations, but when novel types or sizes of ships beyond precedent are involved, the skill and judgment of the architect are taxed to the utmost in estimating the various stresses that may be encountered. The normal reaction of the classification societies and marine underwriters is to go slow and to play safe in departing from standard practice. Naval architects, shipbuilders, and ship owners are more likely to be interested in progress and improvements. A long period of discussion is likely to ensue when novel designs or changes in practices are proposed, but with the accumulation of experience the doubtful questions adjust themselves.

Rolling and Pitching.—The action of waves set up rolling, pitching, and other oscillations of a complex nature in ships at sea. Of these, rolling is normally the most important. All such motions are related in a large measure to the stability characteristics of the ship. When a vessel is floating in disturbed water the location of the center of buoyancy is changing constantly, thus causing the vessel to depart from the upright. The force of gravity operating through the center of gravity of the ship is at the same time acting to return the ship to the upright. In the process the ship acquires angular velocity and swings beyond the upright, then a righting moment in the opposite direction comes into play to restore the ship again to the upright, thus rolling begins. In the absence of waves or other disturbances the friction of the water quickly brings a rolling ship to rest.

There are a number of factors that influence rolling. In general, vessels of large metacentric height roll quickly, those of small metacentric height have a sluggish rolling motion. When floating among waves which are large as compared to the vessel, the ship of great metacentric height tends to float like a board, keeping its deck practically parallel to the surface of the waves. The vessel of small metacentric height will, under such circumstances, at times roll toward the wave crest instead of away from it, a very undesirable condition with low freeboard vessels. In practice, vessels vary widely in their periods of oscillation. For large vessels the shortest period from the extreme on one side to the extreme on the other is of the

order of three seconds and is encountered in low freeboard warships such as monitors; this because such ships have a large metacentric height. A large vessel of small metacentric height may take as much as ten seconds for a single roll from side to side.

For small angles less than about 15° rolling is practically isochronous, that is, the time taken for a complete roll varies little with the angle. This ceases to be true when larger angles are reached. If there were nothing to retard rolling, ships that are otherwise perfectly seaworthy might reach capsizing angles when among waves whose period coincides with that of the ship because each passing wave would add a little to the amplitude of roll, just as large oscillations can be imparted to a swinging weight by applying to it small but properly timed impulses. The skilled seaman can do much to limit excessive rolling by changing course sufficiently to break up synchronism. The risk of capsizing due to rolling alone is, therefore, not very great.

Rolling even when not excessive is objectionable for a number of reasons. For one thing, the traveling public objects to rolling because it causes seasickness. Next to the common cold, seasickness is probably responsible for more human misery than any other of man's minor ailments. Heavy rolling may result in damage to the ship and to the cargo, as well as injury to the personnel on board. In warships, heavy rolling interferes with accurate gunfire. In all ships rolling of any magnitude is objectionable because it is an operating handicap. For these reasons naval architects have given much thought to antirolling devices. The devices that are or have been employed either in actual service or experimentally to reduce rolling are (1) bilge keels; (2) antirolling tanks; (3) gyroscopic stabilizers; (4) moving weights, and (5) stabilizing fins.

Bilge keels are fins attached to the bottom of the ship at the turn of the bilge. Their longitudinal extent varies from 25 to 75 per cent of the length of the ship and their depth from approximately 1 foot to 3 feet depending on the size and type of ship. Ever since their effectiveness in reducing rolling was first demonstrated, around 1870, bilge keels have been fitted to nearly all ocean-going vessels, both commercial and naval. If properly proportioned and fitted, they reduce the maximum angle of roll to less than one-half of what it would be without them. They also slow down the period of rolling. Their effectiveness increases with the speed of the ship.

The earliest installation of antirolling tanks was made in about 1874. Broadly speaking, this device consists of tanks opposite each other at the sides of the ship, connected at the bottom by a tunnel, or large pipe, through which water flows from side to side as the ship rolls. In some installations the shifting of the water is accelerated and controlled by pumps. Such installations are particularly suited to icebreakers, as bilge keels cannot be used on such ships. In all cases the shifting of water or other liquids from side to side if properly timed resists the righting moment of the ship and thereby dampens the rolling. Gyroscopic stabilizers have advantages as well as disadvantages compared to other devices. Some of the disadvantages are high cost, weight, delicacy of adjustment, and the power required for their operation. Gyroscopic stabilizers have been installed on many yachts and on some large ships, the largest being a ship of about 41,000 tons displacement. The experience on this ship was that it reduced the angle of roll about 44 per cent when the free roll away from the vertical was as much as 5°. The weight of the installation came to about 700 tons. Retractable stabilizing fins that can be moved in and out at will and controlled from within the ship are recent antirolling devices. They have achieved a considerable degree of popularity, both for certain types of warships and for passenger ships.

Speed and Resistance.—To the layman the most interesting fact about ships is usually their speed. The keen interest taken by the general public in the speed records of transatlantic passenger liners illustrates this point. The methods in use at present for determining the power required to drive ships at desired speeds and the underwater forms best suited to economical propulsion are comparatively recent developments in naval architecture. They are based on the scientific research during the last half of the 19th century of William Froude, an English engineer, and of his son R. E. Froude. These methods were later carried to a high state of perfection in the model basin at Washington, D.C., by the late Rear Admiral David W. Taylor, Construction Corps, United States Navy.

The principles underlying these methods are that the resistance of a ship in moving through water at a given speed is made up of three factors, first, the skin friction between water and the surface of the ship. This is dependent only on the nature of the surface as to smoothness, the wetted area, and the speed of the ship. It varies slightly with variations in the form of the ship because such variations affect the velocity of the water over the hull, but in general this variation is too slight to be of importance in practice. The second element is wave-making resistance, and is due to the waves that are formed by a ship moving through the water. Power is required to produce these waves and must come from the power driving the ship. The third element is eddy-making resistance, and is due to the eddies formed in the water behind square corners of the hull and attachments, such as sternposts or propeller struts.

The skin friction component can be calculated with considerable accuracy from experiments on the frictional resistance of plane surfaces towed through water at known speeds. Froude demonstrated that the remaining resistance (wave and eddy-making) of a full-sized ship could be calculated with considerable accuracy from careful determination of similar resistance of a small model of the ship when towed at a speed corresponding to the desired speed of the ship, the corresponding speeds of model and ship being in the ratio of the square roots of their linear dimensions. For a ship 500 feet long, for example, and a model 20 feet long, the ratio of linear dimensions is 25; so that the actual speed of the model corresponding to 20 knots for the ship, would be $20 \div \sqrt{25}$, or four knots. Model experiments lend themselves to comparatively inexpensive and rapid investigations of the effect on speed and power due to changes in shape and dimensions which would be impracticable if attempted on full-sized ships. The principles followed in passing from models to full-sized ships can also be applied in passing from one full-sized ship to another, provided the two ships are similar, or nearly so.

Model Basins.—Model basins thus became the principal tools of the naval architect in designing ships. They are found in practically all shipbuilding countries of the world. There are at present some thirty-five model-testing stations with a total

of forty-eight basins. The first model basin was built by William Froude, in Torquay, England, in 1872. One of the earliest and the most advanced basin for its time was the one designed and built by Naval Constructor David W. Taylor for the United States Navy in Washington, D.C. in 1899. A new station was completed and put in operation by the U. S. Navy in 1940 at Carderock, Maryland, a few miles outside of Washington. It was named the David Taylor Model Basin to commemorate Rear Admiral Taylor's world renowned work in this field. This station has four separate basins —one for the normal testing of ship models in deep water, a second for testing models of ferryboats, towboats and barges in shallow water, a third for testing models of high-speed craft, such as motorboats, patrol boats and coastal torpedo boats, and a fourth for testing special models and for conducting extended research which cannot be worked into the normal busy schedule of the large basins.

The main basin was originally 963 feet long but was extended in 1945 and 1946 to a length of 2,775 feet. Its width is 51 feet and its depth 22 feet. Two model towing carriages span this basin having speeds of 15 and 18 knots respectively. Models up to 32 feet in length and displacement up to 10,000 pounds may be towed in this basin; the standard model length is about 20 feet. The shallow water basin is about 250 feet long and 51 feet wide. Its depth can be varied to suit the test being conducted, from a maximum of 10 feet down to a minimum of a few inches. A turning basin formed like the letter J at one end of the shallow water basin makes it possible to study the behavior of models up to 20 feet long when making turns up to about 180°.

The high-speed model basin is 2,968 feet long. It has two carriages capable of being operated at 40 and 60 knots respectively. It is 21 feet wide, 10 feet deep, for a length of 1,160 feet, and 16 feet deep for the remaining length. The small model basin is 142 feet long, 10 feet wide, and 5 feet 6 inches deep. Models in this basin have a length not exceeding 5 or 6 feet. They are towed by what is known as a gravity dynamometer, actuated by a falling weight, or by a special device, depending upon the test. There is at Carderock a circulating water channel built for flow studies and special investigations on ship models, in which the model floats stationary in a moving stream of water. This channel is 22 feet wide, 9 feet deep, and the moving water in it has a maximum speed of 10 knots.

The towing models in the cold weather countries of northern Europe are generally made of paraffin wax, which is cast in a mold roughly representing the shape and scaled-down dimensions of the hull of the ship. In the warmer countries of Europe, such as Italy, and in the United States, the towing models are normally made of wood. Recently a wax compound has been developed that will retain its shape under higher temperatures. Both the wax and the wood models are roughed to shape in special machines and are then finished by hand. All large model basins, both in the United States and abroad, are equipped with self-propulsion dynamometers, for fitting in or on the model, by which the ship models are made to drive themselves along the model basin. An electric motor, combined with devices to measure thrust, torque, and revolutions, is connected by a shaft passing through the model to a small propeller representing the design proposed for the ship.

Using the data obtained from the towing and the self-propulsion tests of the model, it is possible to determine not only the effective horsepower necessary to tow the full-sized ship but the horsepower which the propelling machinery must develop, taking into account the mechanical friction losses between the engine and the propeller, as well as the hydraulic loss in the propeller itself. The ratio between the effective horsepower as defined above and the horsepower developed by the propelling machinery (indicated horsepower for reciprocating engines, brake horsepower for Diesel engines, and shaft horsepower for turbines) is called the propulsion coefficient. It ranges from about .6 to .8 and depends on the friction in the machinery and shaft bearings, on the efficiency of the propellers, on the shape of the stern of the ship, on the flow of water to the propellers, but mainly on the number of propellers used to drive the ship.

With four propellers driving the ship the propulsive coefficient is about .6, with two propellers it is about .7, and with a single propeller the coefficient is about .8. This range of values represents fair, average practice obtained in well-designed modern vessels. Lower values than these are usually due to difficult service requirements, inefficient hull design, unsuitable propellers, or a poor selection of machinery. While single screw ships show the highest propulsive efficiency, the limit of power which can be developed by a single screw is constantly being increased. In addition, there are other reasons for preferring multiple screws to a single screw—such as greater security against complete breakdown at sea, better maneuverability, and the advantage of being able to subdivide the propelling machinery between several compartments—this being particularly important in warships to guard against complete disablement from a single lucky hit.

Influence of Materials.—As naval architecture has been largely influenced by the materials used in ship construction, brief allusion to these materials seems appropriate. The material used in the construction of ships underwent, broadly speaking, two changes during the 19th century: a change from wood to iron, which dates from approximately the middle of the century, and a change from iron to steel, which dates from about 1880. Wood is still used as the principal material for building small vessels, such as yachts, motorboats, small tugs, and barges.

The material now generally used for ship construction is a plain carbon steel, frequently called medium steel, which in a standard test specimen exhibits an ultimate tensile (or breaking) strength of approximately 60,000 pounds per square inch of cross-sectional area and an elongation (or stretch) of 25 per cent of the original length of the test section of the specimen. Such steel was not produced in the United States in commercial quantities until 1883 when it was specified for the ships of what was then called the New Navy. With the demand for weight saving in warship construction as well as in the construction of high-speed passenger liners, steels of higher tensile strength and better all-round properties than medium steel have been dveloped. Such steels are more expensive than medium steel, but have made it possible for the naval architect to produce ship designs that would not have been practical with medium steel. However, medium steel is still the most extensively used grade for hull construction except when more strength for the same weight, or the same strength for less weight, is desired, especially in warships, in which case higher strength steels are used in the most highly stressed locations, such as the upper decks, the sheer strakes, the flat keel, and certain other portions of the hull plating and structure.

The high tensile steel most commonly used in warship construction is one having an ultimate tensile strength of 70,000 to 90,000 pounds per square inch and an elongation of 22 per cent. This steel contains not over .18 per cent carbon and up to 1.30 per cent manganese (as compared with .31 per cent maximum carbon and .75 per cent maximum manganese in medium steel), and usually contains small percentages of silicon, vanadium, and titanium. This alloy, and various other alloys offered commercially as high tensile steels, are often used in the construction of merchant ships.

In warship construction, a steel known as special treatment steel (STS), which is specially heat treated during manufacture, was developed for its ballistic qualities and has been used as armor protection. This steel usually contains about 3 per cent nickel, or equivalent alloying elements, and, in addition to its ballistic properties, exhibits a tensile strength above 100,000 pounds per square inch and over 27 per cent elongation. STS is being used in increasing quantities in warship construction in the dual role of hull plating or decking and for its ballistic protection, but has not been used extensively for merchant ship construction. A steel known as HY80 containing about 2 per cent nickel has come into use for merchant ships where strength and weight saving are of particular importance.

Aluminum alloys are used extensively on warships as well as merchant ships for upper works, stateroom bulkheads, furniture, and certain doors, because of the great weight saving that can be effected thereby. Chromium-nickel stainless steels are used where strength or corrosion resistance, or both, are governing considerations. This latter kind of steel must, however, be used with caution because under certain conditions of exposure to

salt water it is no more corrosion resistant than medium steel.

Welding.—The progress of welding has had a marked effect on naval architecture both in the design of ships and in the selection of materials. The use of welding, in place of riveting, in hull construction has effected considerable weight savings by eliminating plate overlaps, butt straps and riveteads. It also effects savings in time and often in cost. The problem of achieving water and oil tightness has been greatly simplified. As a consequence, 100 per cent welded hulls in merchant ships and the smaller classes of warships (destroyers and smaller) are becoming the rule rather than the exception, and welding is displacing riveting more and more in the largest warships and merchant ships. Welding is also being used in other parts of ships. Piping is extensively welded, and many parts, such as stems, sternposts, shaft struts, and machinery foundations, formerly made as castings or forgings, are being fabricated by welding together formed plates or shapes, sometimes combined with smaller forgings or castings. Welding has made it possible for the naval architect to place the metal where it does the most good.

While welding has many advantages, it has also introduced new problems or focused attention on old, sometimes unrecognized problems. To realize the full benefits of welding, the design must be such as to take advantage of prefabrication of subassemblies and so that erection will take place in the proper sequence to avoid distortion and locked up stresses. Design must also allow adequate access to all joints for proper welding, and must be governed by the properties of the materials which it is necessary to use to ensure weldability. In most instances the materials best suited to ship construction can be utilized. Weldability can be assured by specifying more closely the carbon and other composition limits of the material.

Two closely related and important factors on which welding has focused attention are notches and notch-sensitivity of structural materials. Welded ship design must pay more careful attention to the avoidance of sharp corners or other abrupt changes in section, which constitute notches and disturb the uniform distribution of stresses, than was necessary in riveted designs. Provision must also be made for the exclusion of notch-sensitive materials, since such materials do not readily stretch and deform to redistribute concentrated stresses, but instead often start to crack at a notch even when the external loads are little more than normal. Notch-sensitivity is intensified by low temperatures.

The replacement of wood by iron and other metals as shipbuilding materials and the substitution of steam for sail to drive ships exercised a particularly great influence on naval architecture because these changes made it possible to increase the size of ships. These developments necessitated also the use of scientific methods wherever possible in designing ships. The tendency toward an increase in size has been very marked since 1885, so that now ships have reached dimensions which are limited only by the draft of water in channels and in harbors, by the docking and wharf facilities available in the ports to which they trade, by the size of drydocks in which they must be placed for painting and repairs, and by the width of canal locks through which they must pass.

Subdivision.—In the field of naval architecture as distinguished from shipbuilding, one of the most important advances has been the improvement in the design of merchant ships, particularly in passenger ships, to make them less vulnerable to sinking or capsizing after sustaining collision or war damage. Providing protection against the hazards of sinking or capsizing as the result of battle damage has always been a major consideration in the design of warships, but the problem there has been somewhat different from that of merchant ships because the question of cost is secondary in the case of warships, and earning a return on the investment is not involved.

If the underwater shell of a ship is torn open by a collision, or other cause, that portion of the ship to which the sea has access will fill with water to the level of the sea outside. The effect on the ship as a whole will be twofold: (1) The ship will settle bodily into the water by an amount which will depend on the quantity of water entering the ship. At the same time, unless the flooded compartments are located amidship, the ship will trim by the head or by the stern, as the case may be. The effect will be to reduce the distance above water of the deck to which the watertight bulkheads are carried. If the sinkage is such as to bring this deck below the level of the sea, water will enter adjacent undamaged compartments by flowing along this deck and will cause progressive flooding until the ship founders through loss of buoyancy. (2) The flooding of one or more compartments will, in general, change the transverse stability of the ship. The mathematical proof of this statement is too lengthy for an article of this kind. Suffice it to say that the net effect of flooding one or more compartments may be either a gain or a loss in metacentric height, depending on the proportions of the ship and the length of the flooded spaces. If there is a loss of metacentric height, the ship may become unstable and take a severe list or even capsize.

The foundering of a ship, owing to sinkage and trim, is usually a relatively slow process, often taking several hours, but capsizing, owing to instability, if it occurs, is likely to be sudden. For example, the S.S. *Titanic,* after sideswiping an iceberg, remained afloat for about three hours, although the starboard side was torn open for a distance of about 300 feet. On the other hand, the S.S. *Empress of Ireland* capsized and sank in 15 minutes, and the S.S. *Lusitania* capsized and sank in 20 minutes. If war damage, instead of collision damage, is sustained, loss of the vessel may follow the damage by only a few minutes, whether from foundering or capsizing. In both World Wars there were, however, instances of ships remaining afloat many hours and even days after being hit by torpedoes. This was the experience especially during World War II with ships built under the sponsorship of the Maritime Commission.

The prevention of either foundering or capsizing lies in fitting transverse bulkheads so spaced that (1) leakage water will be confined to an amount which will not sink or trim the ship sufficiently to immerse the tops of watertight bulkheads, and (2) the lost water plane will be confined to an extent which will not cause sufficient loss of metacentric height to result in an excessive angle of heel.

Naval architects in all countries recognized at an early date that ships could and should, by appropriate watertight subdivision, be made safer against sinking than was the current practice, but as shipping is internationally a highly competitive business, no nation by itself could require radical departures along these lines in the design of its ships without detriment to its shipowners, because from the operating point of view, closely spaced bulkheads interfere with cargo handling and stowage, with passenger accommodations, and with machinery arrangements, not to mention a higher original investment because of the greater cost of building such ships. In the extreme case, if bulkheads were spaced very closely together, the ship might be rendered entirely useless as a commercial investment. On the other hand, a ship with no transverse bulkheads would be unable to survive any leakage beyond that which could be handled by the pumps. Somewhere between these two extremes lies the best design. The history of improvement in the watertight subdivision of merchant ships is an interesting study. It is the history of marine disasters and of the repercussions of such disasters on the public and on the legislative bodies of governments. These have finally required shipowners to provide certain minimum watertight subdivision in ships carrying passengers beyond 12 in number.

The classification societies and marine underwriters at an early date required the fitting of a peak or collision bulkhead. Regulations with regard to loading and reserve buoyancy were also established many years ago and have already been mentioned. When screw propellers replaced paddle wheels, an afterpeak bulkhead became an obvious necessity to prevent leakage through the stern tubes from flooding the ship. The fitting of a double bottom in larger ships, that is, an inner skin in the way of the large compartments, such as machinery spaces and cargo holds, was soon adopted as the best way of protecting ships against the effects of flooding caused by striking submerged objects or by grounding. There was, however, considerable reluctance on the part of shipowners to add anything more in the way of transverse bulkheads, except as needed for strength and other structural reasons, because of the operating disadvantages mentioned above.

In 1866, the British passenger ship S.S. *London* sank with a loss of 233 persons. After investigation of the accident, the British Institution of Naval Architects recommended that all ships should be so constructed that they would remain afloat with one compartment open to the sea, and that passenger ships should remain afloat with two adjacent compartments open to the sea. This society had, however, no powers to place its recommendations into effect. In 1882, Lloyd's *Register of Shipping* incorporated subdivision requirements in its rules for the first time, and specified that ships more than 280 feet long were to have transverse watertight bulkheads, the number required increasing with the length of the ship. In 1890, the British Board of Trade suggested the first scientific approach to the question of spacing transverse bulkheads by calling attention to the fact that a curve of floodable length could be plotted for each ship, which would make it possible to determine, by making certain assumptions, the maximum length of the ship which could be flooded without causing the ship to sink when damaged at any particular point. In 1895, the German steamship *Elbe* sank with the loss of 335 passengers, which fact led the Society of German Shipowners to issue subdivision regulations based on floodable length. These regulations divided merchant ships into two classes: primarily passenger ships and primarily cargo ships. The regulations called for different degrees of subdivisions for the two classes, but there was no general acceptance of these regulations.

The disaster which finally impressed on the public, on shipowners, on insurance societies, and on governments the necessity for better subdivision of ships was the sinking in the north Atlantic, on her maiden voyage in April 1912, of the S.S. *Titanic,* with the loss of 1,513 lives. After a preliminary investigation of the disaster by the British Board of Trade, the British government invited an International Conference on Safety of Life at Sea to meet in London in 1913. The conference agreed on certain fundamentals and on curves for defining the minimum and maximum subdivision for the two extreme classes of ships mentioned above. The convention was signed in January 1914, but owing to the World War, which started in July 1914, none of the signatory nations put the regulations fully into effect. After the war, British shipowners engaged in replacing war losses, contended that the subdivision requirements of the 1914 conference for ships primarily of the cargo type and carrying few passengers were too severe and requested relaxation of the rules by the Board of Trade. After a conference between British and American representatives in Washington in 1920, it was agreed to relax the requirements for the cargo type of ship. At an international conference in 1929 agreement was reached on many of the moot questions. After the loss of the S.S. *Morro Castle* by fire in 1934 and the S.S. *Mohawk* by collision in 1935 the United States Senate appointed a committee to investigate ship safety for United States vessels. This committee recommended in Senate Report 184, 1937, higher standards for subdivision, fire protection, stability in damaged condition, and other matters affecting the safety of ships at sea. The International Conference on Safety at Sea held in London in 1948 adopted a convention to replace the 1929 convention which includes some of the recommendations of the senate report. Ships flying the American flag and, therefore, subject to United States Coast Guard inspection are required to meet standards that are actually higher than called for by the 1948 convention as they include many of the requirements of Senate Report 184.

The decision as to the number and spacing of watertight bulkheads to insure the maximum chance of survival of a ship in case of collision would, on first thought, seem to be a simple one. Actually, it is very complicated and becomes, in the last analysis, a compromise as have so many other decisions in naval architecture. There are two opposed points of view in this matter: one is that the bulkheads should be spaced as far apart as is possible while still permitting the flooding of the predetermined number of compartments; the other is that the closer the bulkheads are spaced, the safer the ship (leaving out of consideration the operating disadvantages in close spacing already mentioned above). At the international conference, the latter point of view prevailed; namely, that there is continually increasing safety with decreased bulkhead spacing. Instead, however, of prescribing one-, two-, or three-compartment subdivisions with the bulkheads spaced as far apart as possible within each grade or subdivision, the convention gave a permissible length of compartment, which is obtained by multiplying the floodable length by a factor less than unity or as a limit equal to unity, called the *factor of subdivision.* In order to describe briefly the subdivisional characteristics of ships, the terms *one-compartment* ship, *two-compartment* ship, *three-compartment* ship, etc., were adopted, meaning that when any two adjacent compartments of a ship can be flooded without submerging the vessel below the margin line (a line 3 inches below the uppermost deck to which the transverse bulkhead are carried), it is termed a two-compartment ship; when three adjacent compartments can be so flooded, it is termed a three-compartment ship, etc. Obviously, the maximum flooding is coupled with the minimum damage when such damage occurs where a bulkhead meets the side of the ship. If the damage does not come at a bulkhead, then the greater the distance between bulkheads, the greater the permissible damage which will flood only one compartment.

For the reasons already stated, these standards were not made compulsory on ship operators, but, in the case of the United States, the Bureau of Marine Inspection and Navigation of the federal government, which has jurisdiction over such matters, adopted many of them, especially the ones having to do with fire prevention and extinction. The Maritime Commission went a step further in its designs by exceeding many of the requirements of the international agreements. For example, all new cargo vessels under its jurisdiction, such as the Liberty ships, were required to have not less than a one-compartment standard of subdivision. A vessel is said to be a one-compartment ship when it can survive flooding of any one of its main compartments, throughout a large part of its operating range under normal loading conditions.

It is difficult to evaluate the exact effect which design policies and practices have on any complicated engineering product such as a ship, but the following data are interesting as indicative of at least the broad general influence of the "safer ships" design policy adopted by the Maritime Commission. During World War II, 758 merchant vessels operating under the War Shipping Administration suffered war damage. Of this number 467 did not have Maritime Commission sponsorship in design. Of these 467 ships, 80 per cent sank as the result of the damage received. Of the 291 ships which were built in accordance with Maritime Com-

mission subdivision and other safety at sea practices, only 53 per cent sank as the result of damage received. There were at least six of these ships whose survival can be ascribed definitely to the compartmentation policy adopted by the Maritime Commission. It was clearly established also that ships built to these standards remained afloat longer than ships not so designed even when they sank eventually, thus providing more time for the personnel to abandon ship.

The whole problem of bulkhead spacing is also complicated by the kind of cargo which happens to be in the compartment at the time of flooding. To arrive at any conclusion in the matter, an assumption must be made as to the permeability of each compartment. By *permeability* is meant the extent to which leakage water can permeate flooded spaces. It is expressed as a percentage of the total volume of the space under consideration. For example, an empty hold can take nearly its entire volume of sea water. The permeability of such a space is, therefore, about 98 per cent. On the other hand, a ballast tank already entirely filled with water can take no more water; therefore, its permeability is zero. Spaces used for various purposes may have any degree of permeability between these two extremes. A hold filled with canned goods in cases has a permeability of about 30 per cent; one filled with furniture in boxes, about 80 per cent. It will be seen that the effect on the ship, as a whole, of flooding a given space will depend on the amount of water which enters this space, which in turn will depend on its permeability. Hence, before the effects of flooding can be calculated, definite values for the permeability of the spaces involved must be assumed, but the actual permeability in service cannot be known by the naval architect for all conditions, as it may vary considerably from voyage to voyage, depending on the amount and kind of cargo carried. In the last analysis, mathematics can take the naval architect only part way in arriving at the best solution for the subdivision of ships, after which, judgment and a suitable compromise of the conflicting considerations must do the rest. See also Insurance, Marine; Ship; Shipbuilding Industry and Construction; Submarine.

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NAVAL AUXILIARY VESSELS. The term *naval auxiliary vessels* has had various meanings in the past and has, in fact, not always meant the same type of ship in all navies. In the days of wood and sail, all naval vessels were in a sense combatant ships, possibly with the exception of store ships. Auxiliary vessels to accompany the fleet were not necessary, because each unit of the fleet was self-sustaining. With the advent of steam and finally of modern weapons and specialized fighting craft, such as submarines and destroyers, a number of types of auxiliary vessels had to be provided which were not essentially fighting craft, but were necessary to keep the combatant ships in efficient fighting condition. The earliest of the auxiliary types were fuel ships, store ships, transports, and ammunition ships. With the advent of submarines, it was found necessary to provide submarine tenders because of the poor living conditions at that time on the submarines themselves. To avoid the necessity of frequent visits to navy yards, these tenders were also equipped with repair facilities to assist the personnel of submarines in making minor repairs to machinery. Submarine tenders were found so valuable in this respect that destroyer tenders and repair ships were soon added. In order to assist the fleet in self-maintenance still further, large repair ships are now important units of every fleet. Hospital ships (q.v.) complete the list of ships that are normally classed as auxiliaries. All of the above-mentioned types resemble merchant ships more than they do men-of-war. In fact, such ships have often been converted in the past from merchant ships. While naval auxiliaries, except hospital ships, carry some armament—mainly for defense against submarines and aircraft—their primary mission is not that of fighting ships. In some navies, minesweepers, minelayers, patrol craft, and armed merchant ships functioning as cruisers are also classed as naval auxiliaries.

In order to leave no ambiguity as to what constitutes a naval auxiliary vessel, the 1936 London Naval Treaty defined such craft as follows:

"*Auxiliary Vessels* are naval surface vessels, the standard displacement of which exceeds 100 tons (102 metric tons), which are normally employed on fleet duties or as troop transports, or in some other way than as fighting ships, and which are not specifically built as fighting ships, provided they have none of the following characteristics: (a) mount a gun with a caliber exceeding 6.1 in. (155 mm.); (b) mount more than eight guns with a caliber exceeding 3 in. (76 mm.); (c) are designed or fitted to launch torpedoes; (d) are designed for protection by armor plate; (e) are designed for a speed greater than twenty-eight knots; (f) are designed or adapted primarily for operating aircraft at sea; (g) mount more than two aircraft-launching apparatus."

While the treaties limiting naval armaments, including the 1936 London Naval Treaty, are no longer in effect, the above definition of auxiliary vessels is of interest as it gives the limit in protection, armament and speed, beyond which, in the opinion of the naval experts who drafted the treaty, a noncombatant ship becomes essentially a fighting ship. See also Naval Strategy and Tactics.

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NAVAL AVIATION. As an idea, naval aviation dates in the United States from the day in September 1908 when naval officers, observing the tests of the Wright brothers at Fort Myer, Va., suggested the addition of pontoons to their plane for waterborne use. As an actuality, it dates from Nov. 14, 1910, when Lieut. Eugene Ely successfully flew an airplane from a rudely constructed platform on the bow of the U.S.S. *Birmingham* at Hampton Roads, Va. In January 1911, he landed on and took off from the deck of the U.S.S. *Pennsylvania.* A month later, Glenn Curtiss flew in his hydroplane to the waters alongside the same ship, was hoisted aboard and placed back in the water, where he made a successful takeoff.

In the same year, the first naval aviation unit was formed, a training organization so mobile it could move its camp from place to place without difficulty. By the outbreak of World War I, navy fliers had established a number of world records and had demonstrated the ability of their craft to perform usefully with the fleet, given special pilot training. By November 1918, the handful of naval aviators had grown to 7,000 officers and 30,000 enlisted men. The navy had 54 naval air establishments, over half of which were overseas.

The mission of naval aviation in World War I was primarily patrol and antisubmarine activity. Airplanes could not fly across the ocean, and as they increased in size and as shipping space shrank, transporting them became a serious problem. This led to the development of the big NC flying boats, capable of making the ocean flight on their own. On May 8, 1919, four of these planes took off from Newfoundland for Lisbon. Several days later, one of them, the NC-4, became the first airplane ever to fly across the Atlantic.

Despite drastic disarmament following the war, naval aviation in the United States expanded and assumed a more integrated role in operation with the fleet than its specialized antisubmarine assignment of the war. Civilian and military scientists improved the flying boats in range, strength (for rough-water landings and takeoffs), and speed, but still they were tied to shore bases by the necessity for fueling and maintenance. It became manifestly necessary to obtain aircraft which could operate directly from ships out at sea. The catapult, which had been proved feasible during the war, was installed on all the cruisers and battleships of the fleet for launching planes at sea. This device, which functions like a giant slingshot, uses compressed air, hydraulic pressure, gunpowder or electricity, and ultimately was developed to accelerate a piloted plane from zero to 90 miles an hour in the space of 150 feet. The battleships and cruisers also had small complements of float planes for scouting and observation.

Development of Carrier Aviation.—However, out of the experiments of Lieutenant Ely on the *Pennsylvania,* there was developing a more satisfactory way of carrying airpower to sea. England was in the lead in this project for a time and in 1918 converted a cargo ship into the first satisfactory carrier with a full flight deck for landing and takeoff of airplanes. Four years later the United States converted the collier *Jupiter* into the carrier *Langley.* The Japanese had completed the small new carrier *Hosyo.*

This new type of ship made it possible for small and medium-sized aircraft, of higher performance and greater maneuverability than the flying boats, to accompany the fleet anywhere and operate almost independently of the weather. Specially designed to carry planes, the carriers could develop enough speed of air across the flight deck to furnish the necessary lift for takeoffs, even when the wind alone was not strong enough. The landing-run was shortened by use of a tail hook on the plane which engaged in a mesh of arresting gear on the deck. Elevators were constructed to carry the planes from the flight deck down to the repair and maintenance facilities below in the hold.

Navy airplanes increased in variety as well as numbers, but always in three main types:

Carrier-based Planes.—These were developed to offset the drawbacks of flying boats, which could not always keep up with the fleet, and of catapulted seaplanes which were comparatively low in performance and weak on the offensive. The carrier planes consist of three types: (1) highly maneuverable little fighters which give protection to ships against enemy air attack, as well as escort attacking groups of heavier planes; (2) larger torpedo planes, with crews of three, which deliver either torpedo or horizontal bombing attacks; (3) scout bombers, also known as attack bombers, which operate on long-range scouting expeditions or in the navy-developed maneuver known as dive-bombing.

Flying Boats.—Originally designated two-purpose planes for patrol and bombing work, these later became almost exclusively used by the navy for long-range scouting work. Weighing up to and even more than 60,000 pounds, with wing spans of over 100 feet, they carry crews of 5 to 10 men, and operate either from shore bases or aircraft tenders which permit use of any reasonably sheltered water as a base.

Seaplanes.—These are constructed with a single main float and auxiliary wing-tip floats to lend stability on the water. They are based on cruisers and battleships, which launch them by catapult and retrieve them from the water with cranes after landing. Seaplanes based on capital ships add much to their effectiveness, widening the scouting range by hundreds of miles and increasing the accuracy of their gunfire by "spotting" the results from the air.

In addition to these three main types, naval planes always include amphibious aircraft, used largely for rescue work, and land-based transport planes.

In the lighter-than-air field, the navy during World War I utilized small nonrigid airships, called blimps, in Atlantic coastal, Gulf of Mexico, Panama, and western European waters, on antisubmarine patrol and escort duty. Kite balloons were widely used at shore bases and on U.S. battleships as lookout and gunfire-spotting platforms.

In the early 1920's, the United States Navy promulgated a program for three rigid airships, one each to be built by Britain, Germany, and the United States. America's *Shenandoah* operated successfully as a naval unit for two years, then was wrecked in Ohio in September 1925. The British-built *ZR-2* was wrecked at Hull, England, during trials. The German-built *Los Angeles* was operated successfully as a naval noncombatant unit from 1924 to 1931, when she was decommissioned for lack of funds.

The *Akron* and the *Macon,* two United States airplane-carrying scouting airships, were built in the early 1930's. Each was of about 200 tons displacement, about two and a half times that of earlier ships. They operated successfully with the fleet for a year and a half and then each was wrecked.

With the advent of World War II, the lighter-than-air arm of the United States Navy was built up extensively, for antisubmarine escort and patrol. At its wartime peak, the blimp fleet of 120 was deployed on all United States continental coasts and in Caribbean, South American and Mediterranean waters; 30 more blimps were in use for training, and airship crews numbered 1,500 officers and 3,000 enlisted men. The K-model airship, the type principally

used, displaced 12 tons and had a crew of 10 officers and men. Of the more than 89,000 vessels escorted by United States blimps during the war, not one was lost due to enemy submarines. After the war, the airship fleet of the United States Navy was reduced to 15 per cent of its peak strength. See also WARSHIPS, MODERN—*Aircraft Carriers.*

Naval Aviation in World War II.—At the time of the attack on Pearl Harbor on Dec. 7, 1941, the United States Navy had 5,000 planes, 6,000 pilots, and 43 air stations. By early 1945, the numbers had grown to 37,000 planes, 55,000 combat-trained pilots, including 10,000 marines, and 168 air establishments, with 325 satellite fields. Coast Guard aviation, along with the rest of that service, came under navy jurisdiction as usual during a war emergency. The peak number of United States aircraft carriers was approximately 100, including 27 of the fast, first-line type, and 69 small escorts. Three 45,000-ton carriers, the *Franklin D. Roosevelt, Midway,* and *Coral Sea,* were the most formidable ever laid down by any country.

Naval aviation operated in four major roles in United States participation in World War II. The first was in the Fast Carrier Task Force, a wartime concentration of air-seapower which operated around the clock through the use of night fighters. The second method of employment was the use of the fleets of escort carriers against submarines in the Atlantic and Pacific oceans. The third was to provide close air support for amphibious operations in general Allied advances, and the fourth was as a search and patrol arm, in which both shore- and tender-based planes were used.

An additional function was performed by the Naval Air Transport Service (NATS), which aided the fleet in the transportation of men and materials and evacuation of wounded in all theaters of operation. In 1946, NATS was still flying world routes totaling 45,000 miles.

In July 1946, planes from United States carriers conducted photographic and reconnaissance missions during the atom bomb tests at Bikini Atoll in the Pacific. On September 29, the *Truculent Turtle,* a long-range navy patrol plane, took off from Perth, Australia, on a record-breaking nonstop flight to Columbus, Ohio, 11,236 miles away.

In the postwar period, the majority of existing aircraft and carriers were placed on a reserve status, in what was known as the Mothball Fleet, ready for reactivation in a comparatively short time. In May 1947, this reserve fleet contained 79 carriers as against only 18 still in the active fleets.

Postwar research and development in naval aviation brought advances in the fields of jet propulsion, pilotless aircraft, rotary-wing aircraft (helicopters), air-sea rescue equipment and electronics, including vast improvement in radar-controlled landing procedures for blind flying.

Several types of jet-propelled or gas turbine-driven bombers and fighters were developed by the United States Navy for carrier operations, some capable of speeds of over 600 miles an hour. One of these, a nonmilitary research plane, the jet-propelled D-558, broke the world's speed record twice in one week, in August 1947, at Muroc Field, Calif., setting a high mark of 650.6 miles an hour. Both piloted and pilotless aircraft were produced to explore the transonic and supersonic areas of speed. The field of winged guided missiles in the navy was assigned to aviation, and divided into four types, according to tactical mission. These were for firing from ship to airborne craft, ship to ship, plane to ship, and ship to shore.

The dual mission set up for naval aviation in the United States after the war was to incorporate into the country's air seapower all the latest developments in aviation, while at the same time pressing the need for continual improvement in existing methods and equipment. See also COAST DEFENSE; WORLD WAR II; WORLD WAR II: NAVAL STRATEGY.

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NAVAL BASES. The sea power of a nation consists of: (1) its navy; (2) its merchant marine; and (3) its naval bases, the last mentioned meaning particularly its advanced overseas bases. No nation can obtain, nor long retain, command of the sea if it lacks any one of these three elements of sea power. The merchant marine of a country is not only one of the components of its sea power; it may be a principal reason why sea power is needed by a nation. All countries are dependent to some degree on seaborne commerce for their prosperity, but the importance, in time of war, of maintaining uninterrupted trade communications by sea with the outside world differs greatly as between nations. Maritime communications are of maximum importance to an insular country such as Great Britain, which must import a large part of the food it consumes, and also the raw materials used by its industries. Such communications are of minimum importance for a huge country such as Russia, which produces everything that it needs for its domestic economy within its own contiguous land areas. The United States falls somewhere between these two extremes.

The part which the navy plays in this triumvirate requires no detailed explanation. In brief, the function of the navy, in time of war, is to destroy the enemy's sea forces wherever they may appear, or to render them innocuous by close blockade. To put it in another way, it is the function of a navy, in time of war, to deny the use of the sea to the enemy, but to keep sea transportation to and from its own country uninterrupted. The navy is therefore the weapon of sea power. It is the function of naval bases to keep that all important weapon in good fighting condition.

Naval bases may play little part in a short war, or in a localized war. When that happens, it is only because sea power itself has not come into action. There have been wars of considerable proportions in modern times which were won

without the victor having command of the sea. The Franco-Prussian War (1870) is a case in point. During that war, France had undisputed control of the sea, so far as Germany was concerned, but nevertheless lost the war.

It may, however, be stated as an axiom that effective sea power cannot be wielded without naval bases. Why are naval bases so important? Because ships are dependent on the land for everything that goes into their construction, maintenance, and operation. Only the salt water that is pumped through the fire and flushing mains of ships comes from the sea. In the days of the sailing ship, there was an additional item—an important one—which did not have to be brought aboard from ashore: the energy of the wind driving the ship. Naval bases and the ships and aircraft in the service of supply of the fleet are the umbilical cord through which the fleet is nourished in time of war.

The requirements that naval bases have had to meet have undergone vast changes through the centuries. These changes have been mainly in the direction of adaptation to the ever increasing complexity of warships. In ancient times, when Phoenicia, Greece, and Rome in turn ruled the Mediterranean, the rowing galley was the weapon of sea power. The galley, overcrowded with fighting men and rowers, did not normally remain at sea even at night, but drew up along the shore in the late afternoon to give the men an opportunity to forage for food and to make camp for the night. With the development of sail power, the size of ships increased, and the living accommodations for the crews became more nearly adequate as compared to the overcrowded rowing galley. Ships remained at sea for longer periods of time, and eventually, the radius of action of the sailing ship became worldwide.

While the galley, or Viking ship, needed only a protected cove, or the estuary of a river, for a repair base, the sailing ship needed something more. For one thing, there had to be a hard sloping beach, with sufficient rise and fall of tide to permit careening ships to make repairs to their bottoms, particularly to their copper sheathing. The anchorage had to be protected from strong winds and the open sea. The depth of water had to be sufficient to accommodate the larger ships, but not so great as to make anchoring difficult. The shore establishment of the base had to carry a sufficient stock of such materials as timber, cordage, and canvas to replace spars, rigging, and sails. An important function of the base was to serve also as a revictualing station. Compared to modern requirements, the naval base of the sailing ship era was a simple affair, easily established, and easily maintained in times of peace. England became mistress of the seas during this era largely because of her far-flung naval bases, which often became the nucleus of new colonies, and always protected and stimulated her foreign trade. During the era of sails, warships came closer to achieving independence from overseas bases than at any time before or since, but it was independence only in a relative sense. Even sailing ships had their limits as to the length of time they could remain away from repair bases. During the War of 1812, the lack of a naval base for making repairs to spars, and for refitting rigging, brought David Porter's cruise in the *Essex* to a disastrous end, for the rotted rigging and the decayed spars of his ship gave way during preliminary maneuvers against his British adversaries. By that time the *Essex* had been away from a naval base for 18 months. That was a long time for a ship to cruise without benefit of a navy yard, even in the days of sail.

During the first half of the 19th century, two changes occurred in ships which influenced profoundly the service demanded of naval bases. These developments were: the substitution of iron for wood as the principal shipbuilding material, and the substitution of steam for sails as the principal propulsive agency for driving ships. It took more than half a century to bring these innovations to the point where it can be said that iron had replaced wood, and that steam had replaced sails. The conservatism of seafaring men, and their reluctance to accept new ideas, are often given as the reason for the slowness of these developments. This is hardly fair to the great majority of those who followed the sea in one capacity or another during that period. The theoretical advantages of iron over wood, and of steam over sail, were so obvious that only the very prejudiced failed to grasp them; but 150 years ago there were some very real problems to be solved before the change could be completely made. These problems had much to do with naval bases, and the lack of worldwide ship repair facilities.

The iron ship and, later, the steel vessel operating in salt water was, until only a few years ago, subject to a very serious malady—the fouling of its bottom by marine growths. Within a few weeks after leaving dry dock, freshly painted, a noticeable falling off in speed took place. Within six months sometimes—depending on the waters being navigated—the increased power required to drive ships at their designed speeds reached serious proportions, due to fouling. To put it in another way, high-speed ships in particular, because of fouling, could not come within many knots of making their top speed after being out of dry dock a number of months. Iron ships therefore had to be docked frequently for cleaning and painting of their bottoms, even when no other underwater repairs were necessary. This was not a problem in the case of wooden ships, whose copper-sheathed bottoms were immune to fouling. Not until about the time of World War II was a bottom coating developed which permits steel ships to remain out of dry dock for as much as 18 months without serious fouling. The overwhelming defeat of the Russian Fleet by the Japanese, at the Battle of Tsushima (1904), was partly due to the fact that the bottoms of the Russian ships were so foul that the ships could not make the speed required to get them into the battle formation ordered by the Russian admiral when contact was made with the Japanese Fleet.

Fouling was soon recognized as one of the drawbacks to the adoption of iron for building the hulls of warships. Before Great Britain, as the foremost sea power of that period, could wholly adopt the iron ship, dry docks had therefore to be provided at home, as well as in distant parts of the world, for the periodic docking and painting of such ships. Naval bases equipped with fixed dry docks were consequently considered an indispensable element of sea power, up to the time of World War II. During that conflict, sectional floating dry docks of various sizes were provided, which, in effect, accompanied the fleet as it moved forward in the Pacific.

The adoption of steam power for ships carried with it an even greater logistic problem than the substitution of iron for wood in their construction. Steam meant that fuel had to be made available for ships in distant parts of the world, if sea power was not to be limited to the very short cruising radius of the early steam warships. Coal piles at distant naval bases therefore became closely associated with the conception of sea power. The fueling problem was no doubt in the mind of the author of the *English Seamanship Manual,* official textbook for the training of British naval officers, when he wrote, as late as 1860, that "there is no greater fallacy than to suppose that ships can be navigated on long voyages without masts and sails." This opinion was written more than 50 years after the first successful commercial steamship line began operating on the Hudson River, and some 40 years after the first ship crossed the Atlantic Ocean under auxiliary steam power. The German ships which found themselves in the Pacific Ocean at the outbreak of World War I had only a short shrift of activity, largely because they soon used up their fuel. Coaling at sea, either from prizes or from friendly colliers, proved very difficult, and sooner or later led the ships into the hands of the enemy. When oil replaced coal, many fuel problems were simplified for warships, including the difficulty of fueling at sea.

History is replete with examples of disastrous consequences to individual ships, to whole fleets, and to the best of war plans, because of the lack of naval bases. However, there has never been a wholly satisfactory solution of the problem of anticipating, in time of peace, the naval base requirements for war. It is nevertheless recognized as axiomatic that, unless the naval forces attempting to exercise command of the sea are continuously supplied with the innumerable things that ships consume, and with adequate docking and repair facilities, they must sooner or later fail in their mission; and that only naval bases in one form or another can supply these needs. The difficulty in solving this problem lies, for one thing, in the fact that, in time of peace, it is never possible to foresee with certainty what enemy, or alliance of enemies, must be faced in the next war. Then too, public opinion, particularly in democracies, is always opposed in times of peace to the expenditure of large sums of money in preparation for the next war. The result has been that advance naval bases have never been provided by any nation in such number, in such locations, and with such completeness as to fulfill all of the requirements of the next war. Such was the experience of both Great Britain and the United States when confronted with World War II. After World War I, Great Britain spent considerable money in establishing a large naval base at Singapore, and smaller bases elsewhere in the Orient. The United States developed the navy yards at Cavite and Olongapo in the Philippines, so far as permitted by the limitation of armaments treaties adopted after World War I. After Japan denounced these treaties in 1936, the navy attempted to obtain appropriations to develop Guam in addition, but it was then too late. The United States had also, over a period of 30 years, built up a first class naval base at Pearl Harbor, but this was more in the nature of a bastion for the West Coast, than an advance base in support of a fleet operating in the western Pacific. The Netherlands had also a sizeable investment in naval shore establishments in Java, on which most of the Dutch Navy was based.

The combined bases of these three nations in the Orient were not, however, sufficient to support a fleet large enough to come to grips with the Japanese Navy immediately on the outbreak of World War II; and, as a result, Japan captured all of the advance bases of the United Nations in the Orient within a few months after the attack on Pearl Harbor. This experience illustrates perfectly the dependence of the fleet on overseas naval bases. It demonstrates that without constant support from ashore, the fleet cannot exist; and that, without the continuous protection of the fleet, naval bases must sooner or later fall into the hands of the enemy.

The plans for a war with Japan recognized as a practical certainty that the naval bases in the western Pacific could not be held until the fleet, and the required logistics, had been built up to the point where the offensive could be taken in that area. The plans therefore included the development of advance base facilities along two lines. The one line was the expansion of the train and of the service of supply of the fleet. Before World War II, the train, which is in effect a mobile naval base, consisted of a few repair ships, tenders for destroyers, and submarines, ammunition ships, oilers, hospital ships, seaplane tenders, cargo ships, a salvage vessel, and a few other units not primarily combatant craft. A small floating dry dock, large enough to dock destroyers, had been added just before the outbreak of the war. Qualitatively, the units were excellent, but in numbers they amounted to no more than prototypes. A large construction program to augment the train was undertaken just before the war. More than 1,500 auxiliary ships, of the types mentioned, were ultimately built or converted, from merchant ships for this service, not including commercial tankers and cargo ships, which required no special features for naval use. The early naval task forces in the Pacific theater of the war were dependent entirely on the train for their supplies. In case of serious battle damage, ships had to make the best of their way back to Pearl Harbor, or to navy yards in the United States.

The second line of development contemplated the establishment of bases on captured islands, or on near-by islands, as soon as the war had shifted to the offensive. In accordance with this plan, the first advance base in the Pacific was established at Espiritu Santo, in the New Hebrides, after the southward progress of the Japanese had been checked at the Battle of the Coral Sea, during the first week of May 1942. From that time on, until the capture of Okinawa in June 1945, the war in the Pacific was, in effect, a continuous battle for advance bases, where airfields, supply depots, and ship repair facilities could be established, to serve as the springboard for the next offensive movement deeper into enemy territory. As the forces advanced, new bases were established, partly by stripping the old bases and moving their stores and repair facilities forward. This process came to be known as "rolling up the back areas."

The advance bases ranged in size from small units for the maintenance and repair of patrol boats, manned by only a few officers and men, to major repair bases comprising floating dry docks, pattern shops, foundries, machine shops—in fact,

practically all of the facilities to be found at a navy yard, or an air station, in the United States. They were manned by all of the trades and specialists employed at such stations. Some bases served particular purposes, such as providing hospitalization, rest, and recuperation for naval personnel relaxing after their return from combat zones. Convoy escort bases were located at the terminals of convoy routes, to provide fuel, stores, ammunition, and repair facilities for merchant ships and their escort vessels. A total of 152 floating dry docks, ranging in size from small units to huge sectional docks capable of lifting the largest battleships, were built for the bases after the war started. These floating dry docks contributed immensely to the speed with which ships damaged in combat could be repaired and returned to service. Many damaged ships would probably not have reached Pearl Harbor, because of the distance involved. Some of the bases were set up and operated only as airfields for the use of protective fighter planes and bombers. Others were developed into staging bases for anchoring, fueling, and revictualing the huge armadas of transports, cargo ships, oilers, and other vessels comprising the train which accompanied the combat forces and serviced them at sea.

The most important bases developed in the Pacific were the main repair bases at Espiritu Santo, in the New Hebrides; Manus, in the Admiralty Islands; Leyte-Samar, in the Philippines; and Guam in the Marianas. The last mentioned was established as soon as Guam was recaptured in the summer of 1944. This base alone was capable of supporting one third of the Pacific Fleet, and was the springboard for operations against Iwo Jima and Okinawa. These bases were capable of repairing major battle damage to the hulls and equipment of ships, and made it possible for the fleet to survive the Japanese suicide air attacks during the last months of the war. The naval and air forces needed to accomplish specific missions could be much reduced once these extensive base facilities were available close at hand, instead of being 5,000 miles away.

More than 400 bases, ranging in importance from small weather stations to full-scale fleet repair bases, were established in the Atlantic and the Pacific theaters during World War II. Many of those in the Pacific were in operation only a short time, being moved forward as the back areas were rolled up. In the western Atlantic, this element of sea power turned out to be less important than in the Pacific, because the United States Navy, in the former theater, was called on principally to fight a war against the German submarine. Some of the western Atlantic naval bases were, however, extremely valuable in carrying on this subsurface war. In the eastern Atlantic and Mediterranean, British bases were largely used.

Acquisition of Atlantic advanced bases by the United States began in the summer of 1940, when the Battle of Britain was in its initial stages and German submarines were making heavy inroads on shipping around the British Isles. At the beginning of the war, the British Navy had suffered severe losses, particularly in destroyers, during the Norwegian campaign and in the evacuation of Dunkerque. To make good these losses, Great Britain entered into an agreement with the United States to exchange certain rights in various localities in the Atlantic area adapted to the establishment of advance naval bases, for 50 of the older destroyers which were no longer fit for fleet service, but suited for antisubmarine duty. The bases so obtained are located in Newfoundland, Bermuda, Antigua, Jamaica, St. Lucia, the Bahamas, Trinidad, and British Guiana. These bases advanced the sea frontier of the United States several hundred miles in the direction of the Axis powers, and as they were leased for a term of 99 years, they continued to be of strategic importance to the United States after the war.

In order to give the construction of advanced naval bases the special attention warranted by their importance, there was added to the United States Navy, at the outbreak of World War II, a ground organization called the Naval Construction Battalions—popularly known as the Seabees. These battalions were recruited largely from the ranks of the construction industry, and consisted of workers from about 60 trades, the most important of which were operators of construction machinery and power plants, concrete workers, metalworking mechanics, carpenters, and electricians. The officers were assigned from the navy's Civil Engineer Corps, which is made up of graduate civil engineers and men who have specialized in the management of construction work. The basic administrative and operational unit of the Seabees was the battalion, which was composed of four construction companies and one headquarters company. Each battalion had a complement of 34 officers and 1,082 men. The diversification of trades, the training, and the equipment were such as to make each battalion a self-sufficient unit as a construction team, and as a fighting force when the need arose. By June 1945, the personnel of the construction battalions had grown to about 259,000, of whom 214,000 were stationed overseas, most of them in the Pacific.

The Seabees accompanied the first waves of the assault forces in an amphibious operation. Their first job was to get equipment ashore to build an airstrip for the use of protective fighter planes, and to assemble pontoons into causeways, landing docks, and other such facilities. They assisted also in clearing away any underwater obstacles placed by the enemy. Then roads were built for moving supplies from the exposed beaches to more protected positions inshore, or to the location chosen for the base. Sources of potable water were next developed, mess and hospital facilities set up, gun emplacements built, and radar and radio equipment installed. The construction of shops and store houses, the assembling of floating dry docks, and the installation of facilities of all kinds then followed, if a repair base was in the making. Finally a contingent of Seabees was left to take care of the maintenance of the base. The setting up of bases, and getting them into operation, was accomplished with amazing speed. By the use of a very carefully planned functional component catalogue, it was possible to order in advance all of the parts and equipment needed to set up any type of base, from a small weather observation post to a fully equipped air station or ship repair yard.

The responsibilities of the Seabees ended with providing the shore facilities and floating dry docks, and with keeping them in operating condition once they were provided. The actual repair and maintenance work on ships and aircraft was not done by the Seabees, but by the engineering duty officers, the mechanics, and the artificers

forming part of the officer and enlisted personnel of the navy. The repair forces at the advance bases and on the ships were the unsung heroes of the war. The part they played was less glamorous than that of the Seabees, but it was the end toward which all of the efforts in establishing advance bases were directed. The repair forces for manning advance bases, and, to a considerable extent, for manning repair ships, were organized as Ship Repair Units. The men for these units were specially selected and trained, with particular emphasis on their versatility, ingenuity, enthusiasm, and physical stamina, rather than on their outstanding proficiency as craftsmen in the various trades which they represented. There was no problem of trade jurisdiction, or limitation on daily output, which so often, even in time of war, interferes with the rapid performance of work in civilian establishments, because all of the personnel were commissioned or enlisted in the naval service. The mission of the units was to keep the ships at the front in fighting condition, and, if that were not possible, then to repair battle or other damage sufficiently to permit the ships to return safely to home yards for complete repairs. High standards of workmanship in accomplishing this mission were of secondary importance—speed and ingenuity counted above everything else. All jobs were emergency jobs, with long working hours the rule rather than the exception. There was, of course, no overtime pay for such work. The training and general administration of the Ship Repair Units came under the cognizance of the Bureau of Ships. The transportation, storing, and issuing of hundreds of thousands of items, including machinery spare parts, food, clothing, and other materials were handled by the Supply Corps of the navy, and by other personnel assigned to this duty. In order to keep supplies moving, and to reduce to a minimum the time during which ships were exposed to air and torpedo attack while unloading at advance bases, the longshoring was handled by special stevedoring battalions.

By July 1945, one fifth of the entire personnel of the navy, about 500,000 officers and men, were stationed at advance naval bases, or were engaged on work connected directly with the construction or operation of such bases. During the month of July 1945, approximately 800,000 long tons of materials of all kinds were handled by the advance bases and the fleet train in the Pacific. At Guam alone, 1,000,000 gallons of aviation gas were used daily during the month of June 1945. During the Okinawa campaign, naval ships fired 50,000 tons of projectiles, ranging in size from 5-inch to 16-inch. Ammunition of this kind was usually supplied directly to the combat ships by ammunition ships.

Late in the 18th century, in the heyday of the sailing man-of-war, a few hundred items stocked at an advance base sufficed to keep the ships going. There are now over 900,000 items used by the navy. Radar alone, in a few years, added about 30,000 items to the list, any one of which may be suddenly needed as a replacement by a ship in a task force engaged on a vital mission. The most reliable way to keep the machinery of ships running is by the lavish use of spare parts. This is particularly true of the internal combustion engines with which the smaller ships and aircraft are powered, and of the great variety of auxiliary machinery, much of it electric, installed on all ships. Replacement instead of repairs to machinery was found to be the best way to keep ships at the front, but it added greatly to the list of items that the train and the advance bases had to furnish on short notice. Improved wireless communication, and the development of a naval air transport service, did much to mitigate some of the additional supply problems that the increased complexity of warships brought to the fore. The Naval Air Transport Service did not get into its stride until the middle of 1943, largely because of lack of trained personnel and of suitable aircraft. By July 1945, the service operated 80,000 miles of basic routes connecting the principal distribution centers in the United States with the advance bases in all of the theaters of the war. For the two-year period from June 1943 to July 1945, Naval Air Transport made a total of 20,396 flights, handling 125,197 tons of material.

A few examples of the problems that air transport solved for advance bases may be of interest. A cruiser in the South Atlantic stripped a reduction gear pinion. A replacement pinion weighing 6,000 pounds was flown from Philadelphia to Recife, Brazil, in 34½ hours and was there installed in the cruiser, restoring the ship to service in a few days. The battleship *New York* suffered a casualty in the western Pacific which normally would have necessitated the return of the ship to Pearl Harbor. Spares weighing 10,000 pounds and 6,500 pounds respectively were flown in 72 hours from the Norfolk Navy Yard to the advance base at Manus, where they were installed in the ship. A French cruiser engaged in bombarding the Italian coast ran out of projectiles. Within 36 hours, 30,000 pounds of projectiles were flown from New York to Bizerte. In the last stages of the preparation for the invasion of Normandy, the United States Navy base at Dunkeswell, England, needed additional minesweeping gear. Between May 15 and May 23, 1944, 225,000 pounds of such gear were flown from New York to Dunkeswell. Air transportation of such material is enormously expensive if measured in dollars and cents alone, but when measured in terms of ships kept in the front lines, it is very cheap.

In one respect only, namely in supplying fuel, were the logistic requirements of the fighting ships of World War II simpler to meet than they were for the ships of World War I. After the latter conflict, oil gradually took the place of coal as fuel for practically all warships, partly because oil is far easier to transport, handle, and transfer to ships than coal. This development led to the building of high-speed tankers equipped with special gear for delivering fuel to ships under way at sea, at normal cruising speeds. The technique of transferring oil at sea to a ship under way progressed so rapidly, under the necessity of war, that it soon became routine practice even in rough weather. The same technique was used for transferring stores and ammunition to ships under way. While some oil storage was provided for emergency use at a few advance bases in the Pacific, most of the storage was eventually concentrated in the floating-tank farm at Ulithi, an atoll south of Guam. This base consisted of standard commercial tankers, from which the fuel was pumped to the high-speed oilers already mentioned. The magnitude of the fuel problem in the war with Japan is best illustrated by the statement that 25,026,000 barrels of

bulk fuel were shipped to the Pacific for war purposes during the single month of June 1945.

The experience of World War II demonstrated, as never before, that naval bases are an essential element of sea power, and that the United States could not project its power, west of Hawaii in the Pacific, without extensive additional base and fleet train facilities. These bases and facilities had to be provided, and had to accompany the fleet before sea, air, and land power could be used effectively against Japan.

In order to expand base facilities quickly when needed, the mobile units comprising the fleet train, including floating dry docks, repair ships, tenders, and store ships, must be kept in various degrees of readiness as part of the active fleet, of the ready reserve fleet, and of the laid-up reserve fleet. Such mobile units must be available to be sent forward in time of war, to assigned stations, when the area has been cleared of the enemy sufficiently to permit establishing a base. In occupying an advance base site, it may again be necessary, in the early stages, to depend entirely on floating facilities. As occupation expands, the shore facilities would be developed, ultimately providing a balanced repair, supply, and air base.

In peace time some components of the fleet train, like other units of the fleet, must be kept in full commission for training personnel, for participation in maneuvers, and for working out the procedures best adapted to the function of advance bases. Improvements in the prototypes of mobile base units, made to keep them in step with technological advances in ships and in industry, must receive constant attention.

Finally, it may be said that modern transportation and communication facilities have, in effect, made a naval base of the mainland of the United States; but this statement remains true only so long as the United States retains control of the sea and of the air. Overseas bases, in fact, are no more than strategically located branches of the main base, which is the United States. Sea, ground, and air potential are therefore irrevocably linked with the industrial potential of the country itself. See also NAVAL DISTRICTS.

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NAVAL COMMUNICATIONS AND RADIO STATIONS. The Naval Communication Service of the United States Navy is an activity of the Navy Department, established under the chief of naval operations, and is administered by an officer of the navy, usually a rear admiral, detailed to duty as the chief of naval communications. In accordance with broad policies laid down by the secretary of the navy and the chief of naval operations, the chief of naval communications carries out the following tasks: plans and supervises all elements of the Naval Communication Service both ashore and afloat; prepares communication operational and logistic plans; develops and prepares all navy and certain joint army and navy cryptographic aids, communication instructions and call sign books; operates the registered publication system which distributes all navy registered and nonregistered communication publications; procures, assigns, and protects radio frequencies for naval electronic equipment; supervises naval postal affairs; administers the accounting and disbursing of radio, wire, and cable tolls; operates the Navy Department message center; determines the military characteristics, requirements, and allowances of naval communication equipment for ships and shore stations; maintains liaison with other activities of the navy on matters of research, development, and procurement of communication equipment; maintains active contact with other branches of the military services, with civil agencies of the United States, and with representatives of foreign nations in matters involving military communication methods, procedures, and operational techniques; plans for and participates in international telecommunications conferences where navy interests are involved. The foregoing is also contained in the *Code of Federal Regulations,* part 26, section 26.14(g).

Naval Communication Policy.—The United States naval policy, as approved by the secretary of the navy on Jan. 27, 1947, declares the naval communication policy to be:

(1) To provide and maintain a naval communication system, and the security thereof, based on war requirements.

(2) To operate the naval communication system as required by fleet operations, and by the naval shore establishment, including overseas possessions and bases.

(3) To use the naval communication facilities to promote the safety of life at sea and in the air, maintaining adequate communication with stations of the United States merchant marine and aircraft flying over the sea.

(4) To encourage such development of the commercial communication activities of the United States as will enhance their military value in time of national emergency and safeguard the communication interests of the United States.

(5) To cooperate with the army to reduce duplication of effort and to standardize methods of communications in war.

Development of the Service.—While the Naval Communication Service, per se, is a very modern organization of 20th century origin, the first use of specialized communication procedures among American ships of war was in 1778, when the Continental Marine Committee distributed to the American Fleet the first general instructions for making a few simple maneuvers and recognition signals in a manner similar to that used in other navies for centuries. In 1796–1797, Capt. Thomas Truxtun, United States Navy, prepared and published a book which was the first American signal book to use the numerary system (*Instructions, Signals, and Explanations Offered for the U.S. Fleet*). What is generally regarded as the first official naval signal book was prepared by Capt. John Barry and Capt. James Barron. This publication was brought into use in 1800, and is considered the forerunner of the navy's *General Signal Book.* In the 18th and 19th centuries, primary means of communications were letters, signal flags, and speaking trumpets. A stout pair of lungs in a burly boatswain's mate is still regarded as a most useful means of communications and as one of the most reliable for short distances. No important changes were adopted in naval communications until about the time of the Civil War (1861–1865). The navy used the newly established commercial wire telegraph system to communicate with its units at various ports but did

not attempt to establish a system of its own. The navy also adopted certain elements of the army system of signals, and instruction in the Myer's code was included in the curricula at the United States Naval Academy. The Navy Signal Office was first established in 1869, under the Bureau of Navigation. In 1875, the navy began experimenting with electric lights for signaling, and the following year they were read at a distance of six miles by means of the "machine" and electromagnetic device, constructed by Professor Moses G. Farmer. Use of the flash lamp method, perfected by Lieut. W. N. Wood, which permitted signals to be read at a distance of 16.9 miles, followed in 1878. The Bureau of Navigation was soon unable to deal adequately with the technical aspects of the rapid advances made in communications and in 1890, the Navy Signal Office was abolished, and the Bureau of Equipment was assigned the responsibility for experiment and development. On March 15, 1898, the secretary of the navy issued orders to the president, Naval War College, to institute planning for the establishment of a coastal signaling system on the Atlantic and Gulf coasts. The present Coast Guard lighthouse, weather, and lifesaving systems, grew from this planning.

Officials of the Navy Department were keenly interested in the Marconi experiments in 1898 and 1899 and they invited Guglielmo Marconi to try out his wireless telegraph under United States Navy auspices. The U.S.S. *New York* and the U.S.S. *Massachusetts* were first equipped with Marconi's wireless apparatus and on Nov. 2, 1899, they exchanged messages across 36 miles of ocean. Naval officers were quick to appreciate the tremendous possibilities in the wireless telegraph. Additional ship installations were made and shore stations were set up at Washington, D.C., and at Annapolis, Md. In 1902, after a series of successful tests in the Chesapeake Bay area, all major vessels of the fleet were ordered equipped with the Slaby-Arco equipment, of German design, which then was considered to be the best available. Additional shore stations were ordered to be established.

Wireless was given its first practical test during battle maneuvers of the United States Fleet in 1903. The Blue forces were adjudged victorious over the Red forces and success was attributed to a single radio message which had rallied the Blues at night. The value of the wireless in naval operations was thus forcefully demonstrated and the more progressive minded naval officers agreed that wireless equipment must be installed on all fighting ships of the United States Navy. Six experimental stations were built and a special training school was established at the New York Navy Yard to spread the knowledge regarding the wireless telegraph throughout the navy. The United States radio industry was commencing to grow rapidly at this stage, and the need for control and regulation of radio communication was recognized by President Theodore Roosevelt. A special board appointed by the president to study supervision of the air waves recommended a three-way assignment: army control of interior military stations; navy control of coastal military stations; Department of Commerce control of commercial stations. Congress passed legislation providing for the regulation of radiotelegraphy in 1912. One noteworthy feature of this measure was the navy's obligation to open its facilities to commercial traffic. As usage of radiotelegraphy increased, so did the need for modernization of coastal stations. The greatly increased number of ship and shore stations, and the increased cost and complexity of equipment required an expansion in the administration of naval communications. The Office of Superintendent of Radio was established under the Bureau of Navigation in 1912. The technical aspects of radio remained under the Bureau of Steam Engineering (later named Bureau of Ships). In accordance with Navy Department General Order No. 240, the Naval Radio Service commenced actual operations when the act became effective on Dec. 13, 1912. This date may well be considered to be the birthday of the Naval Communications Service as it existed in 1947.

Congressional legislation in 1915, created the Office of the Chief of Naval Operations. Among many other things the new chief of naval operations was charged with the operation of the radio service and other means of communications. The Naval Radio Service was reorganized and the Office of Communications was established in the Navy Department. Shortly thereafter, Navy Department General Order No. 226 of July 28, 1916, established the Naval Communication Service under a director of naval communications. The first director, Capt. William H. G. Bullard, USN, was made directly responsible to the chief of naval operations. The title of director was changed to that of chief of naval communications in 1945, but the authority and duties of the chief remain about the same and have already been described fully in this article. See also SIGNALS, NAVAL; TELEGRAPHY AND TELEPHONY, RADIO.

Operation of the Service.—The naval communication system is, of necessity, a flexible organization increasing or decreasing from time to time, according to military requirements. Basically, the Naval Communication Service is composed of a number of shore communication stations and a communication station aboard each ship and aircraft. The major shore communication stations are normally composed of a radio transmitting station, radio receiving station, a message and control center integral with the naval headquarters being served, a wire or relay center, a cryptographic room, a registered publication issuing office, and such supplementary or security activities as may be advisable. Each shore communication station is designed to serve the command with which it is associated and to give adequate fleet communication support. Continental communication stations are connected by leased wire networks which form the navy NTX system and link all important navy commands within the continental United States by teletype. Emergency radio communications are available to replace these leased land lines in case of an emergency. Leased and toll telephone service is also provided within the continental navy shore establishment. Overseas communication stations are connected by radio circuits, normally radio teletype, which can tie in directly with the continental NTX system as required. The communication stations aboard ships and aircraft are equipped with various types of radio equipments, depending on the size and mission of each mobile unit, which will effectively tie each one into the naval communication system. The primary means of communication to ship units is by means of a highpower CW broadcast (Morse

code) from a regional station for reception by all ships in the area at the time. Reliable reception is an essential feature of such a "no answer" method; hence the navy broadcast stations must transmit on several frequencies simultaneously with appropriate power to cover the area served.

Several basic features of military communications as distinct from commercial communications are noted. Commercial communications must handle normal peacetime traffic loads at a profit. Military communications must: (1) cover strategic areas in accordance with national policy, the importance of the areas being not necessarily based solely on the population or industrial plants in the area; (2) be able to keep in constant touch with and adequately control forces in the designated strategic areas; (3) be as independent of commercial communications as practicable, in order to have control of communications necessary to meet emergencies. Military communications, like military forces, are primarily insurance measures for national security rather than money-making ventures.

The Naval Communication Service is, in effect, the nerve system of the navy. It functions in close liaison with the United States Army and Air Force communication systems and with all commercial communication systems. Equipments, methods, and procedures are constantly being improved and standardized to effect coordination and economy insofar as consistent with operational requirements. Integration and cross connection with other communication systems are essential to provide for flexibility and expansion in emergencies. Incidentally, message service is rendered to other government agencies without cost whenever this can be done without increasing navy communication personnel or facilities.

World War II Developments.—The Naval Communication Service expanded tremendously in World War II as necessary to support the operation of navy mobile forces. The total personnel engaged in navy communications in 1945 was roughly 20 times the number so engaged in 1939. However, while the personnel expansion factor was 20, the cost of equipment and the extent and capacity of the service provided by the system were expanded to over 300 times the 1939 level. This is indicative of the technical developments made, and of the greatly increased need for and importance of rapid communications during World War II. Rapid and reliable military communications permitted a speeding up of the coordinated war effort and enabled the armed services to maintain a split-second time table in mounting and conducting large-scale operations. Besides expanding the navy communication personnel and equipment as was necessary for handling a tremendous volume of navy messages daily to all parts of the world, other achievements of naval communications during World War II include: (1) research and development which resulted in many improved methods of communications and security; (2) participation in development and use of multichannel radio teletype circuits; (3) development and use of radio, radar, and sonar, and countermeasures therefor; development and use of loran and other radio aids to navigation (q.v.) in the air and on the sea; (4) expeditious handling of literally billions of pieces of personal and official mail to and from widely dispersed ship, air, and shore units; (5) communication service to all United States merchant ships engaged in war services; and (6) handling of radio press and radiophoto service on an unprecedented scale in order to keep the American public informed as to the progress of the war.

Naval communications thus enabled vast and diverse navy forces to operate as a team; provided means for coordination of carrier task force and joint amphibious force operations; provided essential means for accurately controlling direct attacks and landings; made possible the split-second timing essential to successful air attacks and naval bombardments supporting troop landings; and conveyed swiftly and accurately the information essential to planning and executing naval operations.

C. F. HORNE,
Captain, United States Navy; Deputy Chief of Naval Communications.

NAVAL CONSTRUCTORS. Naval constructors were, until 1940, a separate corps of officers of the United States Navy, having charge of the designing, building, and repairing of the ships of the navy. By act of Congress, they were amalgamated with the Line of the Navy in 1940. See also NAVAL ARCHITECTURE.

NAVAL DISTRICTS. The geographical limits of the United States naval districts and their headquarters are as follows:

District No.	Geographical limits	Headquarters
1	Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island (including Block Island).	Boston, Mass.
2	There is no second naval district.	
3	Connecticut, New York, northern part of New Jersey including counties of Monmouth, Middlesex, Somerset, Hunterdon, and all counties north thereof; also the Nantucket Shoals Lightship.	New York, N.Y.
4	Pennsylvania; southern part of New Jersey including counties of Mercer, Burlington, Ocean, and all counties south thereof; Delaware, including Winter Quarter Shoal Light Vessel; Ohio.	Philadelphia, Pa.
5	Maryland less Anne Arundel, Prince Georges, Montgomery, St. Marys, Calvert, and Charles counties; West Virginia; Virginia less Arlington, Fairfax, Stafford, King George, Prince William and Westmoreland counties, and the city of Alexandria; also all waters of Chesapeake Bay including its arms and tributaries except waters within the fourth naval district and the counties comprising the Potomac River and Severn River naval commands west of a line extending from Smith Point to Point Lookout thence following the general contour of the shoreline of St. Marys, Calvert, and Anne Arundel counties, as faired by straight lines from headland to headland across rivers and estuaries; Kentucky and the counties of Currituck, Camden, Pasquotank, Gates, Perquimans, Chowan, Dare, Tyrrell, Washington, Hyde, Beaufort, Pamlico, Craven, Jones, Carteret, and Onslow in North Carolina; also the Diamond Shoal Lightship.	Norfolk, Va.
6	South Carolina; Georgia; North Carolina except the counties of Currituck, Camden, Pasquotank, Gates, Perquimans, Chowan, Tyrrell, Washington, Hyde, Beaufort, Pamlico, Craven, Jones, Carteret, Onslow, and Dare; Florida; Alabama; Tennessee; and Mississippi.	Charleston, S.C.

7	There is no seventh naval district.	
8	Louisiana; Oklahoma; Texas; Arkansas; New Mexico.	New Orleans, La.
9	Michigan; Indiana; Illinois; Wisconsin; Minnesota; Iowa; Missouri; North Dakota; South Dakota; Nebraska; Kansas; Colorado; and Wyoming.	Great Lakes, Ill.
10	The Island of Puerto Rico, other U.S. islands in the Caribbean Sea, the Caribbean Sea itself, and to limits as defined by the Navy Department.	San Juan, Puerto Rico
11	Arizona; Clark County, Nevada; southern part of California, including counties of Santa Barbara, Kern, and San Bernardino, and all counties south thereof.	San Diego, Calif.
12	Utah; Nevada (except Clark County); northern part of California, including counties of San Luis Obispo, Kings, Tulare, Inyo, and all counties north thereof.	San Francisco, Calif.
13	Washington; Oregon; Idaho; and Montana.	Seattle, Wash.
14	Hawaiian Islands and islands to the westward and southward, including Midway, Wake, Kure, Johnston and Palmyra Islands, Kingman Reef, and Kwajelein Atoll (Marshall Islands).	Pear Harbor, T.H.
15	Panama Canal Zone	Balboa, C.Z.
16	There is no sixteenth naval district.	
17	Alaska and Aleutian Islands	Kodiak, Alaska

Each naval district is commanded by a designated commandant who is the direct representative of the Navy Department and its bureaus. In the administration of the affairs of the district, the commandant does not personally supervise the management of the several groups or units under him, but transacts the necessary business with the officer commanding the group or unit. The responsibility for the organization and efficient operation of administrative units within his command, such as, United States naval bases, recruiting stations, submarine bases, schools, inspection activities, navy shipbuilding activities at private plants, etc., rest with the officer in command of each unit. Communications relating entirely to the technical work of these establishments are carried on direct with the bureau or station concerned. Communications of any administrative unit, which involve questions of military policy or which affect the operation of any other unit in the district, are forwarded through the commandant of the naval district for recommendation or other appropriate action.

The most important groups under certain of the naval districts are the "United States naval bases," formerly known as navy yards, located at Portsmouth, N.H.; Boston, Mass.; Brooklyn, N.Y.; Philadelphia, Pa.; Norfolk, Va.; Charleston, S.C.; Bremerton, Wash.; Mare Island, Calif.; and Pearl Harbor, T.H. The mission of a naval base is to furnish direct service to the operating forces. A naval base is defined as that agency in a given locality which comprises and integrates all naval activities which are capable of contributing to its mission. A component of the naval base is the "United States naval shipyard" under which are integrated all departments and divisions of the former navy yard organizations which contribute directly or indirectly to the building, repairing, overhauling, docking, altering, converting, and outfitting ships; and to related or special manufacturing. In addition to the shipyard, the naval base may, and, in the case of practically all naval districts does, contain other activities, such as a naval supply depot, a naval hospital, a naval ammunition depot, a naval net depot, a naval receiving station, a marine barracks, etc. All of the component activities of the naval base, including the shipyard as a component activity, are under the military command and coordination control of an officer designated commandant of the naval base, who is directly responsible to the commandant of the naval district in which the base is located. The command relationship of the commandant of the naval base to the several component activities parallels that of a division flag officer to the ships of the division under his command, in that the commanding officer of each component activity exercises autonomy within his command and must produce results which contribute to the effectiveness of the naval base as a whole.

Each of the component activities of a naval base, including each shipyard as one component activity, is under the direct control of a commanding officer. Each such commanding officer is under the supervision of the commandant of the naval base for matters of internal security, defense, administration of military personnel, and for coordination of his activity with other components of the naval base in providing logistic services to the operating forces. For all other matters, including assignment of work, allotment of funds, assignment of personnel, establishment of operating methods, procedures, organization, etc., each such commanding officer is under the direct supervision of the cognizant agency of the Navy Department, except when such control is specifically delegated to the district commandant by the Navy Department.

The officer ordered to command of a United States naval shipyard must be technically trained in the building and repair of ships and must have had substantial previous experience in the technical and management phases of such work, both in United States naval shipyards and in the Navy Department. Such commanding officer may have been designated for engineering duty only. It is the duty of the commanding officer of a naval shipyard to supervise and direct all of the work of the shipyard; to assume full responsibility for the quality and quantity of work produced; and to assure the efficient and economical performance of the work of the shipyard.

J. A. FURER,
Rear Admiral, United States Navy (Retired).

NAVAL EDUCATION. Technological and social changes within the navies of the world have had profound effects upon naval education and training. The transition from sail to steam, accompanied by the institution of more humane methods of discipline to replace older methods including flogging, provided marked stimulation for the education of naval personnel. The two world wars of the 20th century and the recent dawn of the nuclear age have resulted in even more dramatic changes.

UNITED STATES

In the days of sail, enlisted men and officers received most of their training aboard ship. Student officers (midshipmen) were given some formal schooling in mathematics and astronomy to enable them to navigate scientifically. As steam engines and rifled guns replaced sail and smooth bores, it became apparent that officers would need at least a basic general and technical education. The founding of the United States Naval Academy at Annapolis, Md., in 1845 was an expression of this need. In addition, officers who specialized in the design of warships and their

armament required advanced technical education. The Royal Naval College at Greenwich, England, the École d'Application Maritime, Paris, France, and the University of Glasgow in Scotland, pioneered in engineering training for naval officers. Until about 1900 United States Naval officers were sent abroad to European schools for postgraduate education. In 1901, however, courses in ship construction for naval officers were established at the Massachusetts Institute of Technology. This was soon followed by courses at other universities for postgraduate training in naval engineering and naval ordnance.

Until World War I enlisted men continued to receive all their training aboard ship. The advent of radio and complex gunfire control systems in warships during the first two decades of this century made some formal schooling ashore of enlisted men necessary.

Aims of Naval Education.—Although navy instructional techniques follow many of the approved practices in public education, the learning atmosphere has certain significant differences. There is an environment that reflects the customs and traditions basic to the navy. The individual is placed in an atmosphere where he is continually stimulated to make these customs, traditions, and ideals a part of his life. He develops a sense of belonging to a fighting service essential to national security. The navy recognizes that gains in education and training demand:

(1) Adoption of technological and tactical improvements without delay.

(2) Utilization of significant advances in civilian education, psychology, and other sciences.

(3) Objective appraisal of all education and training programs of the Reserve and Regular forces.

(4) Integration—where feasible and advantageous to naval training programs with the training and educational activities of the other United States military services.

Responsibility for Education and Training.—The education and training responsibility of the chief of naval personnel is defined in *United States Navy Regulations* (1948) as ". . . recruit, basic, technical training and education of all personnel of the Navy including the Naval Reserve and the Naval Reserve Officers' Training Corps, as individuals, except such types of training as are assigned to other bureaus, offices or commands. . . ." The exceptions are aviation training and professional education, and technical training of medical personnel.

The education and training programs for which the chief of naval personnel is completely responsible may be grouped under five headings: enlisted, officer, functional, officer candidate and Naval Reserve.

Whereas the chief of naval personnel is responsible for the training of individuals (except as noted above) the chief of naval operations is responsible for training which is frequently identified as "team" or "group" training.

Fleet operational training includes the training of ships afloat, either singly or in groups, as well as the training of personnel as units of a ship's company. Training is provided in all forms of gunnery, damage control, engineering, combat information center (CIC), communications, and in tactical exercises. In addition, several shore-based schools, controlled by the fleet, have been established to fulfill particular needs. Among these are Fleet Sonar schools, CIC Team Training Centers, Fleet Gunnery and Torpedo schools, Fleet Training centers, and Naval Amphibious Training units.

The deputy chief of naval operations for air is responsible for the coordination of the aviation training program, both afloat and ashore. The shore-based program is administered by the chief of naval air training.

The chief of the Bureau of Medicine and Surgery (the surgeon general of the navy) is responsible for providing the professional education and training of the Medical, Dental, Medical Service, Nurse, and Hospital Corps. He establishes professional standards and policies, and trains personnel at naval hospitals or civilian installations, if the navy does not have the facilities. In the organization of the Graduate Medical Training Program, the general is assisted by a civilian Board of Consultants to insure that Medical Corps personnel meet the highest professional standards in the country.

In the execution of his assigned training responsibility, the commandant of the Marine Corps provides individual training for enlisted and officer personnel of the Marine Corps. The mission of conducting basic individual training of recruits has been assigned to the commanding generals of the Marine Corps Recruit depots. Training in basic subjects for all other enlisted men is the responsibility of each commanding officer. Primary responsibility for the basic training of newly commissioned officers has been assigned to the commandant, Marine Corps Schools, Quantico, Va.

The naval technical assistants to the secretary of the navy are: the chiefs of the bureaus; the chief of naval research and the chief of naval material; the judge advocate general; and the commandant of the Marine Corps. As we have seen, specific training responsibility has been assigned to certain of these assistants. *United States Navy Regulations* (1948) further provides that the other naval technical assistants shall make recommendations to the chief of naval personnel relative to the training and education of naval personnel who are assigned, or are intended for assignment, to duties in the field over which each technical assistant has authority. For this reason, the chiefs of the bureaus of Aeronautics, Ordnance, Ships, Supplies and Accounts, Yards and Docks; the judge advocate general, and the chief of naval research have considerable voice in the training of their own specialists. Likewise, certain branches of the Office of the Chief of Naval Operations—such as Naval Communications, the Hydrographic Office, and Naval Intelligence, determine training requirements of their own highly specialized personnel.

Education of Officer Candidates.—Naval officers are educated in a variety of ways. Some begin their naval education as midshipmen at the United States Naval Academy or at one of the Naval Reserve Officers Training Corps (NROTC) units; others become officers after years of service as enlisted men.

United States Naval Academy.—Although chaplains and schoolmasters were carried aboard navy ships in the early days, young officers received only rudimentary and haphazard instruction. This deficiency, and the development of steam-driven ships requiring officers with engineering training, led to the establishment of the United States Naval Academy in the year 1845. Today the four-year program at the academy emphasizes the

humanities and the sciences along with the basic knowledge required of the naval profession. The emphasis is on a broad base of fundamentals rather than on specialization.

Midshipmen are indoctrinated through precept and example with ideals of duty, honor, and loyalty in order that the naval service may be provided with junior officers capable of assuming high responsibilities of military leadership and citizenship. For information on methods of admission to the academy and other pertinent matters see UNITED STATES NAVAL ACADEMY.

Naval Reserve Officers Training Corps (NROTC).—The purpose of the NROTC is to provide junior officers with a sound basic education for the Naval and Marine Corps Reserve. The NROTC grew from the first six units established in 1926 to a total of 27 units by the beginning of World War II (1941) when it became a part of the United States Navy's V-12 college training program.

In 1946, Congress authorized a new program within the NROTC for the training of officer candidates for the Regular Navy and Marine Corps (Public Law 729). As now established, the NROTC has the following mission: "To provide, by a permanent system of training and instruction in essential Naval subjects at civilian educational institutions, a source from which qualified officers may be obtained for the Navy and Marine Corps, and the Naval Reserve and Marine Corps Reserve."

By 1957 there were 53 NROTC units located in colleges and universities throughout the United States. These units are administered by professors of naval science who are captains, United States Navy, or colonels, United States Marine Corps, and are staffed by officers and enlisted personnel of the United States Navy and United States Marine Corps.

There are two types of NROTC students—regular and contract. Regular students are selected by means of a nation-wide annual competitive examination, personal interviews, and other selection procedures, and are appointed midshipmen in the United States Naval Reserve. The annual quota, as determined by the needs of the service, is divided equitably among all the states and territories. With the exception of refundable fees, regular students receive all their academic educational expenses, as well as retainer pay, for a period of not more than four academic years, and are commissoned in the regular service. After three years of service they must choose between a permanent commission or further service and transfer to the Reserve inactive service until they have fulfilled their eight-year obligation. Contract students, unlike the regular students, do not enter the program through nation-wide competition, but are selected locally by the professor of naval science from interested students in the entering freshman class. They have the status of civilians who have entered into a contract with the navy. They are not entitled to the compensation paid regular students but are furnished commutation of subsistence during their third and fourth years of training. They do not receive educational expenses. Contract students are in training for reserve commissions.

Regular NROTC students may take almost any desired college course (premedical and predental being the major exceptions) leading to a baccalaurate or higher degree, but must include therein 24 semester hours of naval science (the curriculum for which is provided by the chief of naval personnel), one year of college physics, mathematics through trigonometry, and English of sufficient scope to develop proficiency in oral and written expression. Contract students are not restricted in their choice of curriculum except that they must meet the naval science, English, and mathematics requirements. It is contemplated that in the future approximately one half of the line officers of the navy will be NROTC graduates. See also NAVAL RESERVE—*Reserve Officer Procurement* (Naval Reserve Officers Training Corps).

Merchant Marine and State Maritime Academies.—There are five maritime academies: the United States Merchant Marine Academy at Kings Point, N.Y., operated by the United States Maritime Commission; and four academies under state auspices—the California Maritime Academy at Vallejo; the Maine Maritime Academy at Castine; the Massachusetts Maritime Academy at Hyannis; and the New York State Maritime College at Ft. Schuyler in New York, N.Y. The mission of each of these schools is to prepare selected candidates for careers as officers in the United States Merchant Marine Service.

The navy is interested in commissioning the graduates of these academies as ensigns, United States Naval Reserve, in order to build up the Merchant Marine Reserve and to this end maintains a Department of Naval Science at each academy. The navy provides naval personnel and equipment, textbooks and instructional material, and conducts the course in Naval Science which is required for each Merchant Marine cadet who aspires to a commission in the Naval Reserve.

The Officer Candidate School, Newport, R.I.—The mission of this school is to instruct and indoctrinate enlisted candidates for commissions in the Naval Reserve. During the 16-week course, instruction is provided in seamanship, communications, navigation, naval weapons, naval machinery, damage control, military justice, and leadership. Candidates must be college graduates and meet the age, citizenship, mental, moral, and physical requirements. Candidates may be civilians, inactive reservists, or active duty personnel. Successful candidates receive commissions in the restricted and unrestricted line or staff corps of the Naval Reserve. Training of women officers of the regular navy came about with the passage of Public Law 625 of June 1948. This act authorized enlistment and appointment of women in the regular navy and Naval Reserve.

The officer candidates attend an eight-week indoctrination session prior to their commissioning as officers in the Naval Reserve. This permits further screening after the initial selection and permits those unsuited to military life to be disenrolled before going into the second phase of the program provided for training of junior officers and results in a stronger and more select program for all chosen to continue training.

The program gives identical indoctrination to college graduates, enlisted women who are selected for the program, and college women who are accepted for training during their junior year. Junior officers, upon completion of their training, are immediately assigned to active duty.

Education for Officers.—After the successful candidate becomes a United States Marine Corps or United States Navy officer, his education continues on a more advanced basis.

Periods of Training.—Normally the further

education of an officer falls into the four periods described below.

Basic Period. An ensign's first assignment is normally in a ship of the fleet, where he receives intensive training under the supervision of more experienced officers. His duties may include: on-the-job training, short courses ashore related to his afloat assignments, courses through the navy correspondence courses center and the United States Armed Forces Institute, and required reading. He is rotated through the various departments on the ship and during his first six years, acquires a basic foundation of varied experience.

During this period, an officer may request a type of duty such as submarine or aviation duty. Officers applying for such assignments are selected on the basis of physical and mental qualifications and past record. Some officers are transferred to such specialties as civil engineering or supply corps duty.

Technical Period. The technical period typically occurs between the 6th and 12th years of commissioned service. During the first part of this period a line officer becomes eligible for his first shore duty. One year of this duty must be spent in the General Line School. Officers may apply for assignment to postgraduate courses conducted by the United States Naval Postgraduate School at Monterey, Calif., or at certain associated civilian colleges and universities. Applicants for the postgraduate instruction are selected by boards of officers appointed by the chief of naval personnel.

The Command and Staff Period.—The command and staff period includes the 12th to 30th years of an officer's career in the grades of lieutenant commander through captain. Normally after 12 years of service an officer has completed his first tour of shore duty which may have included one or more years of postgraduate study and a second tour at sea. He has completed his basic and his technical education. His sea and shore experience has prepared him for the advanced training of the command and staff period. His job becomes increasingly less one of operation and more one of leadership with greater responsibility and authority. Each officer is encouraged to request assignments which will further advance his training.

Special and Technical Schools for Officers.—Schools in this classification are maintained for the purpose of providing technical and refresher instruction in a variety of subjects as required to meet the needs of the many technical specialties. These courses, normally attended by junior officers, range from one week to 12 months in length. They are conducted at 16 schools and include instruction in the following categories: public works for Civil Engineering Corps (CEC) officers; atomic, biological and chemical warfare defense; damage control and fire-fighting; electronics; public information; ordnance and gunnery; basic Supply Corps training; freight transportation and cargo handling; naval justice; photography interpretation; and, when required, indoctrination training for chaplains.

The Five-Term College Program (Academic Education).—In 1946 Rear Admiral James L. Holloway, Jr. (1898–), as head of a navy board concerned with the proper education of officers, proposed a broader basis of acceptable training for prospective naval officers. The "Holloway Plan," approved by the secretary of the navy and implemented by Public Law 729, assured Reserve and United States Navy temporary officers accepted for transfer to the regular navy that they would have equal opportunity in the postwar navy with their contemporaries who were graduates of the Naval Academy. To this end the curriculum of the Naval Academy was reviewed to include approximately 2½ years of academic education and 1½ years of professional naval education. Arrangements were made to bring the education and training of all officers transferred to the Regular Navy to this minimum level of achievement. The five-term college program was inaugurated to furnish the required academic education for these officers.

Postgraduate Training.—The navy requires commissioned officers with advanced general and technical training to meet operational and logistic requirements for the maintenance and development of national seapower in peacetime and for rapid expansion in emergencies. Postgraduate education of commissioned officers, both men and women, in many fields is part of the fundamental naval personnel planning policy. Some, but not all, officers are selected for postgraduate education.

Advanced education in a technical specialty forms an important part of the preparation of officers who are later selected for special duty designations such as engineering. In the navy program, officers are usually given postgraduate education after they have served several years in the fleet. In this way, the advantages of maturity and broad viewpoint are realized.

The United States Naval Postgraduate School located at Monterey, Calif., is concerned with the graduate technical and professional education of naval officers. The instruction is conducted partly at the school itself and partly at various civilian institutions in order to utilize the best available resources in each field. Some instruction is conducted entirely at Monterey and some entirely at civilian schools; some courses include study at civilian schools after a year or more at Monterey. Naval intelligence postgraduate instruction is conducted at the Naval Intelligence School, Washington, D.C., which is a subcommand of the Naval Postgraduate School.

The establishment at Monterey comprises three distinct components—the General Line School, the Management School, and the Engineering School. The mission of the 9½ month General Line course is to broaden the mental outlook and increase the professional knowledge of line officers in such a manner as to enable them to meet the duties, responsibilities, and complexities of higher rank, thereby improving the efficiency and combat readiness of the navy. The general policy, insofar as practicable, is for all career line naval officers to attend the General Line School after five to seven years of commissioned service. This will be the first education period.

The Armed Forces Staff College at Norfolk, Va., is under the technical direction and supervision of the Joint Chiefs of Staff. The chief of naval operations is responsible for the operation and maintenance of the facilities used by the college, and administrative control is delegated to the chief of naval personnel. The mission of the school is to train selected officers of the armed forces in joint operations.

The Industrial College of the Armed Forces, Washington, D.C., is also a joint educational institution operated under the jurisdiction of the

Joint Chiefs of Staff. The Department of the Army is responsible for budget and maintenance. The mission of the college is to prepare selected officers of the armed forces for important command, staff, and planning assignments in the Department of Defense, and to prepare selected civilians for important industrial mobilization planning assignments in any government agency, by:

(1) Conducting a course of study in all phases of our national economy and interrelating the economic factors with political, military, and psychological factors.
(2) Conducting a course of study in all aspects of joint logistic planning and the interrelation of this planning to joint strategic planning and to the national policy planning.
(3) Conducting a course of study of peacetime and potential wartime governmental organizations and the most effective wartime controls..

The National War College, at Washington, D.C., is a joint college under the technical direction and supervision of the Joint Chiefs of Staff. The Department of the Army has budgetary and maintenance responsibility.

The mission of this 10-month course is: (1) to prepare selected personnel of the armed forces and other governmental departments for the exercise of joint high-level policy command and staff functions, and for the performance of strategic planning duties in their respective departments; (2) to promote the development of understanding of those agencies of government and those factors of power potential which are an essential part of a national war effort.

The Naval War College at Newport, R.I., is under the supervision of the chief of naval operations. Fiscal, logistics support, and personnel matters are administered by the chief of naval personnel.

The mission of the college is to further an understanding of the fundamentals of warfare, with emphasis on their application to future naval warfare in order to prepare officers for higher command.

The Enlisted Training Program.—The prime objective of the navy's enlisted training program is to develop the civilian enlistee into a petty officer skilled in the technical requirements of his rating, aware of his responsibilities as a leader, informed of his duties as a citizen of the United States.

In addition to formal or school training, the enlisted man is trained throughout his naval career while on the job. The navy also provides opportunities for self-study through training courses, which prepare him for advancement, and through self-study and correspondence courses offered by the Navy Correspondence Courses Center and the United States Armed Forces Institute, which provide a valuable supplement to any phase of training.

A successful enlisted career normally terminates with transfer to Fleet Reserve after 20 years or more of active duty. Yet some enlisted men take advantage of the several opportunities offered during their normal careers to advance themselves to the status of warrant officers, commissioned warrant officers, or commissioned officers.

Recruit Training.—It is in recruit training that the individual receives his early impressions of the navy. Such impressions are likely to be the lasting ones, and it is here that the transition from civilian to military life must be accomplished. Recruits must be prepared mentally and physically for usefulness at sea. The manner in which this preparation is accomplished has a lasting effect upon the navy, for from these men come the petty officers, warrant officers, and some of the commissioned officers of the navy of the future. The kind of start these men get, the attitudes toward themselves and the Navy that are developed, the fundamental knowledges and understandings with which they must be equipped, are of such importance that recruit training cannot be over-emphasized.

Recruit training is conducted in a 10- to 14-week training period at the training centers at Great Lakes, Ill., and San Diego, Calif. Of the 14 weeks, 10 are devoted to the regularly scheduled training of recruits; one week, or its equivalent to service (mess cooking, work details, watches); two weeks to recruit leave; and one week to the retraining period and out-processing. From recruit training the recruit is channeled toward the rating group best suited to his qualifications, or transferred to the operating units of the navy where he can learn more about the navy and thus exercise better judgment in planning his service career.

Service Schools.—The service schools, planned, administered, and supported by the chief of naval personnel, are designed to provide technical training for individuals at successively higher levels. Class A schools are designed to cover the groundwork for general service ratings, the curricula including all the technical qualifications required for petty officer third and second class. Class B schools provide formal training in technical qualifications for advancement to first class and chief petty officers, while Class C schools provide formal training in a particular job qualification or skill which is closely related to the man's rating. Class C schools are subdivided into Class C-1 and Class C-2 schools. The C-1 schools are located in naval establishments, while C-2 schools are special schools, recognized by the chief of naval personnel, but operated in civilian manufacturing plants.

Functional Training.—Traditionally, formalized navy schools fell into two general categories: schools for officers and schools for enlisted personnel. As the normal duties of enlisted personnel differed widely from those of officers, the technical qualifications likewise differed materially. However, during World War II an extensive need was found for another type of training which did not fit readily into either category. A new type of training in which both officers and enlisted personnel learned to function together in the coordinated performance of an operational task aboard ship was inaugurated. This type of training is often called "team" or "group" training.

The Naval Schools, Mine Warfare will partially illustrate functional training. These schools provide numerous courses of instruction using facilities both afloat and ashore, for both officers and enlisted personnel. They give a basic course for officers and in this they are not unlike officers' technical schools. They also give technical courses for minemen and in these they resemble enlisted schools. But these same schools also give an operational course in which officers and enlisted personnel obtain instruction designed to enable them to work together as a team in readying mines for operational usage. These schools also provide an indoctrination course for the prospective skippers of mine vessels, specialized courses in aviation mines, courses for

submarine officers and enlisted personnel, and specialized aspects of minesweeping for rated electricians and boatswains mates. Thus, these schools, concentrated at one location, provide instruction in all areas of mine warfare for all types of personnel who are concerned with the specialization.

United States Marine Corps.—The United States Marine Corps, which is an independent service within the Department of the Navy, shares in navy educational programs. The United States Naval Academy at Annapolis serves the Marine Corps: there are Marine Corps units in the NROTC; and Marine Corps officers receive advanced training in Navy schools. In accordance with the amphibious character of the Marine Corps and its traditions, the basic training of enlisted men is a combination of land training and naval training. This is conducted at the two Marine Corps Recruit depots at Parris Island, S.C., and San Diego, Calif. For advanced training, enlisted men participate in the schools of the United States Navy. Many marines also take correspondence courses through the Marine Corps Institute and the United States Armed Forces Institute.

Summary.—The United States Navy's training program for enlisted personnel is an essential part of the growth and development of the individual and is a foundation stone on which a career in the service must be built. The backbone of the naval service is the enlisted man. Through enlisted training he must be indoctrinated into the service from civilian life; he must be given the fundamental tools of skill and knowledge that will make him of use to the naval service; he must be trained in the technology of his specialty in accordance with his aptitude and ability; he must be taught to work smoothly and efficiently with others as a part of a team, he must be afforded the opportunity and the media for learning by doing, under competent direction and leadership; he must be enabled to grow professionally and as a member of a military force, through training and experience; and he must be advanced in accordance with his competence and effectiveness.

CANADA

The Royal Canadian Navy (RCN) was established in 1910 during a period of growing awareness that the naval strength of Germany represented a threat to British control of the seas.

Officers.—The education and training of officers for RCN began before the inception of the navy itself. An old naval hospital in the dockyard at Halifax, N.S., was converted for use as a naval college and was opened on Jan. 11, 1910. Two old British cruisers, H.M.S. *Niobe* and *Rainbow,* were also used as training ships. Even before this, the first group of young men had begun their training as officers in the Canadian government ship *Canada.*

Boys between the ages of 14 and 16 were entered and given a two-year course to be followed by a year's cruiser training. Later, the course was lengthened to three years and the curriculum broadened so as to include preparation for other than naval careers. In 1915, the subjects taught included mathematics, navigation, physics, engineering, seamanship, geography, history, English, French, and German.

The Halifax explosion in 1917 rendered the naval college building uninhabitable and the staff and cadets were moved to Kingston, Ontario, where accommodation was provided by the Royal Military College. In September 1918, the Naval College was transferred to Esquimalt. Before a permanent location for the college was found, postwar retrenchment changed the picture and in 1922 it was closed. From this time until World War II, the training of cadets was carried out in ships and establishments of the British Royal Navy. Officers were also sent to the British Royal Navy for advanced and specialized courses.

In 1942, Royal Roads at Esquimalt, B.C., was opened as a training establishment for regular officers. In 1949, the establishment was incorporated in a tri-service scheme known as the Canadian Services College and army, navy, and air force officers received a common academic and military training.

In general, prospective officers have at least a secondary school education and are enrolled as cadets. Their education in the service is designed to bring them to second-year-university level or, in the specialist branches, to degree standard. Officers may be entered in one of the following plans: (1) Regular Officers Training Plan; (2) College Training Plan; (3) Venture Training Plan; (4) Upper Yardmen; (5) Branch Officers.

Enlisted men may become officers, meeting some of the necessary requirements of taking a set of Canadian educational tests established on the college level, including some which have their parallel in the work of a technical institute. Each officer candidate from the "lower deck" must pass three or four of these higher tests, the choice depending upon his branch of the service and anticipated avenue of advancement.

Enlisted Men.—The minimum educational requirement for entry into the Royal Canadian Navy is completion of the eighth year of elementary school. The newly enlisted recruit receives very little further academic schooling during his initial training period of 21 weeks, which is devoted largely to professional training. He does, however, get about 16 lectures, treating in an elementary manner a variety of topics. These lectures include two on the significance of guided missiles and atomic energy in modern warfare.

Located at the Educational Training School in Royal Canadian Navy Barracks, Esquimalt, is the preparatory school. This is a school designed to give eight months of advanced educational training to men selected by fleet selection boards for eventual promotion to officer status. These men have been under special quarterly report for a year or more, have shown officerlike qualities, met certain professional standards and have qualified educationally as mentioned above. In the preparatory school they pass the higher educational tests required for promotion, and in some cases, one or two additional.

Preparatory school men are in different avenues of promotion, depending on their age, scholastic ability and branch. A few of the youngest and most gifted are made ready to enter a university course leading to a degree in engineering, honors physics and mathematics, or to the bachelor of commerce degree, the latter being open only to men of the supply branch. A few others, also superior students, but older (24–29), are designated upper yardmen and will become general list officers after about two years of professional training following graduation from the preparatory school. The majority of the students

are older men (30 or more) destined to become Branch Officers. These are limited-career officers qualified only in the field in which they specialized while on the "Lower Deck." Upon graduation and completion of a short course of further professional training they are promoted to the ranks of Commissioned Boatswain, Commissioned Electrical Officer, Commissioned Supply Officer, etc. The best of them will, after a few years, be given an opportunity to qualify as officers of the General List.

After new entry (recruit) training and (normally) an interval at sea, professional or trade training is continued in one of the RCN training schools. Among the most important of these are: the Torpedo-Anti-Submarine School, the Gunnery School, the Electrical School, the Mechanical Training establishments, the Naval Air Maintenance School, the Ordnance School, the Navigation Direction School. In each of these schools, instruction in mathematics and science is included at each level. In the Supply and Secretariat School, science and mathematics give place to bookkeeping, English, and accounting.

There is also a large educational program outside the professional and trade schools. It is based on a system of correspondence courses and voluntary school classes. This Royal Canadian Navy Correspondence Course system is designed to help men to pass RCN educational tests. There are two basic educational tests, one in arithmetic, the other in English, established on approximately the level of the eighth grade of elementary school. Both of these elementary tests must be passed for qualification as a petty officer second class in a technical branch or petty officer first class in a nontechnical branch. There are also tests in English, French, mathematics, physics, chemistry, bookkeeping, and navigation; these are known in the RCN as Canadian intermediate educational tests.

The above outline does not exhaust all the educational opportunities open to enlisted men of the RCN. They may compete, for example, on equal terms with civilians for acceptance in the Regular Officer Training Plan and the Venture Plan. There are also opportunities for men who wish to prepare for re-establishment in civil life. They may take, at public expense, various correspondence courses made available through the Department of Veterans Affairs.

Education of enlisted men is carried on largely by officers of the Instructor Branch of the RCN. These officers have degrees in the arts, science, or engineering, and are, with few exceptions, licensed as secondary school teachers. See also MILITARY EDUCATION AND TRAINING, and sections on defense in articles on individual countries.

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NAVAL GUNS. See GUNS, NAVAL.

NAVAL INSTITUTE, United States, a private, non-profit professional society founded in 1873 at Annapolis, Md., by officers on duty at the United States Naval Academy. Its objectives are the advancement of professional, literary, and scientific knowledge in the Navy. It publishes the *Proceedings* which has reflected the best current and advanced professional thinking of officers and men in the Navy.

Two prize essay contests annually, one for officers and one for enlisted men, stimulate articles on professional subjects. The *Proceedings* also specializes in the publication of historical material by foreign Naval officers.

The Naval Institute acts as the university press for the Naval Academy, publishing texts used throughout the Navy in professional education and training. It also publishes books of general interest dealing with naval history.

The institute membership is composed of most of the senior officers of the Navy and a large number of civilians throughout the world who are interested in naval matters. Associate membership is open to the public. The members elect annually a Board of Control which governs all institute activities, including the selection of articles for the *Proceedings*. A permanent staff under the Board of Control is headed by a secretary treasurer who is always a senior officer on active duty at the Naval Academy. While physically situated on the grounds of the Naval Academy at Annapolis, the institute is an independent, non-government, self-supporting professional society.

NAVAL INTELLIGENCE is the term applied to the collection, evaluation, recording, and assembling in usable form, of naval information which may be useful to the Department of the Navy in time of war, as well as in peace. It is usually thought of as information concerning foreign governments, and especially foreign navies, maritime capabilities, industrial potential, etc., but it includes much information about our own country. Special emphasis is placed on obtaining knowledge of the naval strength, resources, dispositions and intentions of foreign powers. An Office of Naval Intelligence was established by the United States Navy on March 23, 1882, while the British and German navies organized similar agencies in 1885 and 1891, respectively. Long before this period navies had made intermittent attempts to gather information but upon establishment of the Office of Naval Intelligence (ONI), a systematic compilation of data was begun on docking facilities of the ports of the world; foreign navies; naval personnel, numbers, recruitment, training; naval maneuvers; fueling stations; new inventions and patents; submarine cables and telegraph lines; engineering resources of the United States; manufactures of material suitable for naval use; commerce and trade routes; merchant vessels suitable for naval auxiliary use; harbor fortifications; suppliers of maps and charts. The publication of data on professional and technical subjects of special interest began in 1883 and has continued.

The first director of Naval Intelligence was Lt. T.B.M. Mason, USN, who served three years. The first United States naval attaché sent abroad was Lt. Comdr. French E. Chadwick, accredited to London, Oct. 28, 1882. He distinguished himself there and later served as chief of staff to Admiral William Thomas Sampson in the war with Spain. Afterwards he was president of the Naval War College and wrote the standard history of the Spanish-American War. In November 1885, an attaché was accredited to three capitals, Paris, St. Petersburg, and Berlin. In November 1888 one was accredited to Rome and Vienna, and in Feb. 1895 one to Tokyo and Peking. In February 1897, one was sent to Madrid, thus before the Spanish-American War we had five naval attachés abroad. In 1910 an attaché

was accredited to Buenos Aires, Rio de Janeiro, and Santiago de Chile, our first to South America. On the eve of World War I in 1914 the United States Navy had six officers abroad accredited as naval attachés in 10 capitals. At the same time Great Britain had 9 officers serving as naval attachés. In wartime, 1914–1918, the United States Navy established 12 additional naval attachés in as many capitals and added assistants. World War II again increased the attaché staffs. In May 1954 the United States Navy had naval attachés accredited in 45 foreign capitals. The naval attaché in London was a rear admiral with 10 assistants, while the attachés in Paris, Rome, and Taipei, Formosa, each had five or more assistants. At the same time 39 foreign nations had naval attachés in Washington.

Although the basic duties and purposes of ONI have not changed since 1882 the drastic changes in ship construction, the introduction of naval aviation, the multiplication of types of weapons, the astonishing developments in electronics, the improvements in navigational instruments, and aids to navigation, have added to the complexity of the problems involved in collecting, compiling, recording and correcting information. The first head of ONI organized the work along functional lines rather than according to geographical areas from which it originated. Thus all data on navigation were brought together, studied and evaluated, as was done also for data on shipbuilding, marine engines, fuel, guns, ammunition, airplane design, aviation engines, seaplane development, aircraft carriers, bombs, ship supply, etc. This basic organization was essentially unchanged in 1954, but the far greater number of subjects on which data were collected had required some changes in method. In supplying the technical bureaus of the Department of the Navy with data everything was still brought together on each subject, as, for example, radio. Each technical bureau—Ships, Ordnance, Aeronautics, Yards and Docks—has all foreign information collated for its use. Likewise, the planning divisions of the Office of Naval Operations could apply to ONI for all information or any specific information concerning a particular country and be given an evaluation of the available data on that country, the data on one country being put together in what ONI calls the monograph for that nation.

In the collection of information ONI has never relied entirely on naval attachés. Other sources of information are consular reports; reports of ambassadors and ministers to the State Department; reports of intelligence officers of ships of the Navy which visit foreign ports; reports from tourists, businessmen, newspaper correspondents, and commercial travellers; commercial reports of business firms; newspapers and periodicals; books of travel, guide books, geographies published at home and abroad; and agents. The United States Army has had an Intelligence Office since 1885, and the Air Force has had one since it was established as a separate department in 1947. These agencies and the Intelligence divisions of other government departments cooperate in their work and exchange information. On July 26, 1947, the Congress provided for a Central Intelligence Agency (CIA) which functions by collecting, collating and evaluating intelligence assembled by the State Department, the Defense Department, or other government agencies, and its own service. While this CIA is the principal intelligence advisor for the president, the National Security Council, and the Congress, it has in no sense changed or lessened the duties or importance of ONI. On the contrary, its existence has served to emphasize the necessity for an efficient and effective ONI.

Each naval district has an intelligence officer who functions under the Commandant along general lines prescribed by ONI. Each naval vessel visiting a foreign port has an intelligence officer to make certain reports. There is an intelligence officer on the staff of each principal naval command.

ONI became a part of the Bureau of Navigation when first established, but it has been a part of the Office of the Chief of Naval Operations since the creation of this organization in 1915.

ONI has always preferred to operate without self-advertising in war and in peace. In spite of various newspaper stories of exploits of Intelligence officers, the tradition has been one of official silence.

When the United States declared war in 1917 ONI was assigned many duties not usually considered as being related to Intelligence. For example, much of the work in what has since been called "economic warfare" fell to the lot of the Intelligence officers. ONI had planned to take over the inspection of neutral merchant vessels in our ports, and from this duty was derived the task of checking on the quantity and type of maritime supplies which such ships proposed to purchase supposedly for their own use.

ONI organized also a counterintelligence service and a system for protection against sabotage. With the cooperation of the United States Coast Guard, then operating under the Navy Department, our ports and their installations were guarded against misuse or sabotage, and all industrial plants and commercial shipyards were protected. This sabotage detail gave special attention to fire-prevention.

When the United States entered World War I in 1917, there were 8 officers and 18 civil service clerks in ONI in Washington, D.C. On Armistice Day 1918 this total of 26 had grown by 306.

Between the two wars the personnel assigned to ONI was sharply curtailed. The peacetime complement abroad and in Washington was only slightly larger than it had been in 1914. After the outbreak of war in Europe in 1939 there was a rapid expansion, and by Dec. 1, 1941, there were 230 officers, 175 enlisted men, and 300 civilians in the Washington office, while in the naval districts there were well over 1,000 more. In foreign posts there were then 133 officers and 200 enlisted men. During World War II the numbers in Intelligence work in the districts reached a peak in 1943, with 2,597 officers, 3,091 enlisted men, and a considerable number of civilians. ONI in Washington reached a peak in numbers in 1944, with 426 officers, about 600 enlisted men, and 358 civilians. In foreign posts there were then 270 officers and about 300 enlisted men.

In May 1954 the director of Naval Intelligence was a rear admiral and his assistant held the same rank. The Naval Intelligence Division had three principal subdivisions: (1) Security Branch, with a Censorship Section, an Investigations Section, a Commerce and Travel Section, and a Security Control Section. This branch dealt with all problems of security and loyalty of individuals for the Department of the Navy. (2) Intelligence Branch, with sections named Foreign, Collection and Dissemination, Staff, Air,

and Operational Intelligence. (3) Administrative Branch.

JOHN B. HEFFERNAN,
Rear Admiral, United States Navy (Retired).

NAVAL LAW. See MILITARY LAW.

NAVAL MANEUVERS. See ARMY, NAVY, AND AIR FORCE MANEUVERS.

NAVAL MILITIA. See NAVAL RESERVE.

NAVAL MINES. See SUBMARINE MINES, MINELAYING AND MINESWEEPING.

NAVAL OBSERVATORY, The United States, a government institution, located in Washington, D.C., and serving as the national observatory of the United States. Its main activities are in those fields of mathematical and observational astronomy which have immediate practical applications in military, scientific, and civil affairs. Since these fields are not covered by the work of private observatories, the Naval Observatory alone publishes almanacs, makes observations for the basic determination of time and frequency, and makes observations of the principal celestial bodies which provide a fundamental astronomical coordinate system. The observatory acts as an adviser to various branches of the government and undertakes special projects on their behalf.

Early Period: 1830 to 1865.—Attempts were made as early as 1809 to establish a national observatory on general scientific grounds. Although these efforts were not successful, an observatory was created by the Navy Department to meet the needs of navigation. In this early period, naval officers engaged in both the scientific and administrative work of the observatory. The officers instrumental in the founding of the Naval Observatory and the Nautical Almanac Office were Lieuts. Louis M. Goldsborough, Charles Wilkes, James M. Gilliss, Matthew Fontaine Maury, and Charles Henry Davis.

At the suggestion of Lieutenant Goldsborough, who was made officer-in-charge, a Depot of Charts and Instruments was established in 1830 for the purpose of purchasing, repairing, and issuing navigational items such as chronometers, compasses, almanacs, and charts. A small transit instrument was used to determine time, which was necessary for rating chronometers.

Lieutenant Wilkes took charge in 1833, and at his own expense added several instruments and a small observing house. The depot began printing charts in 1835, as some of those purchased were printed in foreign languages.

Lieutenant Gilliss succeeded Wilkes in 1837, and the astronomical work was enlarged through the purchase of several new instruments. The work of the depot was being carried out in rented quarters, which were unsuitable, and Gilliss urged the construction of a permanent building which would house an astronomical observatory. This was authorized by Congress in 1842, the year which may be regarded as that of the founding of the Naval Observatory. A site located about three quarters of a mile west of the White House was selected. Gilliss was charged with the preparation of the plans, and was relieved by Lieutenant Maury.

The new building was ready in 1844 and Maury took charge as the first superintendent. Observations were begun in January 1845, and the results for that year were printed in the first volume of the *Washington Observations.* Both astronomical and hydographic researches were carried on, the two fields not being formally separated until 1866 by the creation of a separate Hydrographic Office. While Maury's fame rests largely on his hydrographic researches, astronomy was not neglected. His aim, from the outset, was to provide observations of such a caliber that an American nautical almanac could be computed. Such a volume predicts the positions of celestial objects, and is essential for the conduct of navigation, astronomy, and nautical surveying.

At the suggestion of Lieutenant Davis, the American Nautical Almanac Office was established independently in 1849 in Cambridge, Mass., and he was directed to take charge as superintendent. Several years were spent in forming new planetary tables, to replace existing ones which were not accurate enough, and in 1852 the first volume, the *Almanac* for 1855, was published. Davis was a mathematician as well as an active naval officer, and he translated *Theoria Motus Corporum Coelestium* by Karl Friedrich Gauss. He served as superintendent of the Almanac Office twice and also as superintendent of the observatory twice. The Almanac Office was first located at Cambridge, Mass., because of the mathematical help that Harvard College could provide. In 1866 the Almanac Office moved to Washington, but did not formally become a part of the observatory until 1894.

Maury served as superintendent of the observatory from 1844 to 1861. He was replaced by Gilliss, who served until 1865. The latter was succeeded by Davis.

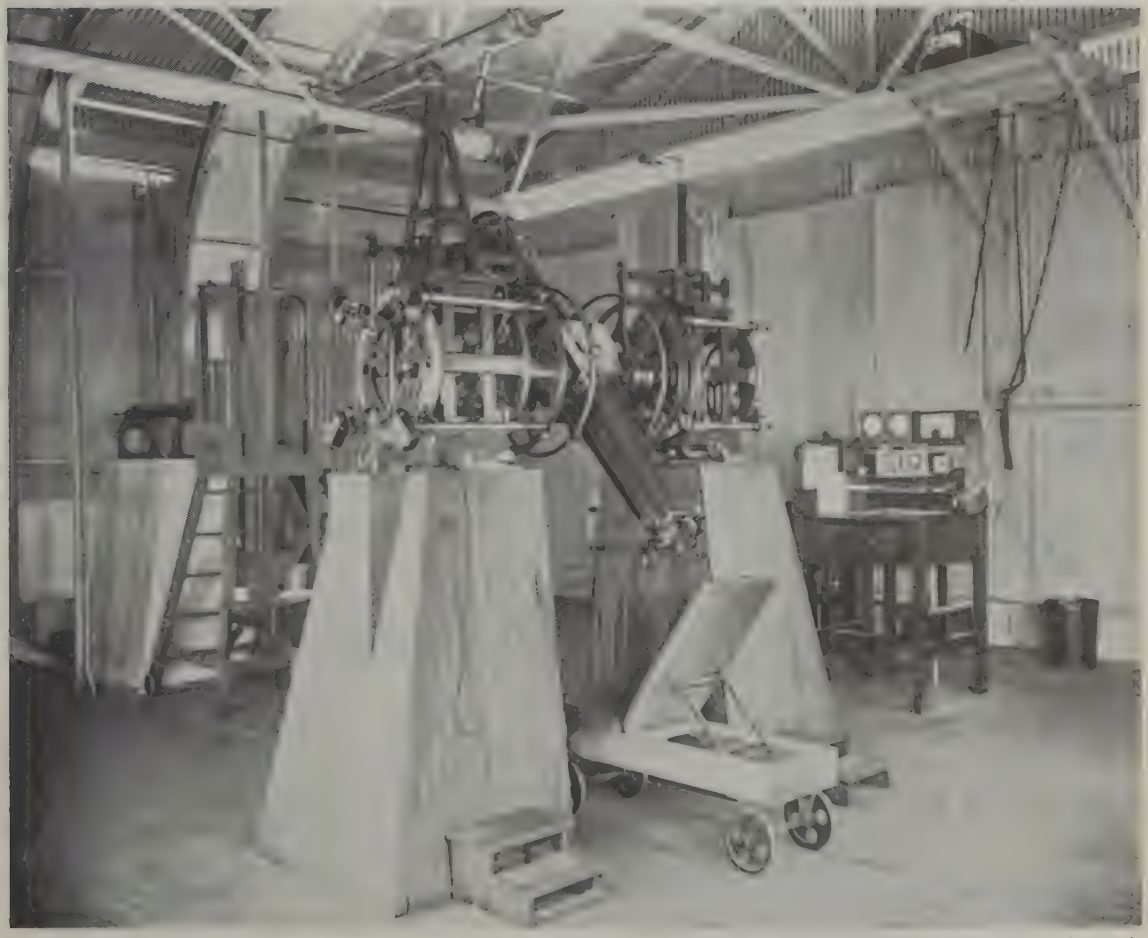
Middle Period: 1865–1893.—The degree of specialization required for further progress in astronomy had become such as to preclude active naval officers from engaging in the scientific researches. The astronomer destined to have the widest influence on the character of the observatory and astronomy as a whole during this period was Simon Newcomb. He undertook what was described by Henri Poincaré as the colossal task of forming new tables which would give the positions of the planets with the highest possible accuracy. To carry out this scheme, it was necessary (1) to have fundamental observations of the Sun, Moon, planets, and principal stars; (2) to determine a new set of astronomical constants; and (3) to construct mathematical formulas, based upon the law of gravitation, for predicting the positions of the Sun, Moon, and planets for any time in the past or future, which are known as "theories of the motion."

Since mathematically exact expressions cannot be obtained, the degree of reinforcement to which the theory is carried is governed largely by the accuracy which the data (1) and (2) possess. Accordingly, Newcomb urged the purchase of two new instruments, an 8.5-inch transit circle, obtained in 1865, for making the fundamental observations, and a 26-inch refractor, mounted in 1873, for observing the satellites of planets. The latter observations were for the purpose of determining the masses of the planets.

The 26-inch was built by the firm of Alvan Clark & Sons, with optical disks furnished by Chance Bros. of England. At the time it was the largest refractor in the world as good disks of such size had not previously been cast. With this telescope Asaph Hall made the valuable discovery, in 1877, of the two satellites of Mars.

NAVAL OBSERVATORY

The 26-inch refractor telescope (above), and photographic zenith tube No. 2 (right), United States Naval Observatory.

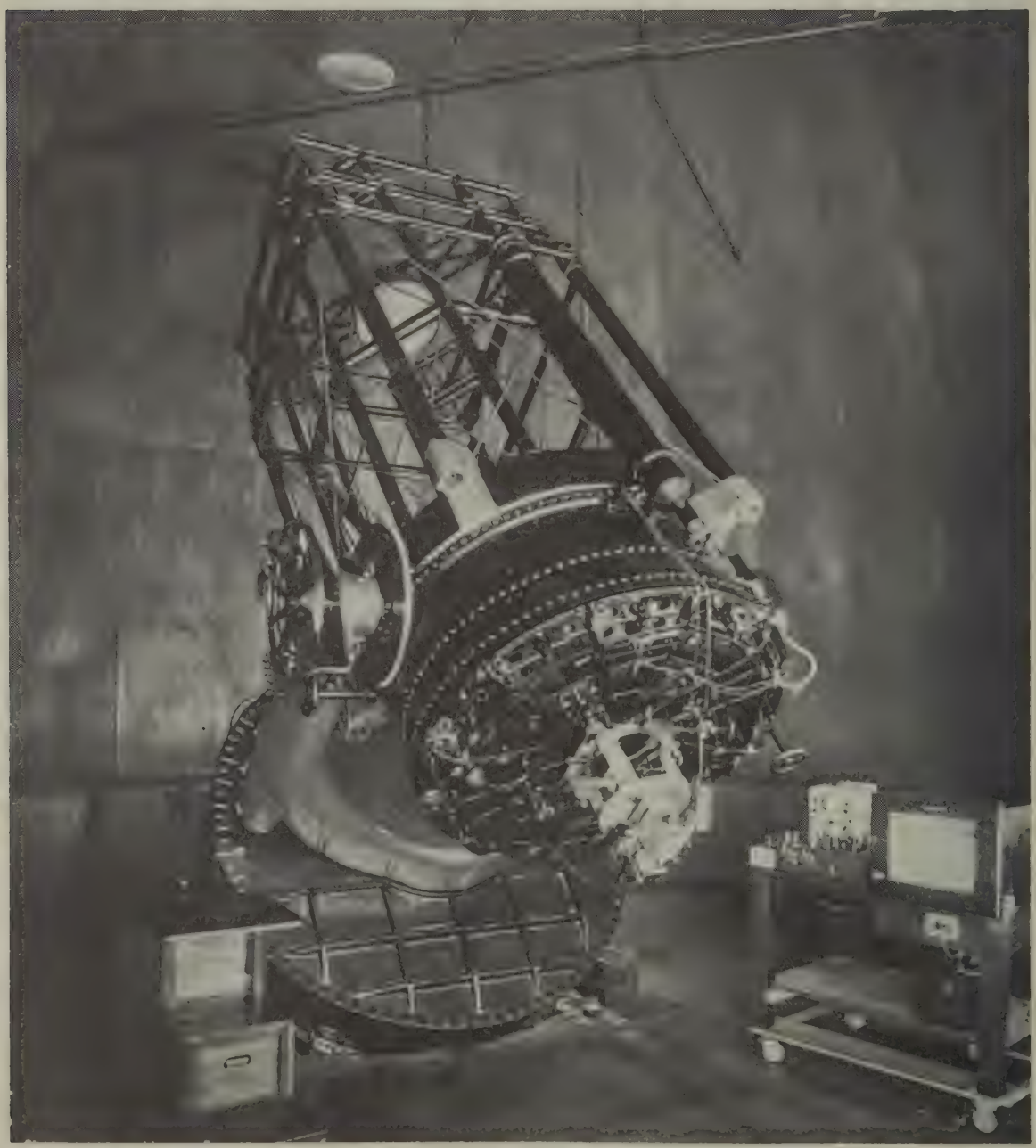


Official United States Navy photographs

Six-inch transit circle, United States Naval Observatory.

NAVAL OBSERVATORY

South entrance of the main building, United States Naval Observatory.



Official United States Navy photographs

The 40-inch Ritchey-Chrétien reflector telescope, United States Naval Observatory.

Newcomb became superintendent of the Nautical Almanac Office in 1877 and served until 1897 (the title was changed to director in 1894). During this 20-year period the astronomical constants were revised and the new tables were prepared. He himself prepared the theories of Mercury, Venus, the Earth, Mars, Uranus, and Neptune. The most difficult part of the task, the theories of Jupiter and Saturn, were entrusted to George William Hill, who, according to Newcomb, "will easily rank as the greatest master of mathematical astronomy during the last quarter of the nineteenth century." Among Hill's outstanding achievements are his researches on the motion of the Moon. These were later developed by Ernest W. Brown of Yale University Observatory to form the most accurate lunar theory available.

The theories may contain hundreds or thousands of terms, and for practical use tables must be constructed. The planetary tables compiled by Newcomb, and his values of the fundamental constants, are now used by all nations in constructing their almanacs. At an international conference held in Paris in 1896 it was agreed that these constants would be used beginning with the almanacs for 1901. This step had two important consequences: (1) it eliminated a chaotic condition in astronomy which had hindered research, and (2) it made possible the exchange of data among the national almanacs so as to eliminate much computing. The exchange of data was agreed upon by a conference in Paris in 1911, and in the next year Congress authorized the participation of the American Almanac Office in this scheme.

The public distribution of time by the observatory had begun in 1845, a time ball being dropped at noon. In 1865 the Western Union Telegraph Company ran its lines into the Time Service and thus started the distribution of Naval Observatory time to its subscribers. The observatory also furnished time to other agencies which ran lines to the Time Service.

Expeditions were organized to observe the solar eclipses of 1869, 1870, 1878, and 1889, and the transits of Venus in 1874 and 1882. The observations of the transits were reduced by William Harkness, who derived a value of the solar parallax.

With the growth of the city the location of the observatory became unsuitable and in 1881 a new site, about two miles to the northwest, was selected. The new buildings were ready for occupancy in 1893. The old buildings now house the Navy Medical School Museum of Hygiene.

Period Since 1893.—The present site of the Naval Observatory is in the form of a nearly complete circle of 2,000 feet diameter. No public street may cut through the grounds, and Massachusetts Avenue has a bend where it passes the observatory. The Administration Building houses the Almanac Office, the Time Service, the library, administrative offices, and the 12-inch refractor. Separate buildings house other telescopes and the service facilities.

The Naval Observatory is a field activity under the management control of the chief of naval operations. It is in charge of a naval officer not below the rank of captain, who is the superintendent. The astronomical programs are laid out by an Astronomical Council which includes the superintendent and the directors of the five astronomical divisions.

The Nautical Almanac Office publishes three principal volumes annually: *The American Ephemeris and Nautical Almanac,* for general astronomical purposes; *The American Nautical Almanac,* for sea navigation; and jointly with the corresponding British office, *The Air Almanac.* Research is being carried out with the aim of improving the planetary tables; much of this is on a cooperative basis with the British Nautical Almanac Office, Yale University Observatory, and the Watson Scientific Computing Laboratory. By action of the International Astronomical Union the national almanacs beginning with 1960 will use new tables for the following: (1) the ephemeris of Mars, Jupiter, Saturn, Uranus, Neptune and Pluto; (2) the ephemeris of the Moon, recomputed with higher accuracy from Brown's theory; and (3) the nutation.

Two transit circles are used for obtaining fundamental positions of the Sun, Moon, planets, and stars. The positions of the latter serve as reference points in determining the positions of the vast quantity of stars that can be observed by photography. The 6-inch transit circle was constructed in 1897 by the Warner and Swasey Co., and has been modified from time to time. Of particular importance is the method of reading the circles and micrometers by photography and of reducing the data automatically. The 8.5-inch transit circle, used up to 1945, was also modified, a 9-inch lens by Clark being substituted in 1893. It was being replaced in 1953 by a 7-inch transit circle which was designed at the observatory and made in its instrument shop. A special project being carried out was the mapping of the marginal zone of the Moon. An automatic photoelectric measuring machine was constructed, which plots the Moon's profile. Numerous photographs taken at the Naval Observatory and at other observatories were being measured and the final results will aid in the solution of certain astronomical and geodetic problems.

A 40-inch Ritchey-Chrétien reflector, built by George W. Ritchey in 1934, is used for astrometric and astrophysical purposes. A photoelectric photometer is used with it to determine the brightness of stars accurately. The discovery of interstellar polarization provides one of the main lines of research.

The 26-inch refractor was remounted by Warner and Swasey in 1893. Both visual and photographic observations are made. The objective is still in excellent condition despite some 80 years of service.

A 15-inch photographic refractor built by Warner and Swasey has a Cooke triplet objective furnished by the Perkin-Elmer Corp. It is used for astrometric work and for the study of scintillation of starlight by electronic techniques.

A photoheliograph of 5-inch aperture and 39 feet focal length is used for photographing sunspots. Visual observations of prominences and flares are made in the light of hydrogen with a Baird birefringent filter.

The determination of time is made with an instrument called a photographic zenith tube (PZT), having an 8-inch objective. It photographs only stars which transit near the zenith. It was acquired in 1915 for the determination of the variation of latitude, but was modified in 1934 so as to determine time also. Its accuracy is so high that it is being adopted by several other countries. Initially, precision pendulum clocks kept in vaults were used for timekeeping. These have now been superseded by electronic clocks, which are quartz-crystal controlled. The first clock of this type

used for the automatic transmission of time signals was built at the observatory in 1931. The transmission of time signals by naval radio stations was started in 1904, and now there is worldwide coverage. In addition, station WWV of the National Bureau of Standards affords continuous broadcasts of time and frequency based on the observations made at the observatory. In order to increase the accuracy of time determination and of the variation of latitude, a Time Service Substation, containing a second PZT, was established in 1949 at Richmond, Fla., about 15 miles south of Miami.

The rotation period of the Earth, which is the ordinary basis of timekeeping, is subject to small fluctuations. While of no consequence for many purposes, it does limit the accuracy with which frequency can be determined, a matter of concern in some fields of radio. Uniform time of great accuracy may be obtained, however, by using the Moon as a clock. A special camera, attached to the 12-inch refractor, has been developed for this purpose. It determines the position of the Moon with greater accuracy than was previously possible.

The repair of chronometers and navigational instruments by the observatory was terminated in 1950. An astronomical instrument shop, however, has been retained.

The library is devoted chiefly to astronomical and mathematical publications, and contains over 50,000 volumes. While maintained primarily for the needs of the observatory staff, the use of the library is available to other scientific investigators.

In addition to the almanacs, the observatory issues several other publications. The *Astronomical Papers of the American Ephemeris* contain the results of theoretical research of the Almanac Office. *The Publications of the U. S. Naval Observatory* contain the star catalogues and other observational results. The *U. S. Naval Observatory Circulars* contain brief works and sunspot measurements.

F. A. Graf,
Captain, United States Navy; Superintendent, United States Naval Observatory.

NAVAL RANK. See Insignia of Rank, Military and Naval—*United States.*

ELLESMERE I.
Arctic
Baffin Bay
GREENLAND
WRANGEL I.
VICTORIA I.
BAFFIN I.
USSR
SIBERIA
ALASKA
Nome
Godthaab
Hudson Bay
Bering Sea
Juneau
North
KAMCHATKA PENIN.
CANADA
ALEUTIAN IS.
Vancouver
Montreal
Ottawa
Toronto
Quebec
St. John's
North Pacific
Chicago
Atlantic
UNITED STATES
New York
San Francisco
Denver
Washington
AZORES
Ocean
Los Angeles
New Orleans
Houston
BERMUDA
Ocean
MIDWAY IS.
Gulf of Mexico
BAHAMAS
MEXICO
Havana
HAWAII
Honolulu
Mexico City
CUBA
HAITI
WAKE I.
BR.HON.
VIRGIN IS.
DOM.REP.
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HON.
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EL SALVADOR
NIC.
Sea
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Wellington
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Ocean
FALKLAND IS.
N
TIERRA del FUEGO
S. GEORGIA
S. ORKNEY IS.
S. SHETLAND IS.
PALMER PENINSULA
ANTARCTICA
Weddell Sea
MARIE BYRD LAND

THE WORLD

ENCYCLOPEDIA AMERICANA MAP

BY HAROLD K. FAYE